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TITLE: Effects of Riparian Vegetation on Topographic Change During a Large Flood Event, Rio Puerco, New Mexico

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ABSTRACT BODY: The nature and pattern of vegetation on floodplains strongly affect the morphological changes that result from large floods by increasing drag and steering the flow through the landscape. Quantifying those changes is only possible through the use of high-resolution, multi-temporal topographic datasets. In 2003, herbicides were sprayed on a section of the Rio Puerco, New Mexico, killing the tamarisk and sandbar willow on the floodplain and banks. A large flood in 2006 caused extensive erosion along the devegetated zone, widening the channel and eroding the floodplain. We use lidar differencing to quantify the topographic change that occurred along a 12-km reach of the arroyo immediately downstream of the sprayed section. We show that the pattern of deposition on the floodplain can be explained as the sum of two signals: the sediment concentration (which depends on the distance downstream of the sprayed reach), and local vegetation density. The presence of dense vegetation on the landscape, regardless of size or species, increases deposition by imparting a drag on the flow and reducing the boundary shear stress on the sediment surface. The spatial variability of sediment depth correlates with the size and spacing of stems: thick, widely spaced tamarisk trunks are associated with high variability in the depth of sedimentation, while dense but thin tamarisk and sandbar willow stems correlate with sheet-like deposits. Away from the influence of the sediment source, the erosion of the arroyo walls balances the deposition rate on the floodplain, resulting in widespread, uniform aggradation of the arroyo bottom.

KEYWORDS: [1825] HYDROLOGY / Geomorphology: fluvial, [1861] HYDROLOGY / Sedimentation, [0483] BIOGEOSCIENCES / Riparian systems, [1846] HYDROLOGY / Model calibration.

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Additional Details

Previously Presented Material: Preliminary results have been presented in part at AGU 2010 and GSA 2011. A manuscript related to this abstract was submitted to JGR-Earth Surface in late July 2012.

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