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Measuring rill erosion in post-fire environments using concentrated flow techniques

P. Robichaud (1), F. Pierson (2), J. Wagenbrenner (1), R Brown (1)

(1) USDA Forest Service, Rocky Mountain Research Station, Moscow, Idaho, USA, (2) USDA Agricultural Research Service, Northwest Watershed Research Center, Boise, Idaho, USA (probichaud@fs.fed.us / Fax: 208 883 2372 / Phone: 208 883 2349

Rill erosion is the dominant hillslope erosion mechanism in steep post-fire forest environments. Several studies have been conducted using rill simulation techniques to directly measure rill erosion on disturbed forest soils. Rill simulation involves multiple 12-min periods of concentrated flow, which is released at 7, 15 30 22 and 48 L/min on plots 2, 4, and 9 m in lengths. In one study, four different surface treatments (high burn severity, low burn severity, skid trail, and unburned) were evaluated. Preliminary results suggest that the runoff, sediment concentration, and flow velocity all decrease with increasing plot length in natural and low severity burned plots. For natural and low severity burned plots, the 9-m plots reflect physical reality in undisturbed forested areas; no overland flow occurred during all but the most extreme rainfall events. However, in high severity burned or skid trail plots, thus results varied for these variables. The runoff ratios decreased with increasing length in the high severity burned plots, but they did not change with length in the skid trail plots. Flow velocities also did not change significantly with increasing plot length. Despite the reduction or no net change in runoff ratios and velocities, the sediment concentration increased with increasing plot length in both the high severity burned and skid trail plots. In the high burn severity and skid trail areas, the 9-m plots produced greater sediment concentrations than the shorter plots. These results suggest that a longer flow path is needed to capture the detachment and entrainment processes. These results are being used in erosion prediction models for steep forested hillslopes where rill processes dominate.