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In Brief

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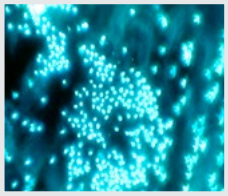


Western Canada's boreal forest more vulnerable to climate change

In this study, researchers from the University of Natural Resources and Life Science of Austria, the Université du Québec à Montréal and the Canadian Forest Service showed that Western Canada's boreal forest (from Ontario to Saskatchewan) is more vulnerable to climate warming than its eastern counterpart (from Quebec to the Maritimes) by projecting four climate change scenarios over 300 years. This increased vulnerability is mainly attributable to the absence of plant species that are adapted to a warmer climate in current stands as well as to a significant increase in burned areas in this region due to climate change.

The climate scenarios used (current reference climate, RCP 2.6, RCP 4.5 and RCP 8.5) are related to changes in the concentration of greenhouse gases. Researchers showed that climate warming would provoke changes in tree species by modifying their growth potential and increasing fire activity. These changes would lead to reduced volumes, perhaps even the disappearance, of the boreal tree species that currently dominate (spruce and fir). They would also result in the increased presence of species that are adapted to warmer temperatures and disturbances (red maple and white pine), of pioneer tree species, and of species that can adapt to fires (poplar and jack pine). Furthermore, these changes would bring about a drop in the productivity and total biomass of these forests.

With regards to sustainable forest management, the various stakeholders of the southern boreal forest will have to take these expected changes into consideration in their plans. They must also account for the adaptation of ecosystems to climate change.

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Are old boreal forests a carbon sink?

Photo: NRCan

The boreal forest is one of the largest carbon pools in the world. Indeed, more than a third of the world's terrestrial carbon is stored in the boreal forest. In this study, researchers from the Université du Québec à Montréal, Université Laval, the Université du Québec en Abitibi-Témiscamingue and the Canadian Forest Service analyzed fuel dynamics (dead branches, litter, needles, bark, etc.) in terms of the time elapsed since the last fire in the Clay Belt region of northern Ontario and Abitibi-Témiscamingue in Quebec. They also verified the influence of fuel amount variations on carbon emissions attributable to forest fires throughout succession stages. Natural Resources Canada's Canadian Fire Effects Model was used to simulate carbon emissions caused by forest fires.

This research demonstrated that fuel accumulates after fire in coniferous forests. These simulations also demonstrated that, on average, old-growth forests generate less carbon during a fire than younger forests, and that fuel structure impacts the amount of carbon emitted.

Therefore, maintaining old-growth forests in the Clay Belt area ensures the sustainability of the boreal forest, in addition to optimizing carbon storage.

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Detecting knots in saw logs using computerized tomography

Computerized tomography is an X-ray imaging technique used to identify specific internal characteristics of logs based on wood density variations.

In this study, researchers from the Luleå University of Technology in Sweden, the University of British Columbia, the ministère des Forêts, de la Faune et des Parcs du Québec and the Canadian Forest Service demonstrated that jack pine and white spruce logs do not dry evenly during storage. This partial drying causes wood density variations that impact the knot detection rate in computerized tomography scans.

Results also show that it would be appropriate for processing plants to sort out logs using computerized tomography beforehand and divide them into two groups based on the presence or absence of the sapwood-heartwood transition line. The validity of the knot detection model that was used depends in part on the precise detection of this line.

Sawing logs with a high knot detection rate would therefore be optimized according to internal characteristics, whereas logs with a lower knot detection rate would be sawed solely based on their external shape.

The results of this study will improve the in-plant sawing process by optimizing the evaluation of logs' internal quality.

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This publication is part of a series that presents popularized summaries of scientific articles written in whole or in part by Laurentian Forestry Centre researchers.

Canada

In Brief

A new control strategy against the eastern larch beetle

The eastern larch beetle is a native insect that attacks conifers, mainly larches. It is considered a secondary insect that attacks trees that have died recently or stressed healthy trees. However, in the event of an outbreak, it can attack healthy trees and cause a great deal of damage. The goal of this study was to develop a new environmentally-friendly biological control strategy against this insect. To do so, researchers from the INRS–Institut Armand-Frappier and the Canadian Forest Service (CFS) assessed the vulnerability of adult eastern larch beetles to several types of fungi and identified those that caused the highest mortality rate.

Photo: NRCan

Thus, researchers demonstrated for the first time that the eastern larch beetle was highly vulnerable to three species of fungi that cause diseases in insects. The combination of a self-dissemination tool and the INRS-CFL isolate (discovered at the CFS's Laurentian Forestry Centre and identified by the Institut national de la recherche scientifique) constitutes a promising and innovative approach to controlling this pest.

Using insects' natural pathogens is more acceptable and less damaging to the environment than using chemical pesticides. This control strategy is very specific as it targets only one species, thereby minimizing its negative impact on other organisms that are not being targeted.

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Increasing radial growth through partial cutting

Partial cutting is one of the strategies used in the sustainable management of boreal forests. However, the effects of moderate partial cutting (45 to 80%) on the growth of residual trees have not been determined. In this study, researchers from the Université du Québec à Chicoutimi and the Canadian Forest Service analyzed the impact of different partial cuts on the growth of black spruce stands 8 to 10 years following cutting. These interventions consisted of progressive seed cutting and seed-tree method cutting.

The study results show that tree growth rate was 41 to 62% higher post-treatment than in untreated plots of trees lining trails used for mechanical equipment and dense stands aged between 80 and 100 years old. The impact of thinning on trees that are located further away from the trails or on stands that are over 100 years old were not significant.

This research also suggests that the treatments studied would be effective to increase the radial growth of black spruce in mature stands and that the edge effect should be considered by forest managers during forest planning.

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Tebufenozide: an effective insecticide against the spruce budworm

Tebufenozide, marketed under the name Mimic®, is an insecticide that affects the hormonal system of lepidoptera, causing them to molt prematurely. This incomplete molt is lethal to larvae. It was introduced in the early 1990s to control infestations by certain forest defoliators. It is specific to the caterpillars of several pests, both in agriculture and forestry.

In this study, researchers from the Canadian Forest Service tested the effects of exposure to different doses of Mimic® on spruce budworm (SBW) larvae in the Lower St. Lawrence region. Fourteen days of exposure to foliage treated with Mimic® reduced the survival of older larvae and pupae. It also decreased the rate of successful mating and fecundity among surviving insects. If there is enough Mimic® on the foliage, delayed mortality is observed during pupation, as well as a decreased rate of successful mating among surviving insects and lower fecundity among mated females. Therefore, Mimic® significantly reduces SBW populations.

This work contributes to optimizing control methods against the SBW, the most significant pest affecting Canadian fir forests.

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