

Nutrient and Trace Metal Dissolution from Forest Soils across a Climate Gradient Under Forest Floor and Microbial Treatments

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Climate change will accelerate litter decomposition and alter forest floor production across temperate forests, leaving some stands with additional organic matter inputs and others stripped of the forest floor. Here, we aim to understand if the forest floor controls nutrient and trace metal availability and if it is an abiotic, ligand controlled process or if microbial communities drive metal availability. We conducted a set of laboratory column incubations: six homogenized columns were set up with soils from Mount Moosilauke, NH, a younger soil typically with a deep forest floor, and six columns with soil from Lesesne, VA, an older soil with little to no forest floor, as well as a forest floor control column. Columns were leached with 75 mL of a 0.01 M - 0.04 M NaCl - SrCl solution every three days for sixty days with leachates collected and analyzed. The process was repeated with a solution of 0.04 M - 0.01 M SrCl - Na azide in order to eliminate the microbes. The pH of the columns was not affected by the addition of forest floor. Forest floor slightly decreased ORP in the Moosilauke columns, but did not have the same effect in the Lesesne columns. With leaching of 0.04-0.01 M SrCl - NaCl solution, elements such as Cr, Zn, Pb, and U leached more early on, but dropped to a low, constant rate. Macronutrients like P, Mn, Mg, and K increased to a peak and decreased. Microbial removal treatments show an increasing pH and decreasing ORP. Nutrients like Si, Mg, and Mn show significant differences between forest floor treatments with organic treatments having higher concentrations. Forest floor and the microbial community have been seen to impact specific elements and nutrient availability greater than others, with more difference between treatments with no microbial communities.