



Project Impacts

NSRC-FUNDED RESEARCH FINAL REPORT

Loss of Soil Calcium and Magnesium in Forests of Eastern North America

PROJECT AWARD YEAR AND TITLE:

2001

Base Cation Dynamics at Forested Watersheds in Eastern North America

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Elevated levels of acid deposition and subsequent acid leaching may increase loss of base cations (important nutrients such as calcium, magnesium, and potassium) from forest soils. If base cations are not replaced through mineral weathering or deposition, soils will acidify. Low levels of base cations in soil have been associated with tree nutrient deficiencies, growth decline, and increased susceptibility to drought, freezing, and insect defoliation.

To assess base cation levels in forest soils, 15 NSRC researchers synthesized input-output budgets for sulfur, nitrogen, calcium, magnesium, and potassium using data collected in the 1990s for 21 forested watershed catchments from 17 regions in the northeastern United States, southeastern Canada, and Europe. Sulphate concentration in deposition decreased in 13 out of 14 regions and in stream runoff, decreased at 14 out of 17 catchments. In contrast, nitrate concentrations in deposition decreased in only 1 of 14 regions and in runoff, decreased at 4 of 17 catchments and increased at 1 site.

Deposition of calcium, magnesium, and potassium decreased at many of the catchments. Base cation concentrations in streams generally declined over time, with significant decreases in calcium, magnesium, and potassium occurring at nearly half the sites. Export of calcium and magnesium in runoff exceeded input at all 21 catchments. These losses represent appreciable proportions of the current exchangeable soil calcium and magnesium pools, although losses at some sites likely occur from unknown soil weathering reactions beneath the rooting zone. Despite reductions in sulfur emissions, acid deposition continues to acidify soils in many regions, with losses of calcium and magnesium of primary concern.

