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**NUTRIENT AND CARBON RETENTION IN RIPARIAN AND HILLSLOPE FORESTS  
AFTER MOUNTAIN PINE BEETLE INFESTATION AND TIMBER HARVESTING IN COLORADO**

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**ABSTRACT:** Mountain pine beetle outbreaks have caused an unprecedented amount of tree mortality in northern Colorado and southern Wyoming forests over the past decade. The extensive overstory mortality and associated salvage logging activities may threaten the sustained delivery of clean water from beetle-affected forests. In this study, we evaluate nutrient retention by riparian buffers consisting of beetle-killed trees and examine nutrient responses to harvesting of hillslope and riparian forests dominated by lodgepole pine. Here, we compare nutrient leaching and soil nutrient pools between beetle-killed stands and salvage-logged units for a three year period.

Harvesting dramatically increased the concentrations of most solutes collected in soil leachate by tension lysimeters as compared to leachate from uncut forests. Leachate nitrate and total nitrogen concentrations were 3.5-fold and 1.6-fold higher on harvested hillsides, respectively. Harvesting also caused a 7-fold increase in plant available soil nitrate measured with ion exchange resins and nearly doubled soil ammonium compared to uncut hillslopes. Removal of the dead riparian forest increased leachate nitrate and total nitrogen concentrations 2.5-fold and 1.9-fold compared to uncut riparian forests and also increased plant available soil nitrate. Dissolved organic and inorganic carbon concentrations were higher in harvested hillslope and riparian forest leachate. Conversely, leachate nitrogen and carbon did not differ between uncut riparian zones beneath salvage logged or uncut hillslopes indicating that dead riparian forests are effective at retaining nutrients generated by upslope harvesting. Our findings indicate that the removal of beetle-killed riparian forests has the potential to increase nutrient export and to alter the composition of water draining forested headwaters.

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