Assessing the role of ground cover in post-fire runoff and erosion using simulated rainfall, Colorado Front Range

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Abstract. The amount of ground cover is a key control on post-fire erosion. Rigorous field studies are hindered by the spatial and temporal variability of high-intensity convective storms. Simulated rainfall facilitates the comparison of runoff and erosion rates among sites. The goal of this study was to assess the effects of ground cover on runoff and erosion rates from unburned plots (n=2), untreated severely-burned plots (n=10), and severely-burned plots treated with straw mulch (n=5) or hydromulch (n=7).

The study area was the Hayman wildfire, which burned 530 km2 southwest of Denver in June 2002. Each simulation applied 75-85 mm of rainfall in 60 min on a 1 m2 plot, and all of the plots were on highly erodible granitic soils. After about one week of drying, the litter or straw mulch was carefully removed and a second simulation was conducted on the same plot. On the unburned plots a third simulation was done after the duff layer was removed with a soft brush. Repeat simulations were not conducted on the hydromulch plots because the hydromulch could not be removed without severely disturbing the soil surface.

Runoff rates did not significantly differ regardless of the initial condition. The mean sediment yield from the unburned plots was 44 g m-2, while the untreated burned plots produced 313 g m-2. The mean sediment yields from the straw-mulched and hydromulched plots were about 90 g m-2, or 30% of the value from the untreated burned plots. Removing the litter did not significantly increase the mean sediment yield from the unburned plots, while removing the duff layer caused a four-fold increase in mean sediment yield. Removing the straw mulch tripled the mean sediment yield. These results show the importance of very fine litter and mulch in minimizing erosion from burned and unburned areas, and the results can aid in the planning of forest thinning and post-fire rehabilitation activities.