

Climate change prompts makeover of New England's forests, study finds

January 29 2016



Justin Richardson led a study that finds New England's forest soils will store fewer nutrients and metals as climate change prompts deciduous trees to replace evergreen conifers. Credit: Justin Richardson

Forest soils across New England will store fewer nutrients and metals - some beneficial, some harmful—as climate change prompts maples and other deciduous trees to replace the region's iconic evergreen conifers, a Dartmouth College study finds.

The study appears in the journal *Plant and Soil*.

"Based upon our findings, we conclude that a shift from coniferous to deciduous vegetation could decrease the accumulation and retention of major metals," says lead author Justin Richardson, who conducted the research as part of his doctorate from Dartmouth's Department of Earth Sciences. "Our results can help forest managers and biogeochemists assess the future impact of changing vegetation type on plant-essential and pollutant metal cycling in forests across the region."

Under various climate and land-use scenarios, coniferous stands are expected to lose 71 percent to 100 percent of their current range to deciduous stands across New England by 2085, particularly in Vermont, New Hampshire and Maine, due to increased temperature and precipitation and changes in timber harvesting. Deciduous trees have very different ecological and physical characteristics than conifers, so this switch could impact how they cycle nutrients and store toxic metals in their underlying soil.

The Dartmouth researchers studied eight adjacent deciduous and coniferous forest stands in Vermont's Green Mountains and New Hampshire's White Mountains. They found that deciduous trees cycle

nutrients in their litter layer at a faster rate than conifers, but potentially toxic metal cycling was not different between conifers and [deciduous trees](#). Specifically, coniferous soils had 30 percent to 50 percent less calcium, potassium, magnesium, manganese and zinc than deciduous stands, while metal concentrations also were smaller in coniferous needles than deciduous leaves. Additionally, the results suggest coniferous soils retain calcium, cadmium, copper, potassium, magnesium and manganese 40 percent to 200 percent longer than deciduous soils. These results emphasize that coniferous stands cycle metals at a slower rate than deciduous stands.

"As significant alterations to ecosystems resulting from global change become more likely, environmental scientists and the general public need to appreciate some of the potential outcomes," says senior author Andrew Friedland, a professor in Dartmouth's Environmental Studies Program. "Our paper explores one of these outcomes: changes in beneficial and harmful elements in [forest soils](#)."

More information: J. B. Richardson et al. Influence of coniferous and deciduous vegetation on major and trace metals in forests of northern New England, USA, *Plant and Soil* (2016). [DOI: 10.1007/s11104-016-2805-5](#)

Provided by Dartmouth College

Citation: Climate change prompts makeover of New England's forests, study finds (2016, January 29) retrieved 24 April 2024 from <https://phys.org/news/2016-01-climate-prompts-makeover-england-forests.html>

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