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Modeling soil erosion and mitigation after fires

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Measuring and modeling erosion after disturbances, such as prescribed fire and wildfire, has been a major research focus for the past 15 years. Fire-induced changes include increased erosion due to loss of the protective forest floor layer, loss of soil water storage, and in some cases, creation of water repellent soil conditions. These conditions increase the potential for flooding, debris flows, and sedimentation, which are of special concern to people who live and mange resources in the areas adjacent to burned areas. A web-based erosion risk management tool, ERMiT, has been developed to predict erosion from postfire hillslopes and to evaluate the potential effectiveness of various erosion mitigation practices. The model uses a probabilistic approach that incorporates variability in climate, soil properties, and burn severity for forests, rangeland, and chaparral hillslopes. The Water Erosion Prediction Project (WEPP) engine is used in a Monte Carlo simulation mode to provide erosion rate probabilities. The one-page custom interface is targeted to hydrologists and soil scientists and allows the user to select climate, soil texture, burn severity, and hillslope topography. For a given hillslope, the model uses a single 100-year run to obtain climate variability and twenty 4 to 8 year runs to incorporate soil property and spatial burn severity variability. The output, in both tabular and graphical form, relates the probability of soil erosion exceeding a given amount in each of the first four years following the fire. Event statistics are provided to show the magnitude and rainfall intensity of the storms used to predict erosion rates. ERMiT also allows users to compare the effects of various mitigation treatments (mulches, seeding, and barrier treatments such as contour-felled logs or straw wattles) on erosion. Data to populate ERMiT was obtained using rainfall simulation and concentrated flow (rill) techniques to obtain infiltration and erodibility

parameters for a variety of burn severities, soil textures and rehabilitation treatments (straw mulch, hydromulch, contour-felled logs, straw wattles). Model validation efforts are ongoing at nine paired watershed sites around the western United States.