

Interactive comment on “Impacts of Changing Hydrology on Ravine Growth: Experimental Results” by Stephanie S. Day et al.

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Thank You, Dr. Wells, for your comments, we have made significant modification to our manuscript to reflect your suggestions, and feel that it has been greatly improved.

Based on your first comment, we have worked to clarify much of our methodology per your suggestion. The laser scanner we used was developed in house at the St. Anthony Falls Laboratory and therefore there is little published information about it. We provided more details about the scanner in page 4 lines 29-31. You also noted the unusual gridding of the scanner. This is a result of the topographic laser scanner system built for these basins. There were two laser scanners that each collected points at 2 cm intervals moving across the basin, each of which were spaced 2.5 cm apart

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and moved 5 cm after completing a single row of data. The scanner uses a red laser and therefore the flow was indeed stopped to make measurements.

Based on your second comment, information about the substrate was also clarified. The term “mud” was replaced with “fine grained” throughout the text, to more precisely describe the substrate. Unfortunately, we did not collect data regarding the bulk density and water content of each bed preparation and therefore we could not add these data to the text. This would be useful information to record in future studies, and may explain some of the variation we saw, yet we might expect that the variation among the substrate preparations would also reflect the variation within a single substrate, making sampling difficult. Throughout each of our experiments we worked to be as consistent as possible including creating an initially flat bed and vertical knickpoint, yet variability certainly exists even in these controlled settings. This variability is important to note as it is likely a fraction of the variability present in the natural systems we are working to better understand.

Based on your third comment, we have added additional references to our text and modified our discussion to include some additional studies. Regarding your comments on the widening model, we tested the width equation from Wells et al., 2013 that does include slope, but it didn't fit our data as well as the Leopold and Maddock hydraulic geometry equation. A short description about this is included in the discussion section of the paper. We appreciate your comment on the variation in process between rainfall and overland flow, yet in a saturated substrate the erosion should be comparable as no water will infiltrate the subsurface. While rain splash may contribute to detachment this is generally not significant. Finally, we have kept our discussion of the Istanbuloglu paper, because it focuses on volume, which is the focus of this study, and it represents what we anticipated our results to be. Moreover, this paper has a careful discussion of processes observed, and the variation between processes is critical to understanding why our results vary. We did include some additional discussion in page 10 lines 1-10 to reflect this variation in headcut propagation process.

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