Predicting variability in post-fire sediment yields: Efforts to validate ERMiT in the Colorado Front Range

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Abstract. Wildfires in the Colorado Front Range can greatly increase sediment yields and severely impact aquatic resources. Resource managers commonly apply treatments to reduce post-fire erosion, and there is an urgent need to accurately predict the effectiveness of these treatments on a probabilistic basis. The Erosion Risk Management Tool (ERMiT) was recently developed to predict the exceedence probabilities of post-fire sediment yields from both treated and untreated areas. The exceedence probabilities are obtained by combining the probabilities of different storm events, the spatial variation in burn severity, and the distribution of soil parameter values. In this study we compare the values predicted with ERMiT against measured hillslope-scale sediment yields from untreated, seeded, and mulched plots (351 values from 72 burned hillslopes in the Colorado Front Range). The results also indicate ways in which ERMiT might be improved.

In the first-year after burning the predicted sediment yields were similar to the measured values for the untreated and seeded plots. In subsequent years ERMiT tended to underpredict sediment yields, as 94% of the measured values were larger than the 50% exceedence probability prediction. For the mulched plots the predicted sediment yields spanned the range of the measured values, but mulching was more effective in preventing large sediment yields than predicted by ERMiT. On the other hand, all of the mulched plots produced sediment in each of the first three years after burning, while ERMiT generally predicted that the mulched plots would have only a 50% probability of producing sediment. The tendency for ERMiT to underpredict sediment yields in the second and third years after burning can be minimized by slowing the presumed rate of vegetative recovery. The implication is that post-fire vegetative recovery in the Colorado Front Range is relatively slow, and our field data suggest that the slow regrowth can be attributed to both the coarse-textured soils and the paucity of rainfall during the growing season.

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