Sediment Pollution and Restoration Effectiveness in an Impaired Urban Creek

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The Problem

Tennessee's waterways suffer from immense pollution due to anthropogenic activity and land use changes. 5,800 miles of Tennessee's streams are labeled as "impaired" due to pollution levels that exceed state and national Maximum Contaminant Loads. Second Creek in Knoxville suffers from many pollutants, but sediment pollution due to erosion is a particular concern, as high erosion rates threaten UT's infrastructure, reduce biological viability, and reduce water quality for various human uses.

Importance of the Project

Second Creek is a tributary to the Tennessee River, which supplies drinking water for Knoxville, TN and surrounding areas. Sedimentation of Second Creek and thus, the TN River, can increase water treatment costs, provide connection sites for pathogens, and reduce biological and recreational viability of waterways (Hill 2004). Furthermore, erosion of Second Creek's banks threatens University of Tennessee infrastructure. Reducing erosion in Second Creek is vital to protecting local ecological functions, access to safe water for human use, and important university infrastructure.

Others' Solutions

- Armouring Creekbanks (Niemann and Loechle, 2009)
- Erosion control vegetation (Arnold and Toran, 2018)
- Riprap for stability (Maynord et al 1989)

The Project

The goal of this research project is to determine the effectiveness of "green engineering" techniques (stream meandering, native limestone armoring, selective boulder placement, and native vegetation) to reduce erosion along Second Creek's banks. Six months of erosion pin and turbidity measurements at both pre and post restoration sites were collected and analyzed to determine whether restoration efforts by UT Stormwater had proven effective. In this project, the main leader was my research advisor, who guided me in completing research; however, I had many opportunities to lead while working with field assistants and producing final project deliverables and presentations.

What was achieved?

Project Vision: Contribute to stream restoration efforts and provide data to guide and fund further stream restoration projects.
Project Mission: Write a paper for publication in a scientific journal and participate in the GSA SE conference to share data supporting the "green engineering" method of restoration in Second Creek.
Project Values: hard work, sustainability, community, knowledge
Alignment with Personal VVM: My personal vision is to benefit the Earth while working in a job that brings me joy. This project fully aligns with this vision and my personal values of hard work, environmentalism, community, and education.

Timeline of Project

Research for potential project topics began in the summer of 2020. The final topic was selected in the fall of 2020. Research was conducted from March 2021 until August 2021.

Final Project Status

Datasets have been finalized for this project, and data analysis has been completed. Deliverables are currently being created to be sent for publication consideration and I will be presenting the research at the GSA Southeastern Conference in April 2022.

Leadership Highlights

This project taught me how to inspire a shared vision, create a long-term strategic plan, and collaborate with partners to produce high quality data and deliverables. I also learned how to effectively communicate scientific findings to the academic community and general public.

Future Project Plans

It is hoped that these data and findings can be used by UT Stormwater to advocate for increased restoration funding. Ideally, the creek will be restored using green engineering methods wherever erosion rates pose a significant threat.

Partners and Acknowledgements

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