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CS 6260

Group 04

Term Project Report

30th November 2023.

Topic: Water and Soil Data Analysis.

**PART I**

**TEAM MEMBER NAMES**

* Elvis Nnaemeka Chukwuani
* Kiana Kiashemshaki
* Uchechi Nwala

Below is the link to the project, it is hosted on my GitHub page.

[**https://elvis142.github.io/FinalProject/watermap.html**](https://elvis142.github.io/FinalProject/watermap.html)

**PART II**

* Explanation of the visualization components.

**Requirement:** I would like to have maps with the wetland pools color-coded by arithmetic mean values for each of the chemical analysis parameters. The initial set can be averages of the values for the entire sampling collection period.

In meeting requirement: We met this requirement by creating an interactive map interface that enables users to easily identify the location of each wetland pool, our map shows the 43 wetland pools, and it has a blue identification pointer that points to the exact location of each wetland pool. Using the mouse pointer and distinctly selecting a wetland pool identifier, the user can distinctly see the mean value for chemical analysis (water analysis and soil analysis) of each chemical data.

Below is a snapshot of our map and the wetland pool’s location interface for water wetland pool.

A screenshot of a map

Description automatically generated

A screenshot of a map

Description automatically generated

The above map shows each wetland pool for water analysis. It displays a description of the mean value in a text box for each chemical (TP, TN, NH4, NO3, PO4).

Below is a snapshot of our map and the wetland pool’s location interface for the soil wetland pool.

A screenshot of a map

Description automatically generated

The above map shows each wetland pool for soil analysis. It displays the mean value in a text box for each chemical (TP, TN, M3P, M3Fe, M3AI, SPSC, wEXP, wEXNOx, pH, EC).

NOTE: Users can also distinctly select and view each wetland pool's mean values for water and soil analysis, by clicking on a particular wetland pool on the drop-down scroll menu bar positioned at the left side of our map interface.

**Zoom in and out functions:**

Our visualization design integrates a zoom-in and out function which is represented with + and – symbols, this enables users to explore our map at different levels of granularity and enhances the visualization experience.

Below is a screenshot of our zoom-in functionality effect.

A screenshot of a map

Description automatically generated

Using D3 we integrated an interactive drop-down menu function that allows a view map for both soil and water data and can also distinctly select graphs and charts they would like to use.

A screenshot of a map

Description automatically generated

Requirement: “And it would be interesting to have similar visualization of the amount of change over time of the soil chemical parameters”

Meeting this requirement:

Here we met the second requirement of the user by creating a line graph that allows users to visually view soil and water chemical parameters over time. The lines in the line graph have different colors that represent each mean chemical color parameter.

In our implementation, we represent the mean value of data of each wetland pool for both soil and water analysis. Users can see the wetland pool mean value for soil and water analysis in a line graph, which displays the mean value of each chemical data over different timeframe intervals. Line graphs are used to represent the mean value of data for TP, TH, disNH4, disNO3, and disPO4, of different months of various years, it visualizes data over time from 2021 - 2023.

Below is a screenshot of our line graph representation.

A screen shot of a graph

Description automatically generated

A screen shot of a graph

Description automatically generated

We also used a connected scatter plot chart with markers. This enables users to distinctly select a particular wetland pool they intend to view and select the particular chemical variable. Using mean values of each chemical compound analysis, it displays data over different time frames.

A screen shot of a graph

Description automatically generated

Requirement: “It would also be useful to have the same set of visualizations but for briefer periods. I haven’t yet decided with certainty which periods are best but perhaps: 5/21-10/21; 11/21-4/22; 5/22-10/22; 11-22-4/23; 5/23-8/23. These are sort of seasonable: late spring-summer-early fall and late fall-winter-early spring.”

In meeting this requirement

We met this requirement by creating an interactive seasonal stacked bar chart using a button menu list to change chemical variables.

The stacked bar chart visualizes each selected wetland pool chemical data type over different seasons across the year (spring autumn, summer, and winter). In this chart, the x-axis represents the wetland pool, and the y-axis represents the chemical data type range.

Also, using our implementation of the bar chart, we integrated a mouse hovering functionality that allows users to see chemical data value, using the mouse functionality by pointing to a season on the chart. The color of the bars is based on the seasons of the year.

Below is a snapshot of our seasonal bar chart for water analysis that displays the pH value for wetland pool 9 in the Autumn season.

A screenshot of a computer

Description automatically generated

**PARALLEL COORDINATE:**

For this session, we visualized parallel coordinates of total nitrogen and total phosphorus on a chart using the average mean value of nitrogen and phosphorus.

A screenshot of a computer

Description automatically generated

This is an interactive brush feature that allows you to select a certain range of values on the Y-axis.

A screenshot of a computer

Description automatically generated

**Definition of abbreviation terms used in our design:**

* TN: Total Nitrogen,
* TP: Total phosphorous.
* m3.AI: Aluminium content determined by mehlich-3 extraction & ICP analysis.
* m3.FE: Iron content determined by mehlich-3 extraction & ICP analysis.
* m3.P: Phosphorus content determined by mehlich-3 extraction & ICP analysis.
* SPSC: Soil Phosphorus storage capacity.
* wEX.NH3: Concentration of ammonia extracted by water.
* wEX.P: Concentration of phosphorus extracted by water.
* wEX.NOx: Concentration of nitrate + nitrite extracted by water.
* pH: Soil: Soil level of acidity or alkalinity.
* EC: Soil electrical conductivity.

**CONCLUSION**

In conclusion, for this project, we designed our visualization tool using a four-level nested model and completely implemented it. This tool would be made available for BGSU scientist which would enable them to have an elaborate in-depth understanding and visual representation of their data set.

**PART III: HOW EACH TEAM MEMBER CONTRIBUTED**

* How each team member, including yourself, contributed to the teamwork.

1. **Communication:**

We communicated using Teams chat and had two Teams call. We also had a couple of in-person meetings.

1. **Team Member Contribution:**

* **Elvis Chukwuani:** I worked on the line graph, connected scatter plot, and stacked bar chart.
* Kiana Kiashemshaki: She worked on the soil data map and water data map.
* Uchechi Nwala: She worked on data and the parallel coordinates.