IMPACT OF RIPARIAN VEGETATION ON MORPHOLOGY OF DRYLAND CHANNELS: INSIGHTS FROM SPRING-FED CHANNELS IN HENRY MOUNTAINS, UT

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ABSTRACT

Riparian vegetation is a key control on alluvial channel morphology, but a more quantitative understanding of its morphological impacts must be developed if we wish to predict channel change in the face of riparian succession and prescribe vegetation as a river management tool. Recent studies have focused on vegetation's role as a bank-strengthening agent that hinders braiding and narrows and deepens channels in perennial streams; however, the tendency of vegetation to grow on the channel bed, as opposed to the banks, in ephemeral streams suggests that its morphological impacts may not be fully characterized. Dryland channels draining the Henry Mountains in southern Utah that are intersected by perennial, bedrock springs along their length display high spatial variability in vegetation due to spatial variability in water availability. These channels provide a unique opportunity to study how channel morphology responds to changes in vegetation, and identify the morphological impact of riparian vegetation in channels that accommodate ephemeral streams. I used 1m-resolution digital elevation models and ANUGA flow modeling software to simulate five discharge scenarios for two roughness conditions in three of these channels, and produced high-resolution datasets of channel geometry and spatial vegetation density. I test the hypotheses that 1) riparian vegetation has a quantifiable impact on channel morphology in ephemeral streams and 2) the morphological impact of riparian vegetation in ephemeral streams is different from that in perennial streams. I quantitatively show that, for these ephemeral streams, channel morphology is dependent on vegetation characteristics, and that channel bed vegetation actually tends to widen channels and decrease flow velocity. By comparing results from flow simulations with uniform roughness and spatially-variable, LiDAR-informed roughness, I suggest that it is accurate to identify channel bed vegetation as a flow-resisting agent.

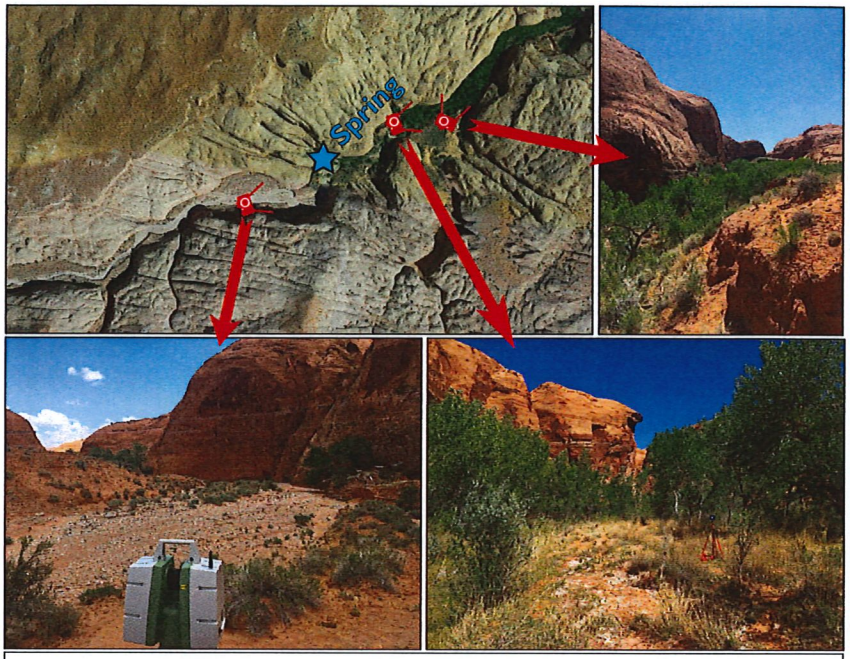

Figure 1: Juxtaposition of sparsely- and densely-vegetated reaches around the location of a bedrock spring in Lower Woodruff Canyon.

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