Investigating Carbon Transport Through Inland Arctic Waters Affected by Beaver Activity

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Introduction

- Beavers (*Castor Fiber*) are known to modify river flow networks that heavily influence hydrological properties.
- This study investigates the influence of beaver activity on the transport and flux of nutrients/carbon in inland arctic waters. Specifically, it examines how variations in beaver activity levels, ranging from high to low, impact nutrient and carbon dynamics within aquatic ecosystems.

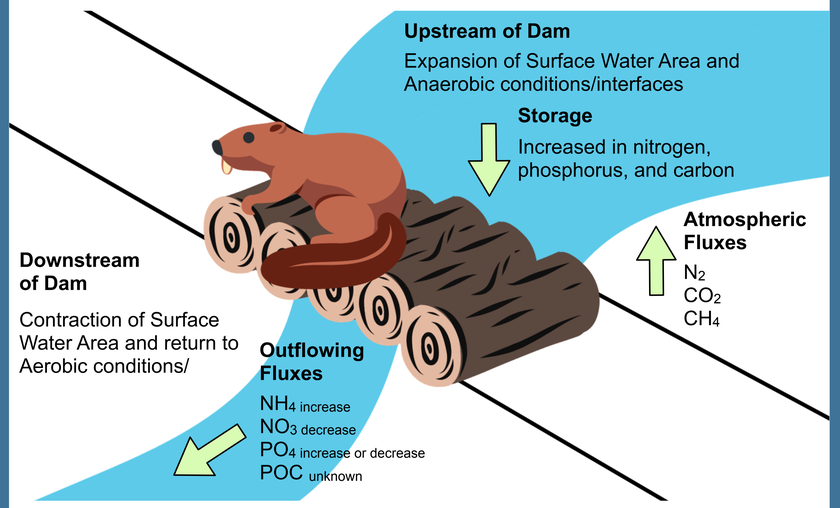

Figure 1: . Conceptual model of changing biogeochemical conditions, pathways and fluxes potentially induced by beaver dams, from upstream to downstream

Methods And Analysis

- 21 sites were sampled. Sampling sites included beaver impacted water (Beaver Pond (n = 6), Stream after BP (n = 8), Stream after DL (n = 3), Stream after LK (n = 2), Lakes (n = 2).
- At each location we measured pH, dissolved oxygen (DO), and temperature. We also analyzed water for Non-Purgeable Organic Carbon (NPOC), nutrients.
- Four sites were selected to measure ebullition and seven sites for CO2 and CH4 diffusion rates.

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Location

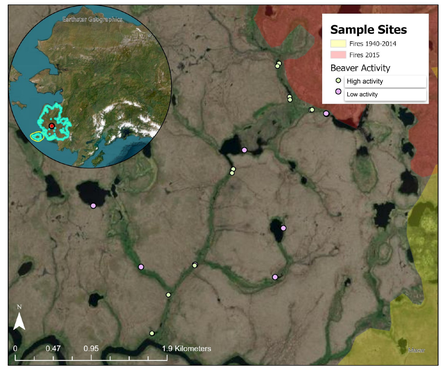

Figure 2: The Yukon-KuskoKwim Delta, Alaska and the sites chosen for this project.

Results

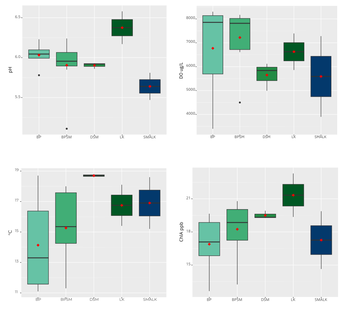

Figure 3: Barplots of pH , DO (ug/L), Temperature (celsius), ChlA (ppb) sampled in 2023, in Beaver Ponds (BP), Streams after BP (BPSM), Streams after Drained Lake (DSM), Lakes (LK), and Streams after LK (SMALK) at the Yukon-KuskoKwim Delta, Alaska

Results

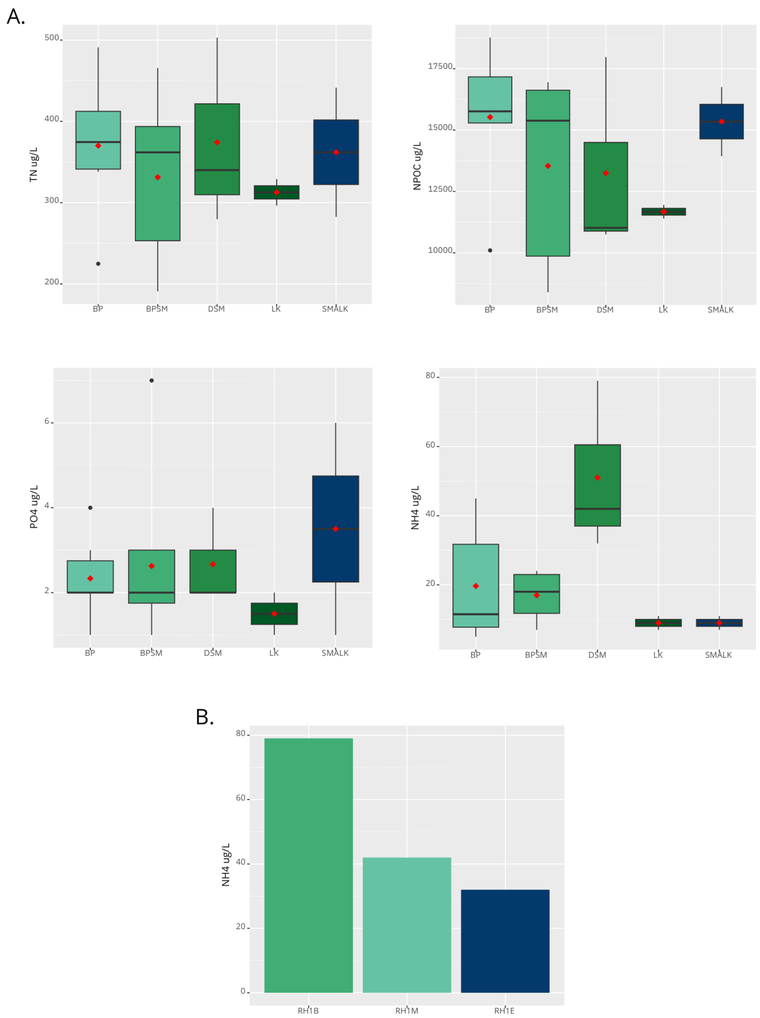

Figure 2: A.) Barplots of PO4 (ug/L), TN (ug/L), NPOC (ug/L), NH4 (ug/L) concentrations sampled in 2023, in Beaver Ponds (BP), Streams after BP (BPSM), Streams after Drained Lake (DSM), Lakes (LK), and Streams after LK (SMALK) at the Yukon-KuskoKwim Delta, Alaska. B.) Bar graph of NH4 (ug/L) concentration in all the the sample sites within the category DSM.

Future Work

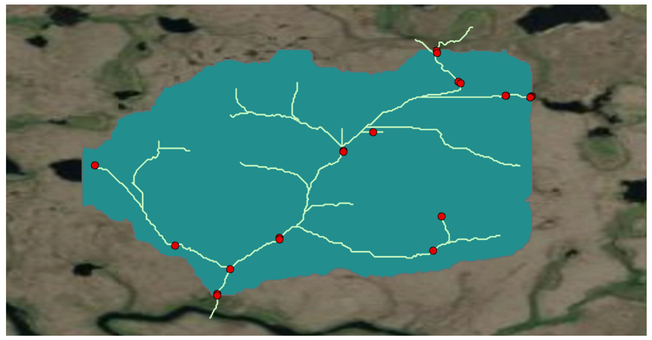

Figure 5: ARCGIS Pro Stream Network Analysis - current progress includes the establishment of the stream network, extraction of key parameters such as length and stream order, as well as the delineation of the watershed with the corresponding extraction of its area. (m^2)

- **Greenhouse Gas Assessment:**
  - Calculate ebullition and diffusion rates for CO2 and CH4.
  - Utilize field-collected data and discharge rate calculations.
  - Investigate the contribution of beaver activity to atmospheric greenhouse gas release based on landscape category.
  - Compare the rate values from different ecosystems.
- **Spatial Nutrient Distribution:**
  - Assess the spatial distribution of nutrients in ponds, lakes, and streams within the watershed of interest (Figure 5).

Summary on Current Data

- **Water Chemistry and ANOVA Analysis:**
  - Beaver activity doesn't significantly impact the landscape.
  - Mean values align with literature observations.
- **NH4 Significance:**
  - Ammonium is the only nutrient with a p-value < 0.05 (p = 0.0124).
- **Turkey Post Hoc Test:**
  - Confirms DSM NH4 concentration is statistically different from other categories.
  - Lake Drainage may explain the DSM disparity.