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Plant-induced variability in soil nutritional status of forest–tundra ecotones in the Kola Peninsula, Russia

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Climate change may result in altitudinal and latitudinal advance or retreat of trees and shrubs. This influences soil nutritional status and may induce both negative and positive feedbacks. This paper addresses the potential impacts of climate-change-induced vegetation shifts on soil nutritional status in the forest–tundra ecotones. Using Kola Peninsula, Russia, as example region we studied variability in the soil nutritional status induced by Norway spruce (*Picea abies* (L.) Karst.), Scots pine (*Pinus sylvestris* L.), white birch (*Betula pubescens* Ehrh.), shrubs, dwarf shrubs, green mosses and lichens in the forest–tundra ecotones in the Khibiny Mountains (altitudinal gradient) and in the surroundings of Lake Kanentiaivr (latitudinal gradient). Comparison of soil nutritional status of moss- and lichen-dominated vegetation compartments with those dominated by spruce, pine, birch and shrubs shows that trees and shrubs appearing in moss- and lichen-dominated tundra would lead to increased level of bio-available nutrients in the soil. Norway spruce demonstrated the strongest effects. Because nutrients regulate the litter decomposition rate, we argue that higher content of nutrients, such as calcium and manganese, resulting from the increased presence of tree and shrub species, could cause higher rate of organic matter decomposition in tundra previously dominated by lichens and mosses. This would promote further colonization by trees and shrubs, their successful growth and development, and carbon sequestration in the growing biomass.

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