

Post-fire Erosion at the Hillslope Scale in the Colorado Front Range: Rates and Controls

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Abstract. Since June 2000 we have been measuring sediment production rates from wild and prescribed fires in the Colorado Front Range. The primary objectives are to: (1) quantify post-fire sediment production rates over time; and (2) determine the key controlling factors; and (3) develop and test models for predicting post-fire sediment production at the hillslope scale. This paper summarizes approximately 250 plot-years of data from 7 wild and 3 prescribed fires in the Colorado Front Range. The 95 unbounded study plots are on planar hillslopes and in zero-order basins ("swales"), and they have a mean contributing area of 1450 m². Sediment production is being measured using sediment fences, and the independent variables being measured include percent ground cover, rainfall, contributing area, slope, and soil texture.

Nearly all of the annual sediment yield was generated from summer convective storms rather than snowmelt, and measurable amounts of sediment were generated from storms with only 5 mm of rainfall. The mean sediment production rate for the first two years after burning ranged from 8 Mg ha⁻¹ yr⁻¹ for sites burned at high severity to 0.6 Mg ha⁻¹ yr⁻¹ for sites burned at low severity. By the fourth year after burning most sites had at least 60% ground cover and sediment production rates were below 0.1 Mg ha⁻¹ yr⁻¹. The best multivariate model had 9 parameters and explained 83% of the variability in sediment production rates, but a model using only percent bare soil and rainfall erosivity had a R² of 0.63 and provided the best match to the validation data.