

Effects of a Wildfire and Salvage Logging on Hillslope Erosion: Star Fire, Placer County, California

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Abstract.

Post-fire erosion rates have been measured in many areas, but there are few published data on erosion rates following salvage logging. The primary objective of this study is to compare erosion rates from different post-fire logging practices on hillslopes burned at high-severity. The logging treatments are skyline and helicopter logging on slopes greater than 35% (“aerial”) and tractor-logging on slopes less than 35%.

The study area is on the west slope of the Sierra Nevada mountains approximately 16 km west of Lake Tahoe. Skyline, helicopter and tractor logging commenced immediately after the area burned in late summer 2001. Sediment yields are being measured on 32 burned sites and five unburned control sites using sediment fences. Contributing areas range from approximately 0.03 to 1.75 ha. Soil water repellency, slope, percent cover, and percent disturbance are being compared between logging systems and related to the measured sediment yields.

The sites subjected to aerial-logging had a mean slope of 43% compared to 25% for the sites subjected to tractor-logging, and significantly less ground disturbance (18% vs. 29%). Percent bare soil was similar between logging treatments, and the overall mean decreased from 38% in summer 2002 to 28% in summer 2003. Sediment production rates over the 2002-2003 wet season were highly variable between sites, as values for the aerial-logged sites ranged from 0.01 kg m⁻² to 1.06 kg m⁻², and values for the tractor-logged sites ranged from 0.01 kg m⁻² to 0.38 kg m⁻².

Mean sediment production from the aerial-logged sites was 80% higher than the tractor-logged sites. Most of this difference results from two aerial-logged sites that yielded approximately 1.0 kg m⁻². If these sites are excluded, mean sediment production from the aerial-logged sites was only 16% higher than the tractor-logged sites. The results suggest that percent bare soil and slope are the primary controls on unit area sediment production rates, regardless of the type of salvage logging treatment. The study will be continued for another wet season, and the final results should indicate how different site factors and salvage logging systems affect post-fire erosion rates.

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