Reflections on Water:

A Data Story of Quality and Ecology in Prince Albert's Lakes

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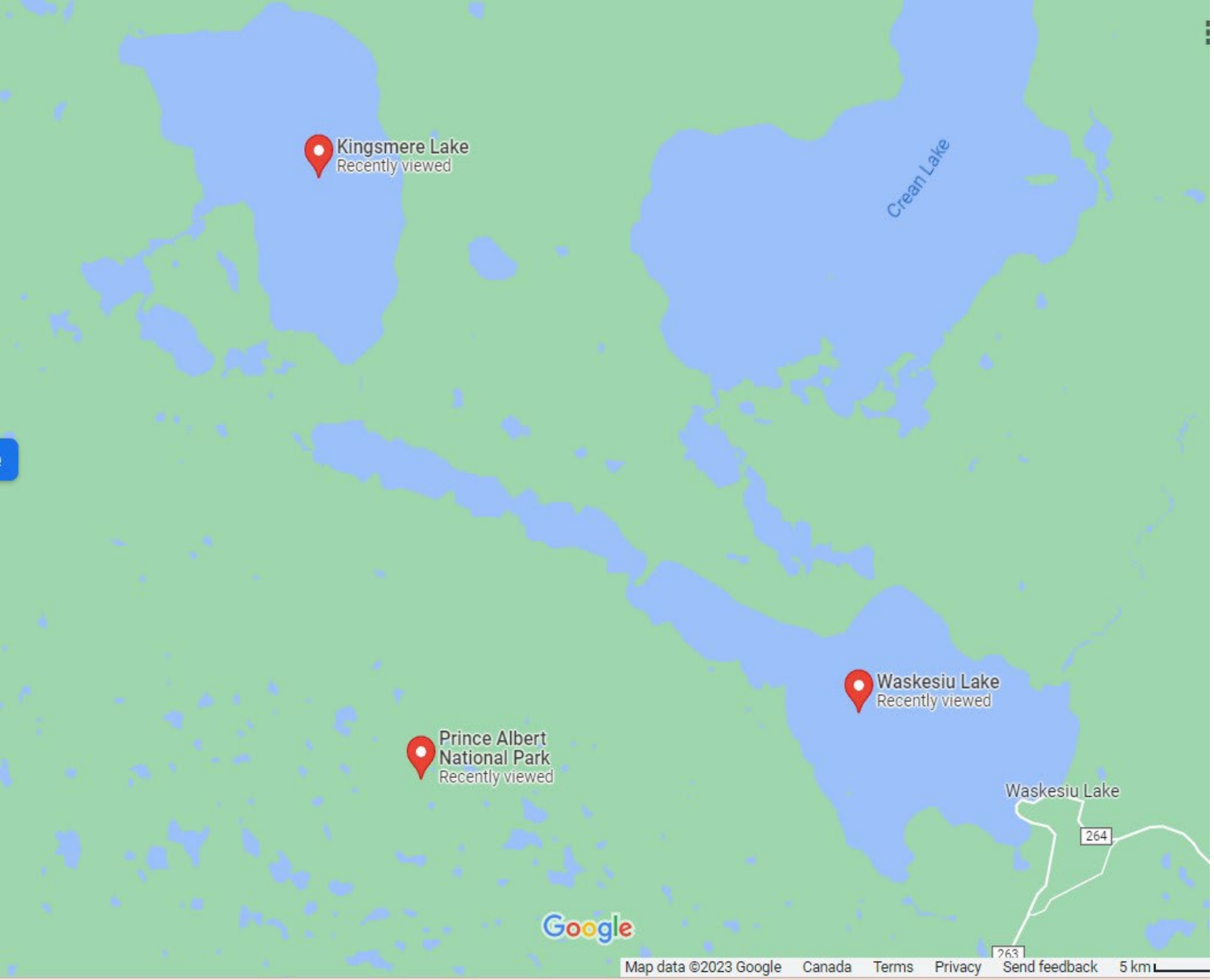
Final Project



Introduction

- Focusing on the water quality and ecological health of Kingsmere and Waskesiu lakes.
- Located in Prince Albert, Saskatchewan.

Tools

- Python and R for data manipulation, cleaning, and analysis.
- Tableau, seaborn, matplotlib, and ggplot2 for visualization.

The Data

- "Water Quality - Prince Albert" Dataset, 6 csv files
- Licensed under the Open Government Licence - Canada

Data Wrangling

- Standardized column names for clarity
- Removed null values
- Data column splitting
- Ensured correct association of attributes and values

Key variables

- pH, Temperature
- Dissolved Organic Carbon (DOC): mg/L
- Dissolved Oxygen: mg/L
- Ammonia: mg/L
- Nitrogen Oxides (Nox): in ppm
- E.Coli: CFU/100 mL
- Secchi Disk Depth: m
- Total Dissolved Solids (TDS): mg/L
- Total Phosphorus: mg/L
- Total Coliforms: CFU/100 mL

Guiding Questions

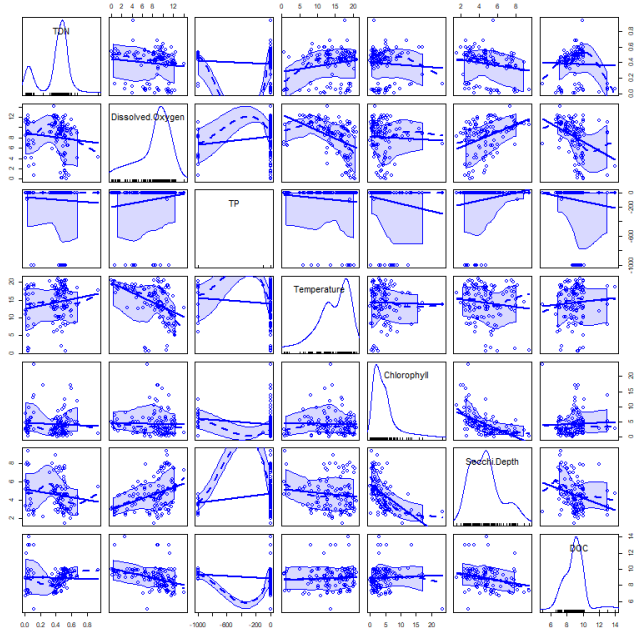
1. How do interactions between chemical attributes in water samples influence the overall water quality in aquatic ecosystems?

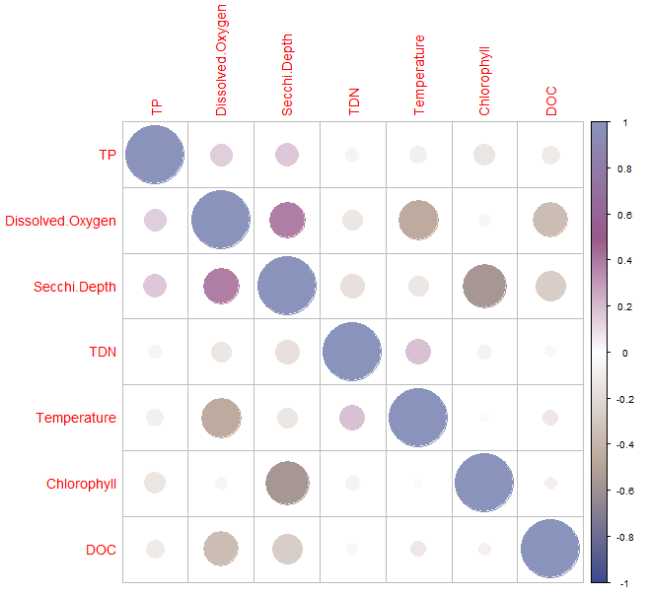
2. How does the Secchi depth change with seasons, and what does it tell us about variations in lake water transparency?

3. What patterns of change have been observed in the temperature, pH, and dissolved oxygen levels in the lake over time?

4. How do the total coliform concentrations contrast between Kingsmere lake and Waskesiu lake?

5. How do contamination levels in the lake vary across different months, and what environmental factors might be contributing to these changes?





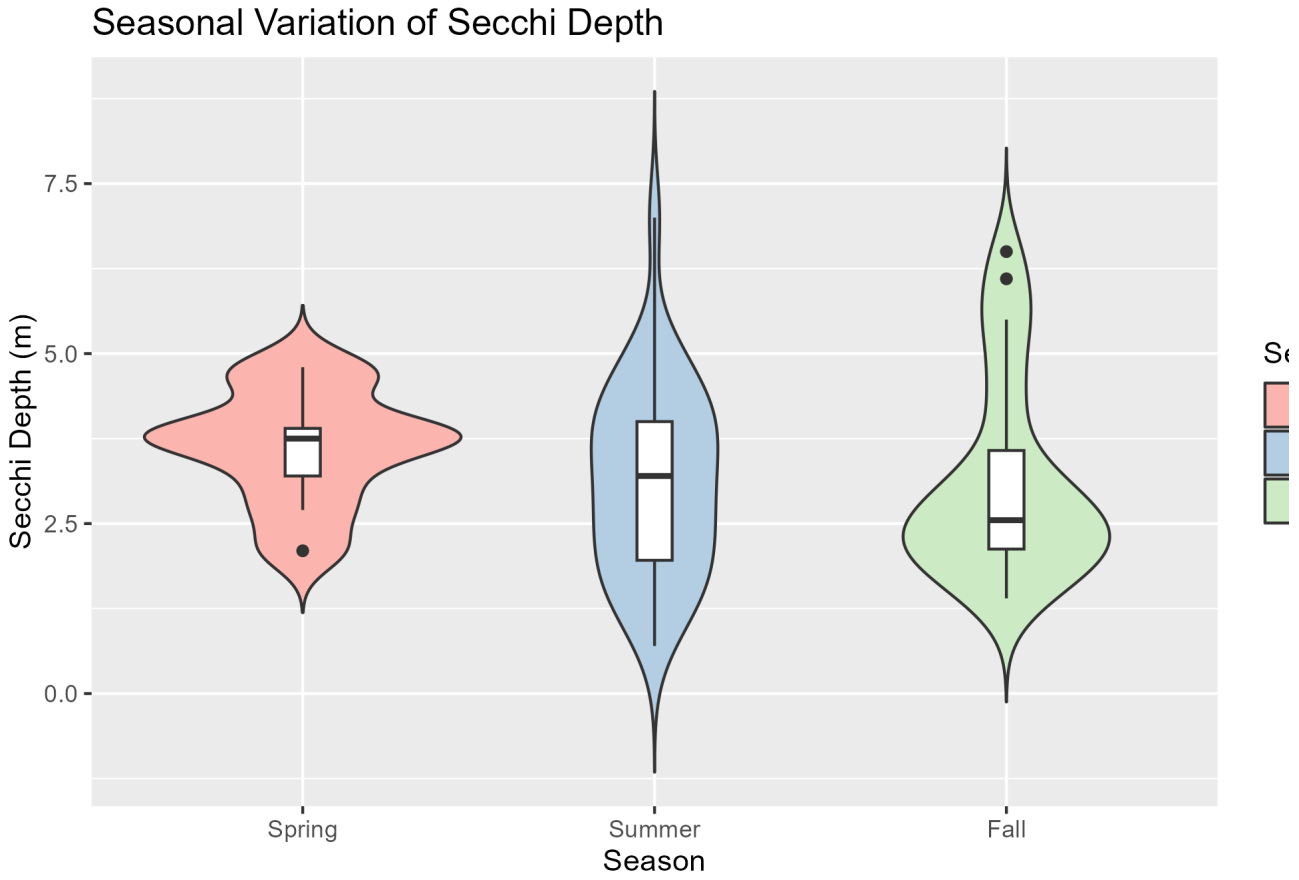
1. Interactions Between Chemical Attributes in Water Samples

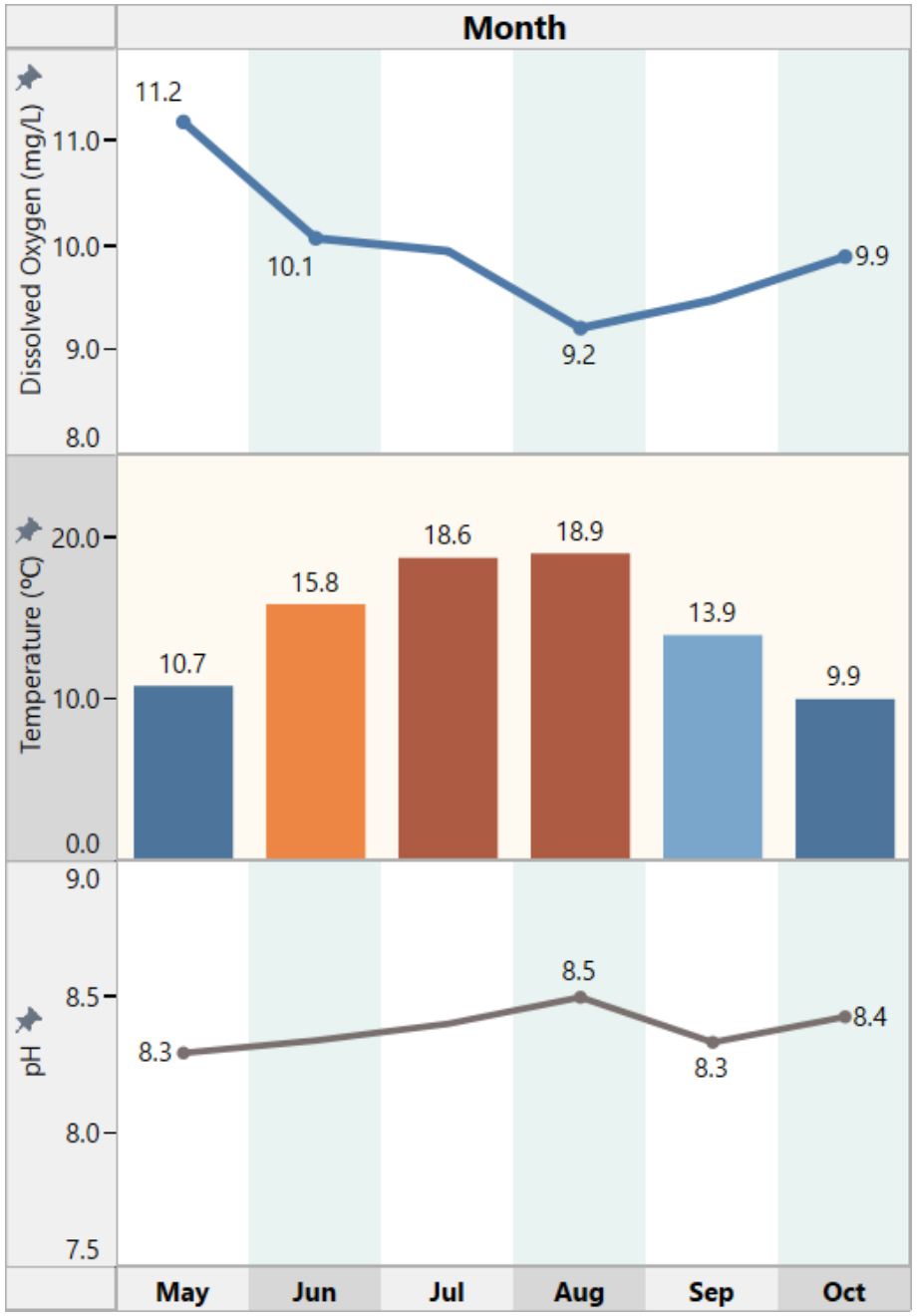
Key findings from the correlation analysis:

- Minor negative correlation between Ammonia and Total Dissolved Nitrogen.
- Noticeable negative correlation between Dissolved Oxygen and Temperature.
- Moderate positive correlation between Nitrogen Oxides and Total Phosphorus.
- Pronounced negative correlation between Secchi Depth and Chlorophyll.
- Moderate negative correlation between Dissolved Organic Carbon and Dissolved Oxygen.

2. Secchi Depth and Seasonal Variations

- Secchi depth is an essential indicator of water transparency.
- High Secchi depth values typically mean clearer water and improved water quality.
- Seasonal variations observed in our data: highest in spring, slightly lower in summer, and lowest in autumn.
- Variations attributed to different nutrient levels, algal blooms, and human activity.



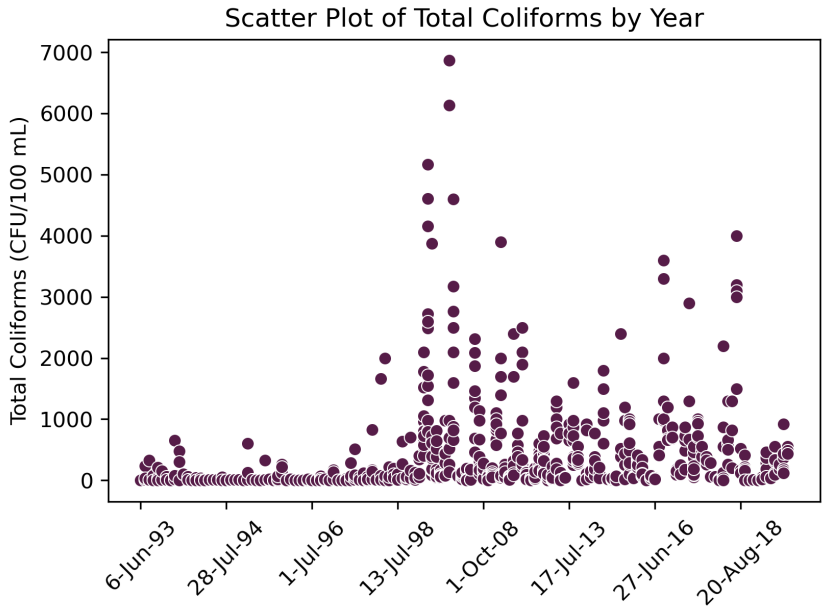


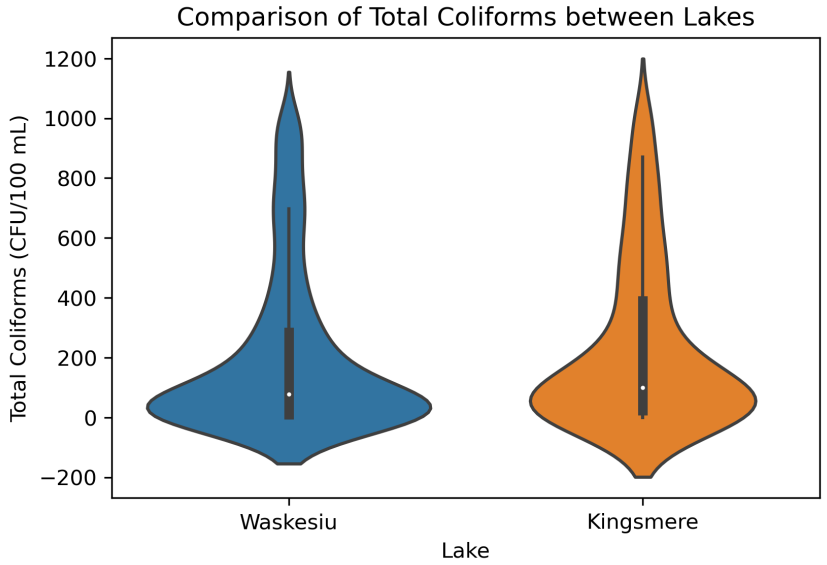
3. Temperature, pH, and Dissolved Oxygen Trends

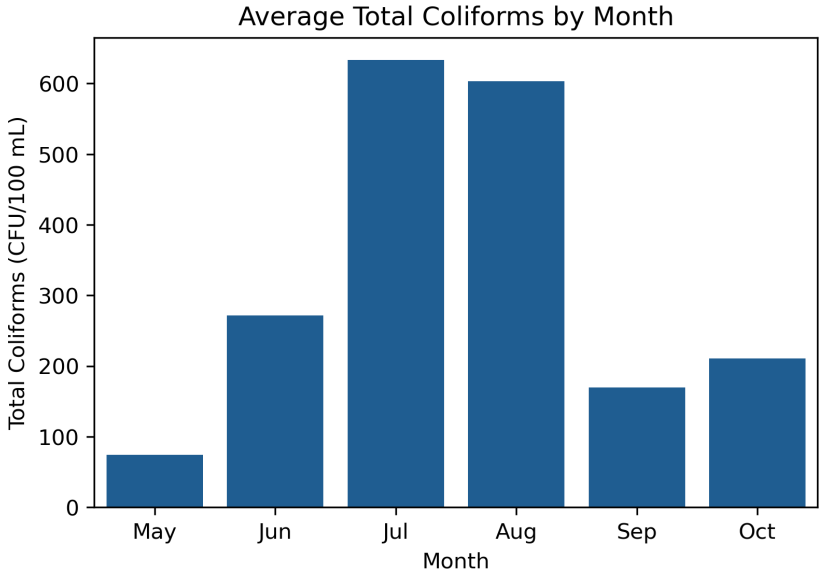
- Water temperature, pH, and dissolved oxygen are key parameters indicating the water quality.
- Water temperature influences the solubility of oxygen: higher temperatures lead to lower dissolved oxygen levels.
- pH levels remained relatively stable, hovering around 8.5, indicating mildly alkaline conditions.
- The steadiness in pH may be attributed to the lakes' buffering capacity, which enables them to resist significant pH fluctuations.
- Various factors such as seasonal changes and metabolic rates of aquatic organisms can influence these trends.

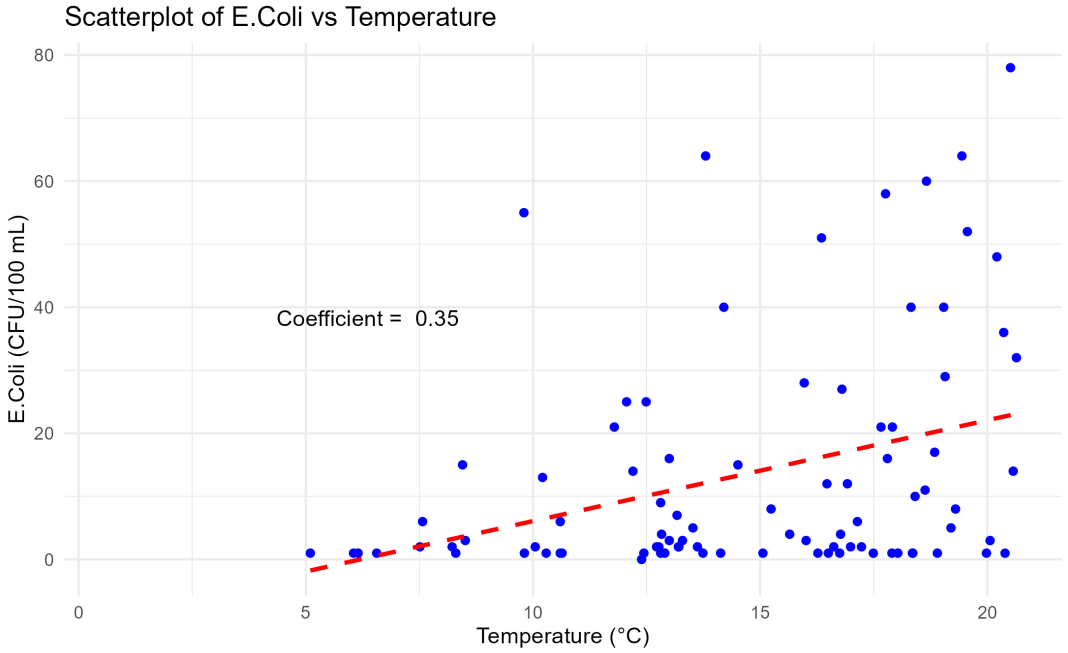
4. Total Coliform Concentrations in Kingsmere and Waskesiu

- Total Coliforms are indicators of potential fecal contamination in water.
- Significant variability in Total Coliforms levels was observed in the data.
- Comparing Kingsmere lake and Waskesiu lake, similar coliform distributions were observed after excluding outliers.
- Kingsmere lake showed a slightly elevated level of contamination in the upper range.









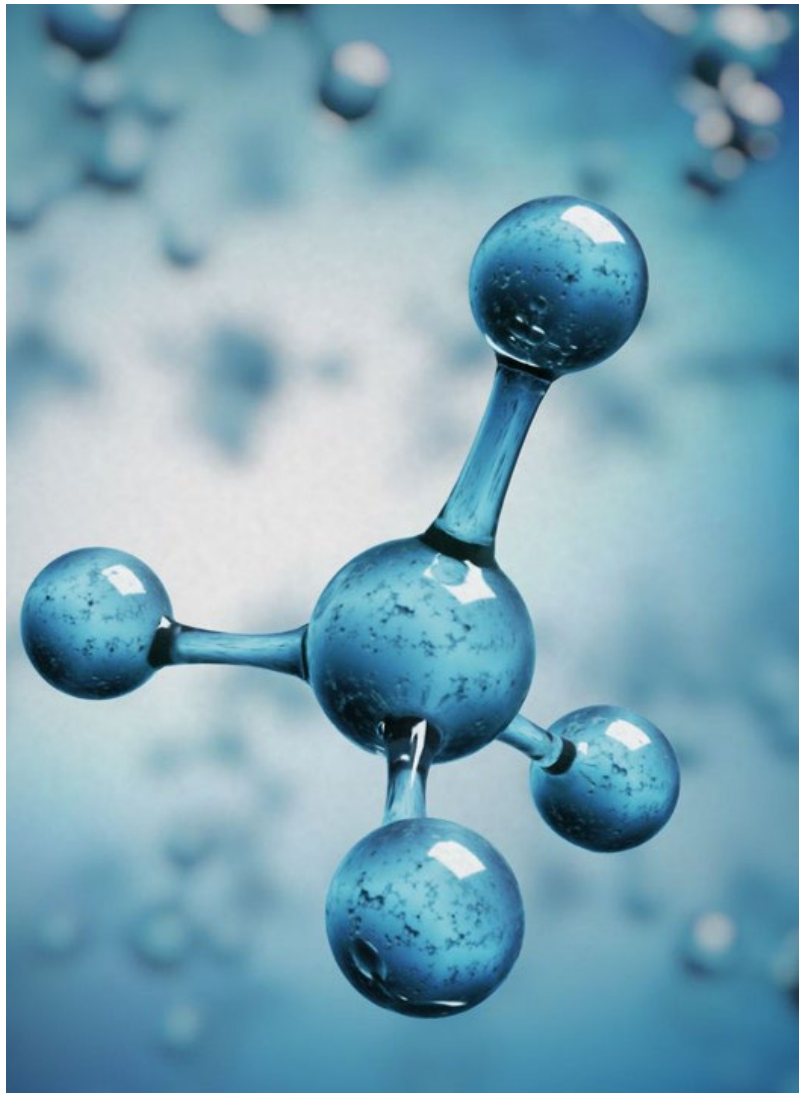
5. Monthly Variations in Contamination Levels

- Contamination levels vary across different months, with average total coliform levels highest in July and August.
- E. coli, a key constituent of the total coliform group, shows a moderate positive correlation with temperature.

The rise in E. coli count during warmer months suggests that warmer conditions are more conducive for multiplication.

Conclusion

- Conducted a thorough analysis of the "Water Quality - Prince Albert" dataset to understand the interactions of various chemical attributes.
- Uncovered significant correlations and trends affecting water quality, transforming complex data into insightful information.
- Water quality is a dynamic phenomenon, influenced by a multitude of ever-changing factors. This study provides a snapshot of this ongoing process.
- The importance of ongoing data collection and analysis is emphasized for understanding and preserving our aquatic ecosystems.
- Our data story is but one chapter in the intricate life of water, with countless tales of ecological, chemical, and biological interactions yet to be discovered.



Reference

- Government of Canada, 2023. Water Quality - Prince Albert. Available at: https://open.canada.ca/data/en/dataset/a0096ea6-6ce0-4007-b43e-9d535cd1a32c. Contains information licensed under the Open Government Licence – Canada.

Thank you