Natural Resources Canada
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CANADIAN FOREST SERVICE

Science HIGHLIGHTS

BOREAL FOREST AGE AND BIODIVERSITY

How does the structural complexity of the eastern boreal forest affect biodiversity?

The size range of trees in boreal forest stands is important to maintaining biodiversity

Boreal forest stands with trees ranging in size support greater biodiversity—that is, a greater number of different species of plants, animals and microorganisms. Studying the size structure of forest stands is helping researcher Louis De Grandpré understand how best to maintain biodiversity and forest productivity in managed ecosystems.

De Grandpré, a research scientist studying plant ecology and forest dynamics, works with the Canadian Forest Service–Natural Resources Canada at the Laurentian Forest Centre in Sainte-Foy, Quebec. He is comparing biodiversity in stands over 100 years old with stands that had burned in the 1930s and 1950s, as well as with stands that were affected by harvesting during the same periods.

Fire is especially important in the growth of boreal forests. De Grandpré's work is concentrated in the eastern boreal forest where conditions are wetter because of more rainfall, and fires are less frequent. Here, fires have happened about every 150 to 300 years or longer. In the boreal zone of western Canada, fires usually happen every 50 to 150 years. This means that in the western boreal zone, forests are usually less than 100 years old and in the eastern boreal zone, forests are usually less than 200 years old.

"We found that the forests were much more diverse when they had a structure with uneven age characteristics. Management policies that that ensure some forests will maintain an uneven age structure are probably more likely to promote biodiversity," De Grandpré says. "This is why it's important to recognize all ages of these structurally diverse older forests as important for maintaining biodiversity."

Promoting biodiversity in managed forests

De Grandpré has ten plots of 0.4 hectares in the North Shore region of eastern Quebec. He hopes to bring the number of plots up to 18. His plots are in old-growth forest and in younger stands originating from fire and clear cuts. Combined, they encompass the range of forest composition found in this region—mostly balsam fir, black spruce and mixed spruce–fir stands.

The amount of time since a large scale disturbance, such as fire or major wind throw, is generally accepted by researchers as the dominant influence on forest composition and structural complexity. "The fire cycle within a region can be used

Overview

Studying the age range of trees in forests is helping to determine how best to maintain biodiversity and forest productivity in managed ecosystems.

Management policies that produce forests with an uneven age structure are probably more likely to promote biodiversity.

To promote biodiversity in managed forests, De Grandpré is developing predictive models for the evolution of forest stands.

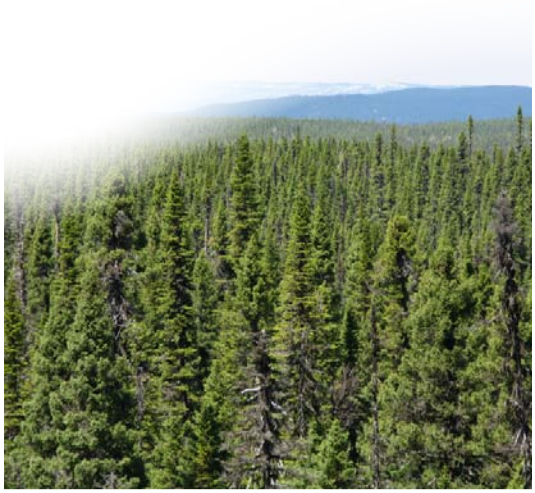
An old black spruce stand with an uneven size distribution and a lot of coarse woody debris

as a template to estimate the proportion of old-growth or structurally complex stands that would persist in an unmanaged forest landscape," De Grandpré says.

He is developing a classification system for forest structure that could be easily applied in forest management strategies. In particular, he also wants to develop targets for old-growth forest management and conservation.

"The relative proportions of old-growth forest that should be conserved and managed could be determined by taking into account the fire cycle. Then you could make a decision about whether to maintain part or all of this proportion in harvested areas," De Grandpré says.

To come up with these targets, De Grandpré is measuring forest canopy gaps and determining how much land is typically affected by fires and other disturbances like wind throw and insects. De Grandpré is also describing the natural spatial patterns caused by these disturbances. His work suggests that a mix of tree species seems to lead to smaller canopy gaps. Therefore, to maintain healthy, resilient ecosystems that include old-growth forests but also provide goods and services for society, De Grandpré says targeted "mitigation measures" like maintaining corridors of unbroken forest or stepping stones of old-growth forest clusters could help promote biodiversity.



An old-growth boreal landscape in the North Shore region of Quebec