SECTION 8

Sucralose

A lake re-emerges: Analysis of contaminants in the *Semá:th X̱ó:tsa* (Sumas Lake) region following the BC floods of 2021
www.raincoast.org/flood-water/

RAINCOAST CONSERVATION FOUNDATION

SUCRALOSE

Capsule

We detected the artificial sweetener sucralose in all samples collected from waterways of the former *Semá:th X̱ó:tsa* (Sumas Lake) and in groundwater, but not at our upstream reference site. Sucralose concentrations rose from 0 at our reference site to an average of 63 ng/L in downstream Sumas Lake surface waters. This suggests that sucralose from septic, municipal wastewater and/or agricultural biosolids in the Sumas area is contaminating local waterways and infiltrating groundwater.

Introduction

The catastrophic floods of late 2021 in British Columbia and Washington State overwhelmed urban, agricultural and industrial infrastructure in the *Semá:th X̱ó:tsa* (Sumas Lake) area, raising concerns about the impacts of contaminant discharges into fish habitat. The absence of pre-flood baseline data and ongoing monitoring of freshwater quality in the area highlighted the urgent need for water sampling and analysis to assess the level of risk to fish and the environment.

Sucralose (trade name *Splenda*™; 1,6-dichloro-1,6-dideoxy-b-D-fructo-furanosyl 4-chloro-4-deoxy-a-D-galactopyranoside) is the most popular artificial sweetener in North America. Its stable nature in water and its lack of degradation in wastewater treatment plants has made it a reliable tracer of human waste in aquatic environments (1).

It is not cancer-causing in humans, but it may alter the gut biome. Less is known about its risks to aquatic species, but it has been shown to adversely affect aquatic plants (2).

Methods

We collected 26 surface water samples from 11 sites in the Sumas Lake area of the Fraser Valley area (British Columbia; 10 samples on December 15, 2021; 8 samples on December 23, 2021; 6 samples on January 27, 2022; and 2 samples on February 2, 2022) as well as 4 groundwater samples on February 2. Two of these samples from Abbotsford groundwater sources will be evaluated separately. Details for sampling sites are listed in the Executive Summary. Samples were stored in the field at 4°C in suitable containers supplied by partnering laboratories, and were submitted to SGS AXYS Analytical Services (https://www.sgsaxys.com/) in Sidney BC for analysis of one target compound (sucralose) using their MLA-116 Rev 2 protocol. For Quality Assurance purposes, a laboratory blank and a spiked matrix were included in analyses. Data are presented in nanograms per litre (ng/L).

We report here on total sucralose concentrations in 26 surface and 2 ground water samples following the British Columbia floods of late 2021. Two additional drinking water samples from Abbotsford groundwater sources will be evaluated separately. There are no Environmental Quality Guidelines for sucralose in Canada.

Results

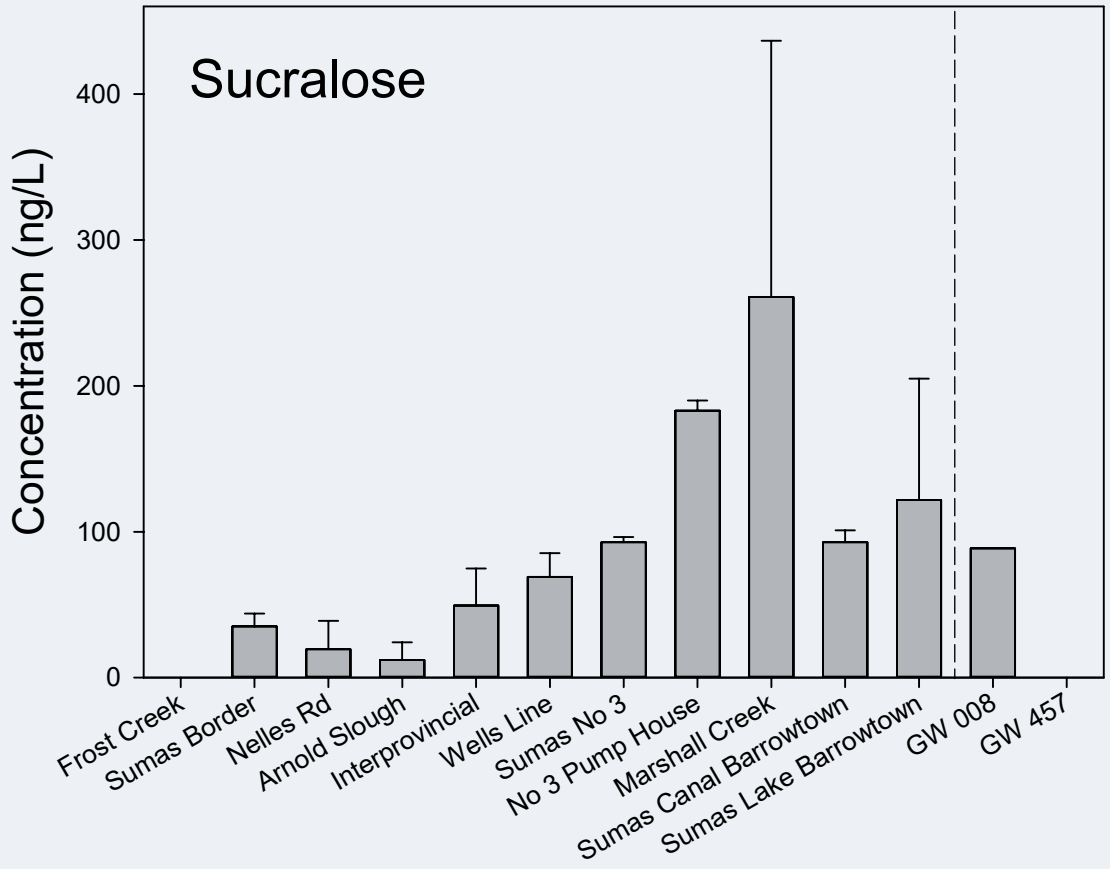
Surface water

- We detected sucralose in 77% of all water samples;
- Sucralose was detected in:
  - 9 out of 10 samples (December 15);
  - 4 out of 8 samples (December 23, 2021);
  - 5 out of 6 samples (January 27, 2022);
  - 2 out of 2 samples (February 2, 2022); and
  - 1 out of 2 groundwater samples (February 2, 2022).
- Sucralose concentrations in Sumas Lake area surface water samples collected throughout the study ranged from 0 to 611 ng/L, with a site-based average of 0 ng/L at our upstream reference site and 261 ng/L at our most impacted site.
- Sucralose concentrations rose from 0 ng/L at our upstream reference site (Frost Creek) to an average of 94 ng/L in Sumas Lake waterways over all sampling dates.
- Sucralose concentrations were 2.2 times (220%) higher on December 23 (2021) compared to Dec 15 (2021), and 1.05 times (105%) higher on January 27 (2022) compared to December 15 (2021).

Groundwater

- Sucralose concentrations ranged from 0 to 88.6 ng/L in two groundwater samples.

Figure 8.1: Sucralose was detected throughout Sumas waters



Sucralose concentrations averaged 85 +/- 79 ng/L across all sites, with highest levels found in the surface waters of the Sumas Lake waterways.

Conclusions

We found varying concentrations of the artificial sweetener sucralose in Sumas surface waters and in groundwater, highlighting the widespread distribution of this compound in fish habitat. The higher levels in Sumas Lake waterways compared to the upstream reference site at Frost Creek point to local sources from human waste released from agricultural biosolids, septic fields, and/or wastewater treatment plants (4). The increase in sucralose levels over the time of our study may indicate that the floods of 2021 led to increased contamination of fish habitat.

The presence of sucralose in Sumas Prairie waterways suggests that human waste is entering this fish habitat. Continued monitoring over space and time will provide insight into the sources of this artificial sweetener, what other domestic pollutants may also be found there, and what the consequences may be for fish.

References

1. Tollefsen, K.E, Nizzetto L, Huggett, D.B. 2012. Presence, fate and effects of the intense sweetener sucralose in the aquatic environment. *Science of The Total Environment 438:* 510-516.

2. Luo, J., Zhang, Q., Cao, M., Wu, L, Cao, J., Fang, F., Li, C., Xue, L., Feng, Q. 2019. Ecotoxicity and environmental fates of newly recognized contaminants-artificial sweeteners: A review. *Science of The Total Environment 653:* 1149-1160.

3. Spoelstra, J., Schiff, S.L., Brown, S. 2020. Septic systems contribute artificial sweeteners to streams through groundwater. *Journal of Hydrology X.* 7: 100050. Available at: (PDF) Septic systems contribute artificial sweeteners to streams through groundwater (researchgate.net)

4. Spoelstra, J., Senger, N.D., Schiff S.L. 2017. Artificial Sweeteners Reveal Septic System Effluent in Rural Groundwater. *Journal of Environmental Quality* https://doi.org/10.2134/jeq2017.06.0233.