# Foliar Chemistry of Sugar Maple: A Regional View

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## Abstract

Forest health and monitoring issues have become major focus of scientists and research institutions in Europe and North America during the last decade because of widespread forest decline symptoms in Europe, high elevation spruce/fir decline in eastern North America and sugar maple (*Acer saccharum* Marsh.) decline in Quebec, and the United States. Foliar concentrations of Ca, Al, K, Mg, N, and P are highly correlated with tree growth, health, and physiological function for a wide range of species. Other studies have shown that foliar Ca and Ca:Al ratios are correlated with dark respiration rates and basal area increment on sites that are affected by acid deposition or are susceptible to cation depletion. Further work in Pennsylvania and New York has linked decline of overstory sugar maple trees to multiple insect defoliations in stands with low foliar nutrient status. These results have implications for forest management agencies across the northeastern United States.

In order to understand sugar maple productivity and health at a regional scale, 75 plots representing a wide range of soil types, spanning the northeastern United States have been established. A suite of soil chemical and physical variables will be measured along with health and productivity. Results from the chemical analysis of sun leaves from 3 to 5 healthy, dominant or co-dominant sugar maple trees per plot are presented here. Foliar Ca fell below putative minimum values (5000 ppm) on 24% of the plots region wide. Foliar Mg fell below putative minimum values (700 ppm) on 22% of the plots region wide. Low Ca and Mg values can indicate deficiencies of these elements. Maximum Mn values were 3740 ppm, much higher than the putative maximum of 1630 ppm reported in the literature. High foliar Mn may indicate toxicity in sugar maple. Other elements (Al, P, K and N) were not at levels that could be considered deficient or toxic. Sugar maple decline symptoms exist in PA and NY but are not widespread in NH and VT. However, foliar chemistry data show that many stands in NH and VT are at least as nutrient poor as affected stands in PA and NY. This data set in conjunction with other data collected on these plots will allow us to understand the linkages between soil chemistry, foliar nutrition, and sugar maple health at a regional scale. In addition this study will allow us to provide tools for forest managers that can be used to identify sugar maple stands that may be vulnerable to decline.

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