

Gully Erosion Processes in a Small, Ephemeral Channel in a Semiarid Watershed

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Incised channels that terminate at a vertical-wall gully heads are common features in semiarid watersheds. Gullies can be a dominant contributor to watershed sediment yield, and the geomorphic evolution of incised channels is often dominated by migration of the headwall. The evolution of a headwall in a low order channel on the USDA-ARS Walnut Gulch Experimental Watershed in southeastern Arizona has been monitored since 2004, and since 2012, time-lapse photography has been employed to observe the temporal dynamics at high resolution. During the runoff season from July through September, images were collected every 30 seconds and the time step was increase to 30 minutes during winter months. The field of view covers the headcut and the immediate surroundings. Runoff events were distinct flash floods in response to high intensity rain. The temporal sequencing of the dominant processes of erosion including mass wasting, plunge pool erosion, and piping are described. Although mass wasting and plunge pool erosion were the most frequent erosion processes observed, a single subsurface erosion event associated with piping caused both the largest linear advance of the headwall and the largest excavated volume during the period of observation.