

## **Long-term Effects of Clearcutting on N Availability and Soil Solution Chemistry in the Fraser Experimental Forest, CO**

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**Abstract.** The effects of timber harvest on soil water ion chemistry and flux have been studied for more than two decades at the Fraser Experimental Forest in central Colorado. We examined the long-term effects of a clearcutting experiment, 18 years after harvesting of a high-elevation mixed conifer forest (2900 m). Early effects of harvesting included elevated concentrations and flux of NO<sub>3</sub>-N in soil water, and these increases continued through 18 years. In 2003, total N loss from the harvested plot (2.0 kg ha<sup>-1</sup> yr<sup>-1</sup>) was four times greater than the control (0.5 kg ha<sup>-1</sup> yr<sup>-1</sup>). The most pronounced differences in subsurface chemistry and flux were found for nitrate (NO<sub>3</sub>-N). The proportion of total N in subsurface discharge as NO<sub>3</sub>-N increased from < 1% in the control to greater than 50% in the clearcut. The annual loss of NO<sub>3</sub>-N equaled 1.2 kg ha<sup>-1</sup> in the clearcut, about one-sixth the loss rate for the first 8 years after harvest. Total post harvest leaching losses of inorganic N were about 67 kg/ha. Nitrate losses from the control forest were negligible (< 0.001 kg ha<sup>-1</sup> yr<sup>-1</sup>) for all periods. On an annual basis net N mineralization showed no effect of harvest after 18 years, but resin bags collected more N in the clearcut site than in the control. High current losses of nitrogen from the clearcut may result from the biological factors of lower plant uptake and increased microbial nitrification, and the physical factors of greater snow accumulation and snowmelt discharge.

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