CALCIUM STATUS OF THE FOREST FLOOR IN RED SPRUCE FORESTS OF THE NORTHEASTERN U.S. - PAST, PRESENT AND FUTURE

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Dieback and growth decline of red spruce (*Picea rubens*) in the eastern U.S. coincides with the period of acidic deposition, and has led to much speculation as to whether this decline is caused by decreased root-available Ca in the soil. Results of intensive research at several sites have led to conflicting conclusions as to whether acidic deposition has depleted Ca concentrations in the rooting zone to the degree that would cause growth decline in red spruce. Regional evaluations of the current status of soil Ca in red spruce forests have been limited by the small number of sites at which soil and soil solution Ca concentrations have been measured with comparable methods. Comparisons with historical data have also been limited by a lack of current data that is directly relatable. To obtain the additional data necessary for a regional analysis of soil Ca in red spruce forests, either 18 or 36 soil and soil solution samples were collected in 1992-93 from 12 sites in New York, Vermont, New Hampshire and Maine in a study supported by the USDA Forest Service Global Change Research Program. These sites represent the range of environmental conditions and stand health for red spruce in the northeastern U.S. Comparison with results from separate studies by Heimburger and Lunt in the 1930s indicate that current acid-extractable Ca concentrations in the Oa horizon are less than one-half the average measured in the 1930's. A statistically significant decrease of similar magnitude was also observed for both exchangeable and acid-extractable Ca, over the past two decades, in archived samples collected in red spruce stands at the Hubbard Brook Experimental Forest, N.H. The average ratio of inorganic Al to Ca in mineral-soil solution for the 12 sites was 5.0, indicating that inhibition of Ca uptake by Al in the mineral soil may have contributed to the decline of Ca concentrations in the forest floor. A Ca budget, developed through the use of Sr isotope ratios to estimate weathering rates, suggests that root-available Ca in the northeastern U.S. will likely continue to decline.

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