Team 24: Data-driven Approaches to Illuminate the Responses of Lakes to Environmental Stressors



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Acknowledgements

Data

Thank you to everyone who has supported, contributed to, and funded this project, including the ELA and the Institute for Sustainable Development, Data+ and the Rhodes Information Initiative at Duke University, Sumeep Bath, Sarah Warrack, Pauline Gerrard, Wenhong Li, and Jory Weintraub

Overview

Long-term monitoring data can offer us important insights into the impact of climate change on our valuable natural resources such as freshwater lakes. However, visualizing and communicating the data to the public is still a major challenge. In this project, we present ecological data collected by the Experimental Lakes Area (ELA) in Ontario, Canada, over a period of 50 years, in an easily understood format. Our goal is to use a data-driven approach to educate the public about lake dynamics and ecosystem health. Using R and the R Shiny platform, we hope to illustrate information on the long-term monitoring data collected at ELA, along with a multitude of different experiments performed at the facility.

Methods

Data Wrangling

We processed monitoring data in R in a consistent format including reorganizing the data into tidy format, merging data sets with similar topics and converting all files into csv. We also wrote metadata for future reference.

Data Visualization

We created a variety of visualizations including line graphs, heatmaps and animations to visualize the ecological trends in the lakes. We also used the plotly package to increase the interactivity of our visualizations.

R Shiny

We built an interactive website in R shiny with educational modules incorporating the visualizations we created. We also used css to increase the visual appeal of our website.

Next Steps

In coming weeks, we will present our website to researchers and staff at ELA for beta-testing. Ultimately, the website will be polished and deployed on the ELA website to facilitate environmental education and outreach.

R Shiny Application

Home Page

The home page includes an introduction to our website, background information about ELA and our data sources as well as four interactive buttons which will take the user to our individual data-driven modules on lake ecology.



Individual Module Layout

We created four educational modules focusing on long-term monitoring, eutrophication, acidification and hydrological diversions. We made an introduction tab for each module detailing the ecological problems of interest and definitions of the scientific terms to provide the user enough background to understand the data. Following the introductions, we have separate tabs displaying visualizations we made to illustrate ecological trends such as seasonal temperature variation in the lake or experiment results such as the pH levels in the lake after the acidification experiment.



About Eutrophication Phytoplankton Zooplankton Lake Colors ELA Experiments Graphs

ELA experiments with fertilization and eutrophication



The ELA has conducted two main experiments in eutrophication: the divided fertilization of Lake 226, and the fertilization of Lake 227.

Lake 239

Lake 239, also known as Rawson Lake, has never been used for experimentation at the ELA, meaning it is considered **pristine**. That makes it a great lake to use as an example of how a lake behaves when it is not affected by experimentation.

Lake 226

Lake 226 was formerly pristing, but beginning in 1373, scientists at the ELA split t into two sides by a vinyl see-curian (similar to a shover curtain) and fertilized with different concentrations of nutrients one sholl each soll each curtain in order to test the effects of fertilization on eutrophication. Recall that phytoplankton consume nutrients to survive. The ELA scientists hypothesized that adding nutrients would lead to an increase in the amount of plankton living in the lake. The south side was fertilized with only carbon and nitrogen, and the north side was fertilized with only carbon and nitrogen, and the north, side was fertilized with only carbon and nitrogen, and the north, side was fertilized with only carbon and nitrogen, and the north, side was fertilized with only carbon and nitrogen, and the north, side was fertilized with only carbon and nitrogen, and the north, side was fertilized with only carbon and nitrogen, and the north, side was fertilized with only carbon and nitrogen.

