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

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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.

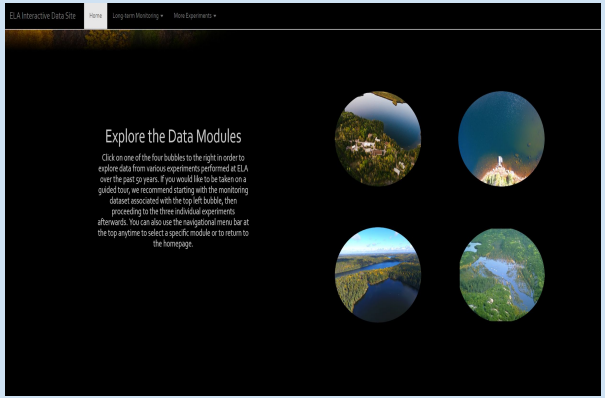
Next Steps

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.