Stream Chemistry and Sensitivity to Acid Deposition along the Appalachian Trail

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The Appalachian Trail (AT) and its corridor of protected land (minimum of 1.6 km on either side of the trail) stretches for 3,515 km from Maine to Georgia, and includes several regions that are among the most acid sensitive landscapes in the US. A study funded by the National Park Service, is evaluating the effects of atmospheric deposition on forested ecosystems along the AT through collection, analysis, and modeling of data from streams, soils, and vegetation. More than 250 headwater streams along the AT corridor were sampled twice during 2010-12 with a goal of targeting high and low flow at each stream. Overall, 69% of the stream samples had an acid-neutralizing capacity (ANC) less than 100 microequivalents per liter (meq/L). These relatively low ANC stream values likely reflect several factors, including high levels of acid deposition, steep slopes that produce rapid runoff, and slow mineral weathering rates that provide limited neutralization of acid deposition. However, there was a wide range of ANC values among the streams (-54 to 1717 meq/L), a reflection of wide variation in the above mentioned factors. Streams in the northern half (north of the MD-PA border) of the AT (median ANC = 21 meq/L) were more acidic than those in the southern half (median ANC = 70 meq/L). Furthermore, 20% of the northern AT streams had inorganic monomeric aluminum concentrations greater than 2.5 micromoles per liter (mmol/L), an indicator of stress in sensitive aquatic biota, whereas only 2% of southern AT streams exceeded this value. Streams in New Hampshire and Pennsylvania had low median ANC values of 10 meq/L and 19 meq/L, respectively, consistent with previous stream studies in these states. Streams in Georgia, an area where stream acidification is not well known and has not been widely studied, had the lowest median ANC value of 38 meq/L among the southern AT states. Streams in Massachusetts and Connecticut, another area not well known for acidified surface waters, had a low median ANC value of 13 meq/L. Future work will explore the relations among these stream chemistry data and various landscape and geochemical metrics believed to be most strongly related to acid-base status with an aim of providing a spatial model of stream chemistry for the entire AT. These modeled data will be compared to modeled acid deposition to evaluate the relative amount of the AT corridor landscape relative to critical loads of sulfur and nitrogen deposition that are affecting aquatic ecological resources.

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