Effect of Peak Flow Increases on Sediment Transport Regimes Following Timber Harvest, Western Cascades, Oregon

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Abstract

A persistent and often contentious debate surrounds evaluating effects of forest harvest activities on streamflow. Despite decades of paired-watershed studies at small experimental catchments world-wide, the jury is still out on the magnitude, persistence, and mechanisms responsible for peak flow changes following timber harvest. Recent studies examining long-term streamflow data from the H.J. Andrews Experimental Forest reached conflicting conclusions on the magnitude and causes of peak flow changes. But no studies have evaluated the geomorphic response to observed peak flow changes-- a question of great interest in interpreting potential downstream consequences of forest management on channels and ecosystems. Since the relation between sediment transport and discharge typically follows a power law, small increases in discharge can translate into large increases in sediment transport. But interpreting the geomorphic effects of peak flow increases is confounded by the fact that timber harvest typically influences both the hydrologic regime and sediment supply of a watershed, making it difficult to isolate the peak flow effect alone. Here we report on a novel approach to this problem using paired-watershed data to predict streamflow response in the absence of cutting. We combine this predicted hydrology with observed relations between discharge and sediment transport to disentangle the relative effects of changes in hydrology and sediment supply. Results indicate that while peak flow increases alone can account for modest increases in both suspended and bedload transport, the peak flow effect is dwarfed by the increased supply of sediment that accompanies timber harvest.

Keywords: sediment transport, peak flows, timber harvest, paired watershed

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