



Controls on sediment production from unpaved forest roads in the Honna watershed, Canada

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Unpaved forest roads are common in many areas and have the potential to produce large amounts of sediment. Traffic on unpaved roads results in the breakdown of surface material and the upward forcing of fine-grained sediment from the road bed. This sediment is transported off the road during rainfall events because the infiltration capacity of roads is generally very low. When there is a high connectivity between the road and a stream, this sediment can be transported to the stream, impacting water quality and aquatic ecology. Despite an increasing number of studies quantifying sediment generation from unpaved roads, there is little agreement on the dominant controls and physical processes affecting the amount of sediment generated from forest roads.

We did 24 rainfall simulation experiments on a 30 m forest road section in the Honna Watershed, Haida Gwaii, British Columbia, Canada to determine the controls on sediment generation, in particular the influence of rainfall intensity, rainfall amount, antecedent precipitation, traffic intensity, and truck speed. The 5-52 mm/hr rainfall experiments took place during active hauling between September and November 2009. The results from the experiments showed that precipitation intensity controlled the amount of sediment generated from the road. The number of passages of loaded logging trucks during an experiment was the second most dominant control. Each loaded truck passage resulted in a new sediment pulse, which persisted for 30 minutes during low rainfall intensity events and for shorter times during higher rainfall intensity events. Eight small scale (4-19 mm/hr) rainfall simulation experiments showed that the spatial variability in sediment production from forest roads is high, even for sections of the same road. Steady state sediment concentrations were, however, similar for the different locations. Upscaling of the results from the large scale rainfall simulation experiments and turbidity measurements in the Honna river suggest that 5-35% of the annual sediment yield of the Honna river is derived from forest roads and that small tributaries frequently lack sufficient discharge to dilute sediment that comes from ditches or road crossings.