SOIL AND STREAM CHEMISTRY RELATIONSHIPS IN HIGH ELEVATION WATERS

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High elevation watersheds in the southern Appalachian Mountains have unique soils and vegetation communities. They also receive greater inputs of acidic deposition as a result of increased precipitation compared to lower elevation sites. Since the implementation of the Clean Air Act Amendment in 1990, concentrations of acidic anions in rainfall have been declining; however, some high elevation watersheds continue to show signs of chronic or episodic acidity. In three large watersheds, North River in Cherokee National Forest, Santeetlah Creek in Nantahala National Forest, and North Fork of the French Broad in Pisgah National Forest, we selected five catchments within each to represent the range in elevation. We collected stream and organic and mineral soil samples seasonally, and measured soil chemistry, mineral soil lime requirement, overstory composition and qualitative site characteristics in each catchment. Watersheds differed in stream acid neutralizing capacity (ANC) and soil chemistry; catchments within watersheds differed in overstory vegetation composition. We used a mixed model statistical approach to determine soil chemical, vegetation, and site characteristic variables that best explained variation in stream ANC. Stream ANC values averaged 42 μeq L^{-1} for North River, 24 μeq L^{-1} for Santeetlah Creek and 19 μeq L^{-1} for North Fork; and ANC was related to soil exchangeable and total cation concentrations and vegetation characteristics such as overstory species composition and total basal area. Our analyses suggest that vegetation characteristics as well as organic and mineral soil cation and total carbon concentrations are indicators of stream ANC and thus, may be useful in identifying sites for which lime application could be used to restore streams from the impacts of acid deposition.

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