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Prepared for: Squamish-Lillooet Regional District

Prepared by: Ashley Davidson, A/Recovery Section Head, Environmental Emergency Branch

Overview of March 14, 2024 Water Quality Sampling at Gun Lake

Background and Overview of Potential Impacts:

Initial sampling and assessment of water quality at Gun Lake was performed in September 2023, immediately post-wildfire, funded through the Ministry of Emergency Management and Climate Readiness and in collaboration with the Gun Lake Ratepayers Association and Xwisten First Nation. This sampling event found evidence of some hydrocarbon fuel residues above suggested guidelines, prompting follow up sampling.

A follow up sampling event was carried out in March 2024 to reassess fuel-related parameters as well as new impacts that may have become evident following the fall and winter precipitation runoff. This second sampling event assessed volatile organic compounds (VOCs) in the lake as there was the potential for burned plastic residues along the shoreline. Polycyclic aromatic hydrocarbons (PAHs) which can be generated from the burning of both natural and manmade materials were assessed in Gun Lake. Metals, nutrients, and physical parameters such as pH, hardness, and cation (salt) concentrations were also assessed that can be expected from leaching of ash, burned soils and debris. This leaching can occur while the soil remains in place and can increase in intensity if soils are eroded and enter a water body. Generally, these changes are expected to take place over the first 1-2 years post-wildfire, and then become reduced in magnitude.

The Key Takeaways outlined below discuss the results from the March 2024 sampling of Gun Lake. The sample results are compared to relevant BC Water Quality Guidelines (BC WQGs) for source drinking water and for the protection of freshwater aquatic life. There are typically two standards for the protection of aquatic life – a long-term and a short-term standard.

- Long-term WQGs are designed to protect the most sensitive species and life stages against negative impacts for an indefinite amount of time.
- Short-term WQGs are set to protect against lethal effects such over a short amount of time (e.g. 96 hours).
- Source drinking water quality guidelines are developed in collaboration with the Ministry of Health and are designed to reduce risks to drinking water sources and are part of a multi-barrier approach to drinking water safety.

Comparison of the sample results against the applicable guidelines outlined above allow for assessment of the potential risk to a range of lake users at this point in time. These results have been reviewed by ENV staff and the Interior Health Authority. More information about water quality guidelines and their use can be found in the guideline summaries for [Aquatic Life, Wildlife & Agriculture](#) and [Drinking Water Sources](#); these and more resources regarding approved water quality guidelines can be found here: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines/approved-water-quality-guidelines>.



Key Takeaways:

Water quality across all sites sampled on March 14, 2024, met BC Source Drinking Water Quality Guidelines, apart from phosphorus, and there were **no exceedances of guidelines for the protection of human health at this time.**

Phosphorus is discussed in more detail below, and the drinking water standard is an aesthetic limit that does not have an impact on the protection of human health. It is recommended that residents continue to follow best practices regarding private drinking water safety, including regular monitoring and testing. More information can be found on Interior Health's website: [Drinking Water | Environmental & Seasonal Health | IH \(interiorhealth.ca\)](https://www.interiorhealth.ca/Drinking-Water-Environmental-Seasonal-Health)

Changes in water quality were observed in several parameters when compared to results from pre-wildfire sampling over the last two decades. Generally, these changes are expected to take place over the first 1-2 years post-wildfire, and then become reduced in magnitude. A few parameters did exceed BC WQG for freshwater aquatic life, as noted below.

No compounds related to fuel or plastic degradation, including volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) were detected at any of the sites that were sampled.

- These compounds were an immediate concern to drinking water quality, but also raised concern should a boil water advisory be considered because it could increase the release of these compounds. During a meeting with community members in attendance, it was noted that some residents regularly boil their water as a treatment strategy. If these VOC compounds are present when water is boiled, they may be released into the air and pose a health risk if inhaled.
- The absence of these compounds means a boil water advisory can be used to manage water quality concerns that may develop in the future (e.g., elevated fecal bacteria levels).
- These compounds were assessed at the scale of the lake itself. This did not include assessment of chemical contamination of drinking water if pipes, meters, and wellheads are burned or exposed to heat. If pipes are damaged and leak, there is also potential for bacterial contamination. See the following webpage for further information: [Wildfire: Its effects on drinking water quality | HealthLink BC](https://www.healthlinkbc.ca/wildfire-its-effects-on-drinking-water-quality).

No exceedances of BC Water Quality Guidelines (BC WQGs) for Freshwater Aquatic Life for acute (immediate impacts) were observed in this sampling event. However, BC WQGs for Freshwater Aquatic Life exceeded the chronic (long-term) standard at multiple locations. This included the metals aluminum, copper, and zinc, as well as the nutrient phosphorus.

- Aluminum, copper, and zinc exceeded long-term aquatic health guidelines, and if these concentrations are sustained, the health of the aquatic environment may degrade over time. Leaching of metals from soil post wildfire to water is expected for the first 1-2 years and then will likely decrease. Current concentrations will not cause an immediate negative impact to aquatic life.



- Phosphorus exceeded recreational and freshwater aquatic life guidelines. Phosphorus itself is not toxic, but this increases the likelihood of algae blooms that will decrease water quality and clarity for aquatic species and recreational users. Certain species of algae can release toxins that may impair drinking water quality. Resources to identify common species of algae in BC can be found through [Algae Watch](#). Information on health impacts from algae can be found on [HealthLinkBC: Cyanobacteria Blooms \(Blue-green Algae\)](#). During a cyanobacteria bloom, consider using an alternate source of drinking water for you, your family, and any pets or livestock. Boiling the water will NOT remove toxins.

Next steps:

- B.C. Lake Stewardship and Monitoring Program (BCLSMP) will be supporting volunteers from the Gun Lake community.
 - This program will analyze samples collected by volunteers every 2 weeks during the ice-free period of the year. The program aims to collect 12 rounds of samples each year, over the next three years.
 - Samples will measure phosphorus and chlorophyll-a concentrations in the lake. Chlorophyll-a is a compound produced by algae that can be used to monitor the amount of algae growing in the lake. Together with field measurements of dissolved oxygen, this program will provide information about overall lake health.
 - ENV will continue to work with the volunteers of the program to try incorporate additional metals sampling in 2025.
- Private water users should assess their water systems for signs of impacts. They can either complete this work or look to a Qualified Professional for support. From [Wildfire: Its effects on drinking water quality | HealthLink BC](#), signs of wildfire impacts to a water system can include:
 - Fires at, or upstream, of your water intake
 - Changes in water appearance, clarity, colour, smell and/or taste
 - Electricity/power outages or fire damage to structures (e.g. building, water intake valve, water well head, treatment system, piping, etc.)
 - Burning at or close to your well or piping

Water lines may need to be flushed and water supplies may need to be tested for bacteria and chemicals before being used. In some cases, repairs or replacement of damaged pieces may be required. [Wildfire: Its effects on drinking water quality | HealthLink BC](#) contains additional information on when to consider testing tap water and where to take the sample.

Disclaimer: the conclusions in this document are based upon review of the “Gun Lake Water Quality Sampling – March 14, 2024” report, detailing work performed by Stantec Consulting Ltd. This document was prepared by staff from the Environmental Emergency Branch, in consultation with the Environmental Monitoring and Analysis Branch, the Ministry of Emergency Management and Climate Readiness, and Interior Health Authority.

If you have further questions, please refer to the contacts below:

Ministry of Environment and
Climate Change Strategy

Environmental Emergency Branch
Environmental Protection Division

Website:
www.gov.bc.ca/spillsinfo

Report a Spill:
1-800-663-3456



Environmental Emergency Branch

- General questions about the potential impacts of wildfire on the environment
- Questions about the details within this document

Email: SpillRecovery@gov.bc.ca

Interior Health Authority

- General questions about drinking water quality
- Questions about drinking water treatment strategies

Email: EHWest@interiorhealth.ca

BC Lake Stewardship and Monitoring Program

- General questions about monitoring studies
- Direct contact information

Website: [B.C. Lake Stewardship and Monitoring Program](#)

Algae Watch

- Submit observations of algae to the online database
- Resources to help identify algae species

Website: [Algae Watch](#)