Patterns of stream water N and P concentrations during a high-flow event in northern hardwood forested headwater catchments

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The chemistry of forested headwater streams often changes during high-flow events due to changes in flowpaths that more directly connect shallow soils with the streams. The magnitude and duration of the changes in stream chemistry can strongly affect leaching of nutrients such as nitrogen (N) and phosphorus (P) and may differ based on various factors, including soil factors such as depth and antecedent conditions, and forest factors such as vegetation composition and management. We are collecting and analyzing high-flow event stream water samples from paired headwater catchments at the Hubbard Brook Experimental Forest in the White Mountains of New Hampshire USA. These catchments are similar in terms of their soils, slope, aspect, and northern hardwood species composition, but differ in their age (100+ year-old mature forest vs. a 50-year-old regrowing forest). We will present analyses focused on major solute chemistry, including total dissolved N and nitrate, and total P and soluble reactive P. We expect the data to show increases in N and P concentrations with increasing flow as these nutrients are flushed from the forest floor or shallow mineral soils. We will be investigating whether the concentration-discharge relationships differ between the catchments based on the forest age, with a central hypothesis being that nutrient availability may be lower overall in the soils of the regrowing forest, leading to less pronounced increases in leaching with increasing flow. The importance of understanding controls on nutrient leaching in headwater streams is likely to become increasingly important as downstream systems face ongoing eutrophication issues and work to meet certain water quality targets.