Riparian System Responses to Fire and Flood Disturbance in Capulin Canyon, Bandelier National Monument, NM

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Disturbance is a driver of riparian ecosystem dynamics, and riparian areas are typically resilient to disturbance events. However, responses to extreme disturbances are not well-documented. We examined riparian responses to extreme disturbance in a montane canyon in northern New Mexico. Multiple severe fires burned extensive areas of live and dead organic material in the eastern Jemez Mountains between 1996 and 2011. Runoff, stormflow discharges, and sediment transport increased greatly after the fires. Capulin Creek flows through a canyon which drains part of the east Jemez Mountains and was severely burned in 2011 and severely flooded in 2013. Here we report results of repeat sampling of canyon bottom geomorphology and riparian vegetation along six transects in Capulin canyon, sampled before (in 2006) and after (2019) the 2011-2013 fire and flood disturbances. Sampling included repeat topographic and landform surveys along six monumented cross-sections to determine geomorphic change and woody vegetation cover, basal area, and stem density by species. We found a dramatic decrease in riparian vegetation between 2006 and 2019. For example, the mean total basal area (per transect), in 2006 was 17.35 ± 12.92 m^2/ha (mean ± standard deviation); whereas in 2019 it was only 0.32 ± 0.49 m^2/ha. *Pinus ponderosa*, *Alnus oblongifolia*, *Acer negundo*, and *Juniperus scopulorum* accounted for the majority of the basal area pre disturbance, with mean basal areas of 10.15 m^2/ha, 4.57 m^2/ha, 1.66 m^2/ha, and 1.55 m^2/ha, respectively. Post-fire and -flood, mean basal areas for *P. ponderosa*, *A. oblongifolia*, and *J. scopulorum* were all 0 and for *A. negundo* it was 0.23 ± 0.51 m^2/ha. Other relatively abundant species in 2019, were *Quercus gambelii* and *Salix lutea* with mean basal areas of 0.075 ± 0.17 m^2/ha and 0.01 ± 0.03 m^2/ha, respectively. Post-disturbance cross-sections revealed significant erosion and a shift from a trapezoidal channel/valley geometry to a wider, braided geometry. Our results will help to inform future management decisions regarding potential restoration actions in highly disturbed canyon ecosystems at Bandelier National Monument and elsewhere around the West.