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GETTING RESULTS: MEASURING POST-WILDFIRE EROSION CONTROL TREATMENT EFFECTIVENESS

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ABSTRACT

In the past decade, wildfires around the world have continued to increase in size, severity, and cost. The number of people living in wildland areas has also increased, putting public safety, homes, roads, public infrastructure, water quality, and valued natural resources at risk from wildfire and secondary fire effects. Major concerns after wildfires are the increased runoff and erosion due to loss of the protective forest floor layer, loss of water storage, and creation of water repellent soil conditions. To reduce the potential postfire erosion and flooding, various postfire mitigation treatments are commonly used on highly erodible areas. We have developed and implemented rapid response approaches to compare treatment effectiveness by monitoring sediment yield and runoff response from hillslopes and small catchments. High-intensity rainfall simulation and concentrated flow (rill) experiments are done to compare treated and untreated areas within a burned area. Small watershed impoundments and/or sediment fence barriers are established within weeks following a forest fire and are monitored for three to five years to measure runoff and sediment yields from natural rainfall. These rapid response protocols allow measurements to be made during the first postfire year when runoff and erosion are likely to be greatest with continued monitoring through the initial recovery period. Our study sites in the Western U.S. encompass a range of rainfall regimes including monsoonal rains in the southwest (Arizona and New Mexico), thunderstorms in the Colorado Front Range and Northern Rockies, and wet frontal systems in Southern California. A paired watershed study that examined the effectiveness of contour-felled log erosion barriers found that runoff, peak flows, and sediment yields were generally lower on the treated sites compared to the control sites for lower intensity storms (storms with less than a 2-yr, 10-min maximum rainfall intensity return interval $I_{10\text{-min}}$); however for higher intensity storms (2-yr or greater return interval $I_{10\text{-min}}$) there was no detectable treatment effect. Mulch treatments (agricultural straw, wood shreds or wood strands) appear to out-perform the barrier-type treatments in reducing erosion and can be effective even for the higher intensity events. Our research results have brought a shift in post-wildfire erosion management strategies. For example, in the 1990's contour-felled log erosion barriers were commonly used to mitigate hillslope erosion on forested landscapes; but this treatment is seldom used today. Since 2002, mulches, especially agricultural straw, are increasingly used for post-fire hillslope stabilization.

KEYWORDS. Rill erosion, Mulching, Contour-felled logs, Paired watersheds, Concentrated flow experiments.

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