

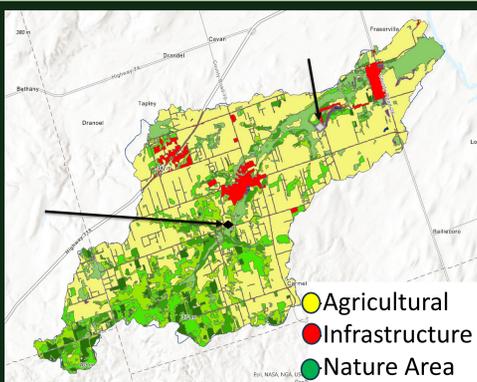
Long-term trends in Water Quality of Baxter Creek

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BAXTER CREEK

This study is hosted by Baxter Creek Watershed Alliance which works to monitor and protect this watershed by supporting student research, raising community awareness and farm stewardship.

Baxter Creek watershed area is 90.95 km² with land type of 38.5% wooded area, 8% wetlands, 7.1% floodplain, and 46.4 % agriculture. Temperate climate with ~ 905 mm of precipitation per year, annual mean temperature of 6.9 °C, and mean elevation of 264.7 m.



PARAMETERS

- Nitrogen
- Phosphorus
- Dissolved Organic Carbon
- Sodium
- Chloride

FIGURE 1: MAP OF WATERSHED & SAMPLE SITES

OBJECTIVES

My objective was to analyze a long-term data series for nutrients, carbon and their ratios (stoichiometry), and test the relationship of these trends with Discharge and season.

WHY THESE PARAMETERS?

These parameters are principal macronutrients affecting biological communities, with excessive quantities raising eutrophication concerns for downstream communities.

DATA SOURCING

The Ministry of Environment Conservation and Parks Provincial Water Quality Monitoring Network samples Baxter creek yearly with exact months sampled varying annually. Flow data from Water Survey of Canada.

STATISTICAL ANALYSES

Data were analyzed with Mann-Kendall test in RStudio of the Seasonal averages per parameter. P values were used to evaluate significance. One way ANOVA and Tukey post-hoc test to examine differences amongst seasons. A general linear model was used to investigate the interacting effects of season and discharge on parameter concentrations.

SEASONS

Spring March-May
Summer June-Aug.
Autumn Sept.-Nov.

SEASONALITY

Nitrates, DOC, TN had significant seasonal differences between Summer and Autumn. Baxter Creek Discharge also varied by season with spring melt as the maximum discharge.

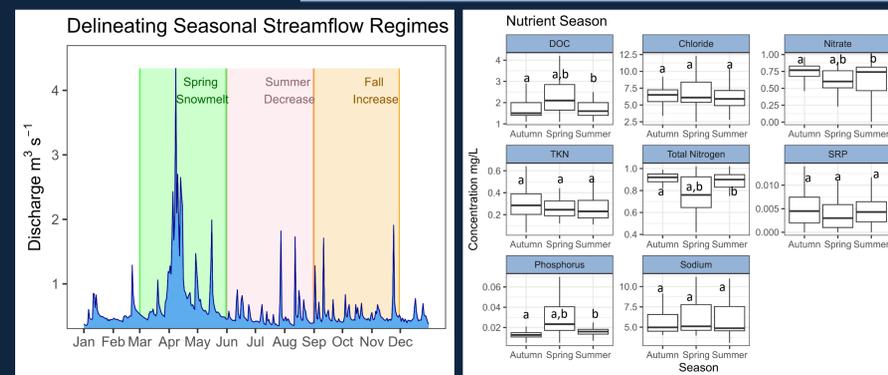


FIGURE 2: SEASONALITY LONG TERM TRENDS

Soluble Reactive Phosphorus (SRP) is the most bioavailable nutrient for algal growth. SRP has been increasing in the summer which is concerning for the development of algal blooms. Total Nitrogen has also been increasing in the spring and summer. Chlorides in autumn was also observed increasing significantly. Other parameters were not significant.

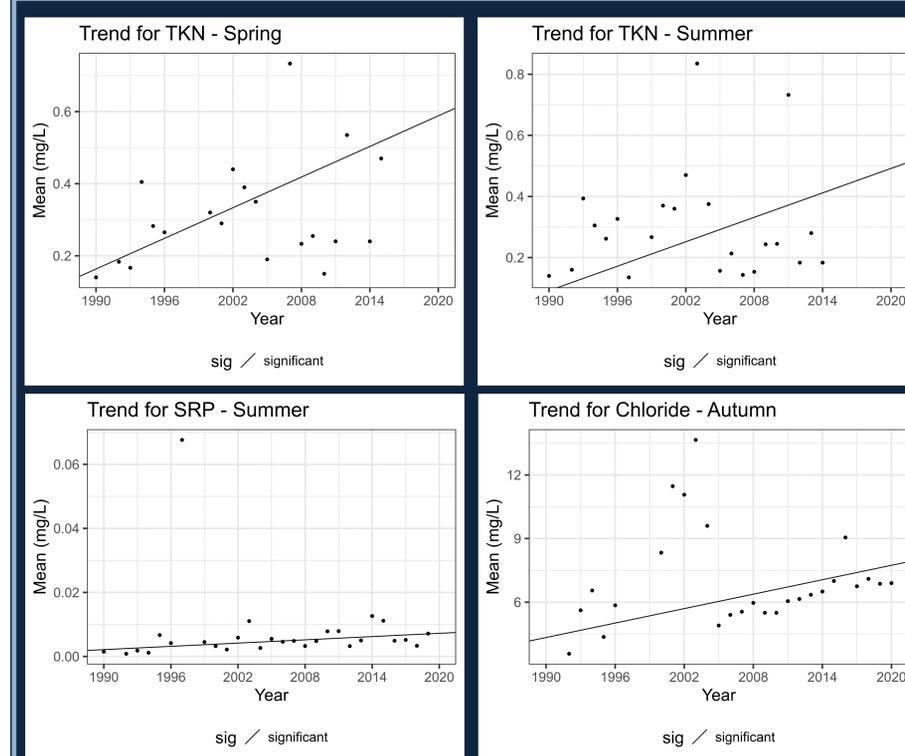


FIGURE 3: SIGNIFICANT LONG TERM TRENDS

STOICHIOMETRIC RATIO TRENDS

The balance of organic carbon (DOC), nitrogen (N), and phosphorus (P) plays a crucial role in aquatic ecosystems and is important to better understand how microbes process nutrients. DOC: SRP is declining which could be problematic for downstream eutrophication.

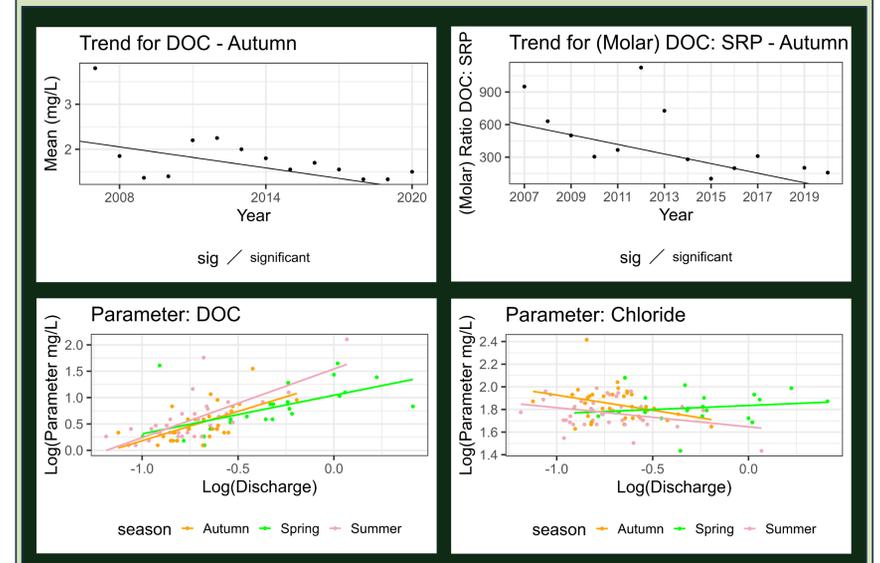


FIGURE 4: RATIO SEASONAL TRENDS AND PARAMETER VS DISCHARGE PLOTS

SUMMARY

SI found increases in concentrations of chlorides, soluble reactive phosphorus, total nitrogen, and nitrates whereas dissolved organic carbon is decreasing but this varied by season.

FUTURE AREAS FOR STUDY

Consider discharge, temperature, or precipitation for possible trends, non-linear trend analysis, consider micronutrient trends, analysis of fluctuations in Dissolved Oxygen, update calculations as more data becomes available

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