Global Water Futures 2021 Operations Team Meeting – Project Reporting Template

Instructions: All GWF projects are asked to provide a summary update on their activities and accomplishments in preparation for the upcoming Operations Team meeting. **Please submit these by email to chris.debeer@usask.ca by no later than December 2.** These will be used to help guide discussions and breakout synthesis activities and will be made generally accessible on our website in advance of the meeting.

Project Name:	SAMMS (Sub-Arctic Metal Mobility Study)

Our major accomplishments to date are:

Metal Depositional History, Pathways, and Processes in Lake Sediments

- Jasiak I, Wiklund JA, Leclerc É, Telford JV, Couture R-M, Venkiteswaran JJ, Hall RI, Wolfe BB. 2021. Evaluating spatiotemporal patterns of arsenic, antimony, and lead deposition from legacy gold mine emissions using lake sediment records. Applied Geochemistry, doi: 10.1016/j.apgeochem.2021.105053.
- Leclerc É, Venkiteswaran JJ, Jasiak I, Telford JV, Wolfe BB, Hall RI, Schultz MDJ, Couture R-M. 2021. Quantifying arsenic post-depositional mobility in lake sediments impacted by gold ore roasting in sub-arctic Canada using inverse diagenetic modelling. Environmental Pollution 228, doi: 10.1016/j.envpol.2021.117723.
- Jasiak I. 2021. Spatiotemporal patterns of arsenic, antimony, and lead deposition in a sub-arctic gold mining region of Canada. MSc thesis. University of Waterloo. http://hdl.handle.net/10012/16725
- Leclerc É. 2021. Mobilité de l'arsenic dans les sédiments de lacs subarctiques contaminés par l'activité minière. MSc thesis. Université Laval. http://hdl.handle.net/20.500.11794/68417
- Leclerc É, Couture R-M, Venkiteswaran JJ. 2021. Data for: Quantifying arsenic post-depositional mobility in lake sediments impacted by gold ore roasting in sub-arctic Canada using inverse diagenetic modelling. Scholars Portal Dataverse, doi: 10.5683/SP2/TW3LGO.
- Jasiak I, Wolfe BB, Hall RI, Venkiteswaran JJ. 2021. Data for: Evaluating spatiotemporal patterns of arsenic, antimony, and lead deposition from legacy gold mine emissions using lake sediment records. Scholars Portal Dataverse, doi: 10.5683/SP2/TNYTQL.

DOM Quantity and Quality, Metal Binding, and Toxicology

- Sharma S. 2021. Modeling Impact of Changing Hydroclimatic Regime on Dissolved Organic Carbon Export from Baker Creek Catchment. MES thesis. University of Saskatchewan.

Terrestrial Stores of Historical Metal Deposition and Transport to Aquatic Ecosystems

- Leathers J. Assessing the potential of mining pollution-affected subarctic peatlands to act as sources of metal(loid) pollutants to downstream waters. MSc thesis in progress. Wilfrid Laurier University.
- Schultz M. Understanding long term role that catchment composition plays in arsenic retention. MSc thesis in progress. Wilfrid Laurier University.
- Aukes PJK. 2021. Disinfection By Product - Guideline Conversion App. https://paukes.shinyapps.io/dbp_guidelines/
- Aukes PJK, Venkiteswaran JJ. 2021. eee2eye: Calculate evaporation to inflow ratios for lakes using a bunch of assumptions and $\delta^{18}O$-H_2O values. R package version 0.2.6. https://github.com/paukes/eee2eye

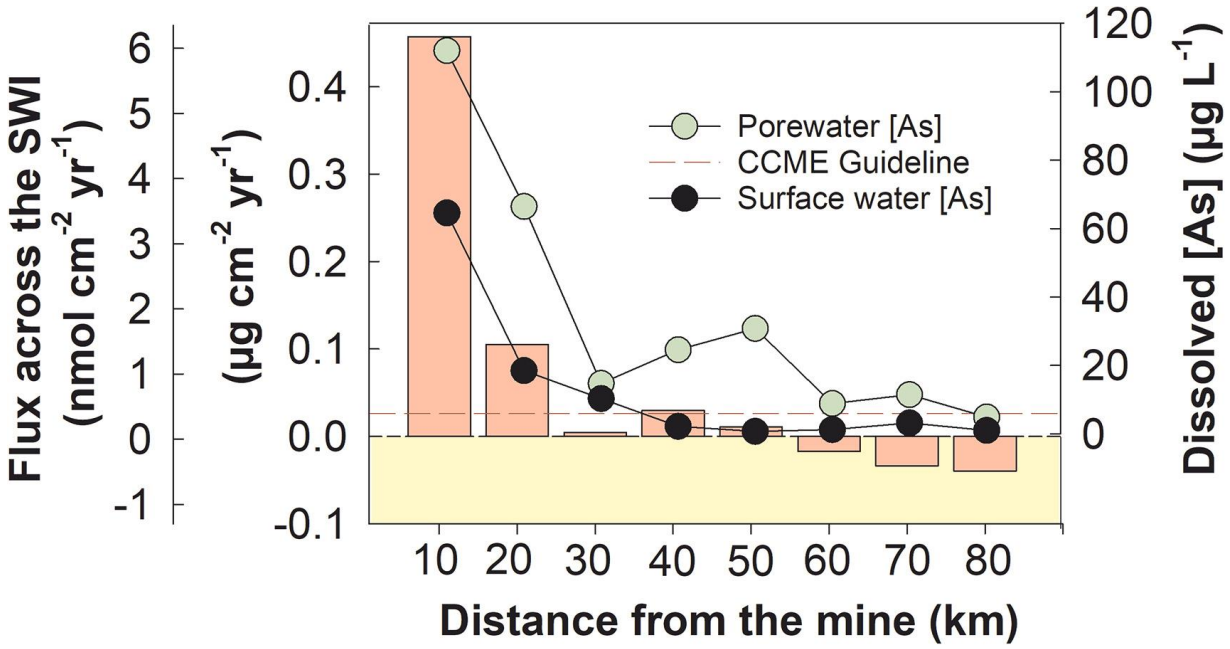
Our current activities are:

- Leveraging SAMMS results with an NSERC ACCSC grant to predict the changing carbon sinks in subarctic Canada.
- Launching new northern collaborations on arsenic-contamination rich Jackfish Lake. NSERC Alliance grant to be submitted soon.
- Precipitation Controls the Composition of DOM in Sub-Arctic Taiga Shield Lakes. This will become a journal article (mid-2022 submission.)
- Climate-induced changes to dissolved organic matter quality in the Northwest Territories, Canada, will affect disinfection by-product formation in freshwaters (mid-2022 submission.)

The main accomplishments expected by the end of the project are:

- Quantitative estimate that Giant Mine arsenic is clearly still present in lake sediments more than 70 km from Yellowknife.
- Quantitative understanding of current continued arsenic flux from lake sediments to the water column in lakes within 70 km of Yellowknife.
- Descriptive understanding of the role of lake catchment size in mediating the delivery of arsenic pollution to lakes.
- Estimate of future rates of arsenic fluxes from catchments and wetlands to lakes near Yellowknife.
- Development of partnership project on Jackfish Lake with NWT Environment and Natural Resources.

Here is a key visual from the project (figure, photo, table, graph, etc.)



Present-day early-summer diffusive As fluxes across the SWI (µg cm−2 yr−1 and nmol cm−2 yr−1; vertical bars) calculated with the code PROFILE along with porewater [As] (peak concentrations, open circles) and surface water [As] (solid circles) for each lake. The long-dashed line is the CCME Guideline (see text).
Leclerc et al. 2021. https://doi.org/10.1016/j.envpol.2021.117723