Introduction:

When you flush your toilet at home do you know where your wastewater goes? For many, it goes to a municipal treatment plant and is treated using a significant amount of labor, land, and money, but here in Sewanee, the Wetlands team is working on treating wastewater through constructed wetlands. Constructed wetlands are a more sustainable and cost-effective alternative to wastewater treatment. Through microbial activity and aquatic plants, wetlands naturally treat contaminants and pollutants, providing a more biologically efficient method of wastewater treatment. Wetland treatment has worked successfully on a large scale such as the system in Clayton County, GA, where they estimated its constructed wetlands use water for half the cost of more conventional methods; however, wetlands have not been used for wastewater treatment on a small-rural scale.

In 2016, Dr. McGrath, Professor of Biology at Sewanee, lobbied for the construction of three wetland basins at the Sewanee Utility District (SUD). Our team's goal was to set up visualizations that allow our community partner, Dr. McGrath, to understand the water quality trends of the wetlands overtime to push for sustainable development in our community.

Our partner wanted to see the trends and status of water quality variables, such as dissolved oxygen, pH, water temperature, and conductance, so we took these variables and used varying plot types to show how they change in the wetlands over 14 months. This included showing visuals on varying time scales, like monthly, daily, etc, as well as including how weather characteristics affect each variable. This also included creating an easily digestible chart to see if the water quality meets government-issued standards. Using the data collected from the Sewanee Utility District, our goal is to create an interactive dashboard that communicates the trends of the wetland's wastewater quality over time. Since we have made our dashboard

updateable, our partner will have the opportunity for continued use to see future trends in the data and act accordingly with wetland management practices.

We initially thought the wetlands would treat more efficiently than the current process of the lagoon and spray field method, but because the wetlands have a smaller area, invasive species have taken over and decreased the amount of dissolved oxygen.

Our partner has already installed an aerator to increase the oxygen flow in the wetlands. This tab shows the monthly comparison of variables pre-aeration which is what all of our data has been. By allowing our partner to continue to input data, water can eventually flow into streams rather than be sprayed on the forest. The spray field method changes the forest environment and requires lots of land which isn't cheap, so wetlands are a more cost-effective method of wastewater treatment.

With the help of our dashboard, we are hoping to gather interest in the well-being of the wetlands from the public. From these results, we are hopeful that our dashboard will allow Dr. McGrath to make appropriate decisions to improve the water quality in the wetlands after the installation of the aerator. The code we have written will be open-sourced so that the next group of "wetlanders" can pick up where we left off and see how to implement wetlands in small-scale wastewater treatment. Wetlands wastewater treatment is a solid #2 but after this project, we hope we can make it a #1.

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So our client came to us and said "ya know, I've got a pretty good idea of how the wetlands are performing based on the collected data but i've never really been able to visualize

it in a way where I can properly analyze the data" That is where our team came in and was able to create multiple visualizations on an interactive dashboard that would not only allow for current data exploration but also exploration of future data inputs. We were given approximately 14 months of data to work with which meant making concrete conclusions and predictions are difficult at this point in time, however, these data visualizations can be extremely useful in trying to adjust management practices to eventually make the wetlands efficient in cleaning wastewater.