LABORATORY MODELING OF SEDIMENT DYNAMICS TO PROMOTE RESILIENT STREAMS

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A resilient river system is one in which the river can maintain its ability to convey flow and provide ecological services despite added anthropogenic or other pressures. Sediment transport is an important river function that that can affect the ability of a river to manage both water quantity and quality. Excess erosion can jeopardize infrastructure and property along the banks and can lead to aggradation and increased flood risk further downstream. Sediment transport is also an important mechanism for moving nutrients from terrestrial to aquatic environments, and can be disrupted by stream modifications such as dams and stormwater ponds. Sediment can also carry many contaminants such as PAHs, which concentrate where sediments settle. By understanding sediment dynamics and sediment transport behaviors under a variety of conditions, scientists and engineers can make better ecological design decisions to maintain natural sediment transport rates while mitigating risks associated with erosion and contaminant transport.

Laboratory experiments were conducted to determine the effect of bend orientation, or skewness, on channel erosion and deposition patterns in an unconfined, alluvial channel. Three experimental runs were conducted, each with a different channel orientation; one had a symmetrical, sinuous channel, one had the apex skewed downstream and another had the apex skewed upstream. All the experiments used a constant flow rate and were run until they reached dynamic equilibrium, where sediment transport rates stabilized. Morphological data was collected using Structure-from-Motion Photogrammetry and processed using Agisoft Photoscan and ArcGIS. The results show that channel orientation can have a significant effect on both the channel planform changes and the location and magnitude of bedform development. The results of this research will allow hydraulic modelers to better predict where erosion and deposition will occur within a river system and allow them to better manage contaminated sediments and protect high-risk erosion areas.

Biography

Ryan Good is a Master of Applied Science student in Water Resources Engineering at the University of Guelph. He completed is bachelor's degree in Environmental Engineering from the University of Guelph in 2016. Ryan has a passion for nature and conservation and became interested in river mechanics and ecological stream design after working in

the Sport Fish and Biomonitoring section of the Ontario Ministry of the Environment and Climate Change in 2015.