Investigating impacts of Rainbow Trout aquaculture on biochemical indicators in boreal shield lakes.

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Hypotheses:

- Rainbow trout aquaculture in boreal shield lakes affects particulate phosphorus concentrations at the epilimnion layer.
- Rainbow trout aquaculture in boreal shield lakes affects particulate nitrogen concentrations at the epilimnion layer.
- Rainbow trout aquaculture in boreal shield lakes affects particulate carbon concentrations at the epilimnion layer.
- Rainbow trout aquaculture in boreal shield lakes affects primary producer productivity at the epilimnion layer of the lake.

Null Hypotheses:

- Rainbow trout aquaculture in boreal shield lakes does not affect particulate phosphorus concentrations at the epilimnion layer.
- Rainbow trout aquaculture in boreal shield lakes does not affect particulate nitrogen concentrations at the epilimnion layer.
- Rainbow trout aquaculture in boreal shield lakes does not affect particulate carbon concentrations at the epilimnion layer.
- Rainbow trout aquaculture in boreal shield lakes does not affect primary productivity at the epilimnion layer of the lake.

Brief description of data source:

The data source was collected from the IISD-Experimental Lakes Area (ELA) located in northwestern Ontario. This research site has been active since 1986 and contributes to one of the longest and most comprehensive data sets on freshwater lakes in the world. This site consists of 58 small lakes where they focus on answering problems related to climate change, water management, and other anthropogenic processes and their influences on freshwater systems. IISD-ELA is known for their whole ecosystem experiments where whole lake manipulations can be conducted. One such experiment was conducted to determine the impacts of aquaculture on a whole lake ecosystem from 2003 to 2007. A significant amount of data, such as water chemistry and species populations, has been collected on this lake before, during, and after this experiment was set up. The data collected from this experiment has been used to provide guidelines for the aquaculture industry (Bristow et al., 2008; Kennedy et al., 2019; Rennie et al., 2019).

The Chemical Analysis of Fresh Water, 1977, Second Edition

Brief description of how data was collected:

From 1982-1990, these water samples were taken as dip samples from the surface at the depth of an arm's length. From 1990-2022, water samples were collected with an integrated sampler. The integrated water sampler was used at depths of 0.5 m above the bottom of the thermal epilimnion to the surface of the water. The thermo epilimnion (thermocline) is defined as the last measured depth before an over 1°C change in water temperature (Sandilands and Fafard, 2020).

Which section of the dataset you plan to use in your analysis:

We plan to examine total dissolved C (inorganic + organic), total dissolved P, total dissolved N, particulate N, particulate P, particulate C, chlorophyll, and SO_4 measurements recorded from lake 375 before the aquaculture experiment, during the experiment (2003-2007), and after the aquaculture experiment had stopped. The columns of interest for our project will include year, activity_start_date, characteristic_name, result_value, result_unit, and result_analytical_method_instrument.

Years we have data for

1982 ,1983, 1986, 1987, 1989, 1990, 1991, 1992, 1993, 1994, 1997, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2011, 2021, 2022

Citation for methods:

1977 – 2014
The Chemical Analysis of Fresh Water - Second Edition, 1977

2015 – 2021
The Chemical Analysis of Fresh Water - Third Edition, 202X

2022 - 2022
The Chemical Analysis of Fresh Water - Third Edition, 202X (except for

TDP, alkalinity, pH, conductivity, and turbidity)

Citation for Dataset

Works Cited

Bristow, C. E., Morin, A., Hesslein, R. H., & Podemski, C. L. (2008). Phosphorus budget and productivity of an experimental lake during the initial three years of cage aquaculture. *Canadian Journal of Fisheries and Aquatic Sciences*, *65*(11), 2485–2495. https://doi.org/10.1139/F08-155

Kennedy, P. J., Blanchfield, P. J., Kidd, K. A., Paterson, M. J., Podemski, C. L., & Rennie, M. D. (2019). Changes in the condition, early growth, and trophic position of lake trout (*Salvelinus namaycush*) in response to an experimental aquaculture operation. *Canadian Journal of Fisheries and Aquatic Sciences*, *76*(8), 1376–1387. https://doi.org/10.1139/cjfas-2017-0578

Rennie, M. D., Kennedy, P. J., Mills, K. H., Rodgers, C. M. C., Charles, C., Hrenchuk, L. E., Chalanchuk, S., Blanchfield, P. J., Paterson, M. J., & Podemski, C. L. (2019). Impacts of freshwater aquaculture on fish communities: A whole‐ecosystem experimental approach. *Freshwater Biology*, *64*(5), 870–885. https://doi.org/10.1111/fwb.13269

Sandilands, K., & Fafard, P. (2020). *Lake sampling and field observations: Physical limnology information sheet*.