



Relationships between zero order basin morphology and sediment transport

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Zero order basins are critical hillslope features in many upland, soil mantled landscapes. Unlike higher order basins, they do not contain a channel, and sit above the channel head. Their morphology is often conceptualized as teardrop shaped, with a slope parallel zone of high concavity along its center. This geometry exerts a control on rates of sediment accumulation following landsliding and, more broadly, how water and sediment are delivered to the uppermost reaches of the fluvial network. Consequently, there is a need to understand how the properties of zero order basins vary in reality and how these variations may influence the rates and nature of hillslope sediment transport processes, particularly under changing climatic or vegetation regimes.

By developing new analysis techniques to identify zero order basins from high resolution topographic data we have created a new dataset of the morphology of over 1000 zero order basins. This work has been undertaken in the Coweeta Hydrologic Laboratory, USA, an experimental forest with an orographic precipitation gradient and large hillslope to channel relief. We find that zero order basin morphology departs furthest from the conceptual teardrop shape on high gradient hillslopes with a thin soil mantle. We hypothesize that the morphology of zero order basins in this location is set, at least in part, by the competition between spatially variable soil creep and stochastic landsliding.