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# In Brief

from the Canadian Forest Service – Laurentian Forestry Centre

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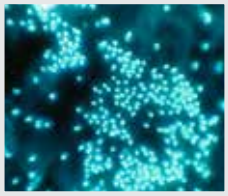


## Better modeling of fire regimes

Large-scale fire regime modeling (area burned, severity of fires, and recurrence and abundance in a given area) is usually based on vast ecological or administrative zones. High variability within these zones can distort spatial estimation of fire activity.

To obtain a better projection of fire regimes, University of Northern British Columbia and Canadian Forest Service researchers have identified relatively homogeneous fire regime zones across Canada. For the period from 1959 to 1999, the researchers identified 16 zones. By modeling fire regimes based on these areas, the researchers expected to obtain more accurate predictions of future fire regimes than by using ecological or administrative zones.

The results show that Canada wide predictions are similar, regardless of the zones used. However, using relatively homogeneous zones makes it possible to better target areas where the fire regimes are different, which is not the case when ecological or administrative zones are used.

This model will make it easier to identify areas where fire regimes may be subject to change. It could also be used to more effectively plan forestry activities in these sectors, ensure the safety of Canadians by reducing fire risks near communities, and better assess the impact on the harvesting of biomass resulting from post fire salvage logging.

The data collected from this modelling will be used in the preparation of additional predictive models, such as those used to determine forest dynamics or wood fibre supply.

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## Climate change and depth of burn: No change in sphagnum spruce stands

There are many black spruce forests in eastern North America. High humidity levels and low forest fire frequency have contributed to accumulations of sphagnum and other mosses in many of these stands over the past millennia.

However, climate change could reverse this trend because of a forecasted increase in the occurrence of droughts and the number of fires. To better understand the effects of these disturbances, researchers at l'Université du Québec à Montréal, l'Université du Québec en Abitibi Témiscamingue and the Canadian Forest Service have studied the relationship between soil moisture levels and weather conditions in Clay Belt area sphagnum spruce stands and spruce-moss stands in Quebec's Abitibi Region. The researchers developed a model for predicting the moisture content of organic matter in the soil based on weather, thickness of organic material layers, and site conditions.

This model was then used to calculate the potential depth of burn based on a variety of climate change related scenarios. The researchers concluded that depth of burn does not vary significantly in sphagnum spruce stands but varies significantly in spruce-moss stands. This demonstrated the resilience of the Abitibi region's Clay Belt sphagnum spruce stands in relation to the increased depth of burn resulting from climate change.

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## Post fire salvage logging would promote poplars in boreal forests

The amount of post fire salvage logging has increased in the past few decades. Post fire salvage logging reduces woody material loss, thereby reducing economic losses following forest fires. In order to verify the impact of post fire salvage logging and fire severity on forest regeneration, researchers at Concordia University, l'Université du Québec en Abitibi Témiscamingue and the Canadian Forest Service set up plots in an area of boreal forest that had burned in 1997. They noted the various species of trees that were present before the fire and those that made up the regenerated forest 2 years after the fire. They compared data collected in the harvested plots with data from control plots where there had been no salvage logging.

The results show that fire severity and logging have an impact on regeneration. In areas where there is no salvage logging, trembling aspen is the main species emerging after a less severe fire, while black spruce and jack pine dominate after a moderate to severe fire. When salvage logging is carried out in areas where the fire damage was moderate to severe, it benefits trembling aspen. The probable reasons for this are the removal of jack pine and black spruce seed trees and the fact that trembling aspen reproduces vegetatively.

To mitigate these impacts, the researchers found that it was necessary to vary the types of salvage logging methods used and to leave clusters of burned trees and unburned trees in place. The remaining trees can thus spread their seeds, thereby promoting greater diversity in the regenerated forest.

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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

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## Hybridization between exotic larches and native larches

Trees with an exotic trait, particularly larches, could play a part in the bioeconomy and in carbon sequestration, as well as be used to eliminate soil contaminants. However, it is necessary first of all to assess the impact of their widespread use on indigenous tree populations.

Three larch species were introduced into Canada to test their growth and adaptive capacities for reforestation purposes. These larches and their hybrids were planted in two seed orchards near forest stands that included tamarack, a native species. The ministère des Forêts, de la Faune et des Parcs du Québec (MFFPQ) planted these orchards for the purpose of selecting good-quality seed.

Using genetic markers, MFFPQ, Université Laval, University of Amsterdam and Canadian Forest Service researchers were able to measure the hybridization rates of native larches and exotic larches. Hybridization was found to have occurred in the two seed orchards, both in the seeds and in the seedlings planted close to plantations. The hybridization rate of seeds produced from "mother" tamarack trees was low (~3%), while the seedlings of exotic hybrids had a high establishment success rate of up to 35% in one of the orchards.

The researchers demonstrated in this study that spontaneous hybridization between exotic larches and native larches occurred when they were planted in proximity to one another. These findings will add to what is known about the environmental risks associated with exotic larches. These risks must be taken into consideration in the management and establishment of plantations containing rapid growth exotic species.

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## Does post fire harvesting in boreal forests have any impact on the quantity of carbon and nitrogen in the soil?

Boreal forest soils are recognized as being one of the biggest carbon and nitrogen reservoirs in the world. Two main disturbances affecting these ecosystems—fire and harvesting—influence the quantity of carbon and nitrogen found in the soil. The objective of this study was to obtain a better understanding of the cumulative effects of these disturbances on carbon and nitrogen quantities in the soil.

Université Laval and Canadian Forest Service researchers studied 14 boreal forest sites in Quebec where fires had occurred less than 7 years earlier. At each of these sites, there was an unburned area, an unharvested burned area and a burned area where harvesting had occurred in the 2 years following the fire.

*Photo: NRCan*

It was found that the soil in the burned sites contained less nitrogen and carbon in the organic (top) layer. In addition, post fire harvesting further reduced the carbon concentration in the organic layer but increased the nitrogen content in the mineral subsoil.

The researchers concluded that harvesting related mechanical disturbances in burned stands stir up the soil, which influences the carbon and nitrogen distribution in the soil layers. However, in the overall soil profile (organic and mineral layers), harvesting in burned forests does not seem to have an impact on the quantity of carbon and nitrogen in the soil.

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## Understanding hybridization in native poplars

Poplars are known for their ability to hybridize. A "hybrid" is a tree resulting from a natural or artificial cross between two species and that has characteristics of both parents. When hybrid poplars cross again with individuals belonging to the species of one of their parents, this is known as introgression. Hybridization and introgression are natural phenomena that allow poplars and other plant and animal species to adapt quickly to new environmental conditions.

Umeå University and Canadian Forest Service researchers examined how hybridization took place in a stand of native poplars made up mostly of eastern cottonwood and balsam poplar. This stand of mature trees was located in an outdoor recreational area in Sainte Foy, Quebec. Their observations showed that the hybrids were mostly derived from eastern cottonwood mother trees, but afterwards, introgression most often occurred with balsam poplar (male or female).

A study of the seedlings from this stand revealed that most of them were balsam poplars. There were no seedlings derived from hybrid trees. This indicates that selection pressure takes place at the regeneration stage.

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