Thesis Project Portfolio

North Grounds Stream Restoration

(Technical Report)

The Environmental, Economical, and Sociological Impacts of Tourism on the Water Supply In Bali

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2024

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Executive Summary

Water resources engineering is a vital part of civil engineering and addresses problems that have been caused by development. In my technical research report, my team and I evaluated select reaches that are part of the Meadow Creek Tributary located in what is known as North Grounds at the University of Virginia. The goal of our project was to design a system that would reduce the environmental impacts that have been imparted on the stream and to create a design that would improve the stream's health in regards to flood prevention, recreation, and gain Chesapeake Bay TMDL credits. In my STS research paper, I studied the effects of tourism water use on the environment, economy, and society in the province of Bali. Both of these topics reflect the importance that water resources has on our society whether it be on the local scale or internationally.

Through my technical work, my team and professional advisors at the company Biohabitats identified the two specific sections of the Meadow Creek Tributary to work with out of the whole stream that we were provided. These sections, Reaches 3 and 5, provided the most potential to gain Chesapeake Bay TMDL credits if restored. To come up with a design for restoration, the first step was to model the pre-existing conditions. We delineated a watershed in ArcGIS and sourced data to create an area with the conditions of our area. We then surveyed with a laser level and sighting rod in our selected areas, Reaches 3 and 5. Additionally, for our pre-existing conditions a Bank Erosion Hazard Index (BEHI) was conducted. The data collected in these watershed and the cross sections were put into HEC-HMS and HEC-RAS respectively. The design of a step pool conveyance system (SPCS) was decided on and to decrease the amount of energy in the system with pools and riffles. After the design was created a post-modeling assessment was run in HEC-RAS to determine the effects of the implementation of the SPSC.

The design showed a reduction in shear stresses for storm events up to a 100-year intensity. The values that were placed in HEC-RAS were also used to size rocks for the riffles that would further protect the channels from erosion. Furthermore the BEHI, provided us with the ability to quantify the amount of sediment reduction in tons per year. From the pre-existing to post conditions the decreases for reaches 3 and 5 were 57.02 and 11.64 tons per year respectively.

My STS research paper focused on the question: what impacts does tourism industry water use have on the environment, economy, and community in Bali? As a developing province, Bali has seen exponential growth in its tourism sector and it has become a significant part of its Gross Domestic Regional Product (GDRP). There are many intended decisions in regards to water uses in tourism that lead to unintended consequences. These were all considered to answer the research question provided.

The impact to local life and structure showed to be impacting the local communities through a lack of knowledge about the gravity of how tourism water use impacts them. In the economy, as aforementioned tourism impacts Bali's economy greatly. So realistically, the expansion of tourism would be good for their economy as long as there isn't a total reliance. A total reliance on tourism could lead to problems during times of instability, natural disasters, etc. The expansion of tourism would mean more water use across the island in this sector. The environment would experience negative impacts from this expansion such as decreases in water supply for agriculture and decreases in water quality. If a more sustainable model for tourism water use in Bali isn't implemented the island will be difficult to preserve for future generations.