

FACTORS DRIVING CHANGES IN PLANT UNDERSTORY COMMUNITIES BETWEEN CONIFEROUS AND BROADLEAF DECIDUOUS BOREAL FORESTS

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Study Description

Natural and anthropogenic disturbances produce increasing changes in tree canopy dominance from coniferous to broadleaf deciduous forests. With a 5-year *in situ* experiment, we analyzed how these changes in canopy dominance affected understory plant composition by simulating the conditions of light, litter, and nutrients, and by exchanging transplants of understory vegetation between black spruce and trembling aspen forests. Aspen understory was resistant to both spruce litter addition and to transplantation to spruce forests. Spruce understory was negatively affected by aspen litter addition, and transplantations into aspen were invaded by their understory species over time. Overstory–understory feedbacks are key to understanding changes in boreal tree canopy dominance.

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Photo 1. We used adjacent stands dominated by black spruce (left panel: *Picea mariana*) and trembling aspen (right panel: *Populus tremuloides*) in Eastern Canada. Spruce forests are dominated by bryophytes and ericaceous plants, whereas aspen forests have a diverse understory dominated by several herbs and shrubs species. Photo credit: Juanita C. Rodríguez-Rodríguez.



Photo 2. Overstory view of forests dominated by black spruce (left panel) and trembling aspen (right panel) in the boreal forest of Québec, Canada. Spruce needleleaf litter decomposes more slowly and acidifies soil conditions, whereas the nutrient-rich aspen broadleaved litter decomposes more easily, which favors nutrient availability in aspen understories. Photo credit: Juanita C. Rodríguez-Rodríguez.



Photo 3. Main treatments that affected understory vegetation. The aspen broadleaf litter addition in spruce forests (top left panel) negatively affected the moss-dominated understory, in contrast to the addition of spruce needleleaf litter in aspen forests (top right panel), which did not affect plant understory communities over time. The transplanted aspen understory into spruce forests (bottom left panel) resisted 5 years after transplantation and started to colonize outside the plot. In contrast, the transplanted spruce understory into aspen forests (bottom right panel) was invaded by the aspen understory over time. Photographs taken after 5 years of treatments in 2018. Photo credit: Juanita C. Rodríguez-Rodríguez.



Photo 4. Some plant understory species found in both black spruce and trembling aspen forests. *Cornus canadensis* (top left panel), *Plagiomnium* sp. (top right panel), *Pleurozium schreberi* (middle left panel), *Rubus pubescens*, and *Linnaea borealis* (middle right panel), the shrub *Ribes triste* (bottom left panel), *Vaccinium* sp. (bottom middle panel), *Rhododendron groenlandicum* (bottom right panel). Photo credit: Juanita C. Rodríguez-Rodríguez.

These photographs illustrate the article “Drivers of contrasting boreal understory vegetation in coniferous and broadleaf deciduous alternative states” by Juanita C. Rodríguez-Rodríguez, Nicole J. Fenton, Steven W. Kembel, Evick Mestre, Mélanie Jean, and Yves Bergeron published in *Ecological Monographs*. <https://doi.org/10.1002/ecm.1587>