Natural Resources Canada | Ressources naturelles Canada

In Brief

from the Canadian Forest Service – Laurentian Forestry Centre

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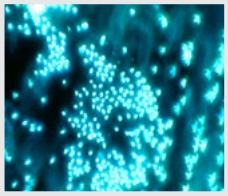


Respect for our old-growth forests

In order to promote forest biodiversity, Quebec managers must aim, among other things, for forests with an age-class structure similar to that of the natural forest. Thus, to preserve old-growth forests, i.e., those over 100 years of age, the minimum goal is 30% over 80% of the area of each management unit. At the time when this target was established, however, no provision was made to account for the impact of current and future fire frequency, which could increase with climate change.

In light of this finding, researchers from the Université du Québec en Abitibi-Témiscamingue, Université Laval, the Université du Québec à Montréal and the Canadian Forest Service decided to compare the historical, current and future age-class structures of western Quebec's boreal forest. These comparisons were made based on the current harvesting level, and recorded or predicted fire activity, impacted by climate change.

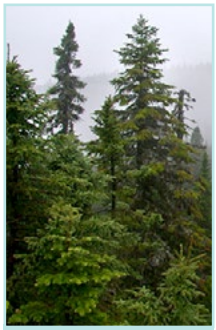

Photo: NRCan

Researchers found that the proportion of old-growth trees in Quebec's boreal forest is approaching its lowest historical level. The situation could become even more critical due to the expected increase in fire activity caused by climate change. Thus, in order to reach the minimum target threshold for old-growth forests, it is essential to include options other than clear-cut harvesting in the forest management plans. In their study, the researchers propose increasing rotation length for wood harvesting, implementing diversified harvesting regimes, using a "fire-smart" approach in order to prevent fires and reach a better balance between intensive management and conservation.

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Logging residues: not just penny-wise!

In Canada, almost all mill residues, such as woodchips and sawdust, are recovered. However, residues from logging activities are a largely untapped resource. These consist mainly of residues stacked at roadside (treetops, branches and foliage) or left in cutover areas (poor quality logs, uprooted or broken logs, and non-merchantable live standing trees or dead trees). They can be converted into electrical and thermal energy, natural gas, or chemical products. However, it is difficult to quantify this biomass, since inventory data are often unavailable.

Researchers at the Canadian Forest Service have therefore developed a spatial estimation method to determine the available amount of residue from logging for nine of the ten Canadian provinces, excluding Prince Edward Island. They first used remote sensing products to determine logging rates by region and stand attributes in order to obtain estimates of the available biomass from harvesting residues. These estimates were then compared with georeferenced field assessments of residues located along roadsides and in cutover areas. Researchers estimate that the availability of residues from logging activities corresponds to approximately 20% of the total aboveground biomass of harvested mature forests.

Using these estimates, they produced forest maps showing annual biomass at the scale of Canada's commercial forests. The maps are available to the public, are free to use, and may aid in the development of bioproducts and new renewable energy projects supporting the forest bioeconomy.

Link to open source maps: https://ouvert.canada.ca/data/en/dataset/5072c495-240c-42a3-ad55-c942ab37c32a

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The invader trapped by its DNA

Forest Invasive Alien Species (FIAS), such as the emerald ash borer and the Asian gypsy moth, cause significant damage in Canadian forests. Genomic biosurveillance is an effective tool for improving risk management associated with these destructive pests. Researchers from the University of Western Ontario, the Canadian Food Inspection Agency, Université Laval, the University of British Columbia, FPInnovations and the Canadian Forest Service have created an illustrated diagram showing the pathways and tools whereby genomics can:

- identify and determine the origin and invasion routes of FIAS intercepted in Canada,
- assess the probability of establishment, and
- detect evidence of FIAS adaptation to the climate of Canada's ecosystems.

Nevertheless, challenges remain. The processing and analysis of large volumes of genomic data require intensive calculations and access to bioinformatics expertise. Furthermore, the identification of FIAS involves comparison with data that already exist about other insect genomes. However, only a small proportion of insect genomes were available (138 species) in 2016, including the emerald ash borer and the mountain pine beetle. Fortunately, improved sequencing technologies and efficient assembly algorithms suggest that this situation will change rapidly, as seen in human health genomics. Plant health regulatory agencies will benefit greatly from genomic innovations and will be able to integrate them into their biosurveillance programs, thereby reducing the risks arising from FIAS.

Link to the diagram: https://link.springer.com/article/10.1007/s10340-018-1027-4

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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

Four major disturbances blamed

Photos: NRCan

Fires, insect outbreaks and droughts are shaping Canada's forests. However, the cumulative effects and overlapping of such disturbances are not always taken into account in forecasting models. This prompted researchers at the Canadian Forest Service to examine the subject. They simulated the cumulative effects and possible overlaps of four major natural disturbances affecting the timber volume at risk in Canada's forests: fire, mountain pine beetle, spruce budworm and drought. The forecasting models used covered the period from 1981 to 2100, tracing a climate change scenario that is pessimistic but nevertheless realistic.

For many forest regions across Canada, projections suggest increased risks associated with fire, mountain pine beetle and drought, but reduced risks related to spruce budworm. With the cumulative effects of disturbances, significant changes in terms of timber volumes at risk are expected to occur during the period from 2011 to 2041, particularly in central Canada and central Quebec. By the end of the 21st century (2071-2100), almost all timber volumes (90 to 100%) may be impacted by at least one of these four natural disturbances, for most of the country's forest regions. This represents as much as six times the volume at risk compared with the period from 1981 to 2010. In light of these results, the researchers propose implementing regional adaptation measures if the objective is to maintain current harvesting levels.

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Landscapes of the past tell an amazing story!

Information derived from forest landscapes predating human activity can be used to determine reference conditions in order to develop better forest management strategies. Starting from this premise, researchers from Quebec's Ministère des Forêts, de la Faune et des Parcs, the Université du Québec à Montréal, the Université du Québec en Abitibi-Témiscamingue and the Canadian Forest Service undertook to compare theoretical natural forest landscapes (i.e., from the past) with those of today. They focused on an area of 175,000 km^2 in Quebec's boreal forest, divided into fourteen landscapes. They described the area's forest composition and age structures resulting from three historical fire cycles (110, 140 and 180 years), taking into account their variability over several millennia. Subsequently, the landscapes of the past were modelled and compared with those of today.

Of the fourteen landscapes studied, nine showed a significant divergence between the natural landscapes of the past and present-day. The comparison revealed the undeniable footprint left by anthropogenic disturbances. Thus, since the beginning of the 20th century, landscape classification has reflected the influence of colonization and logging in the Abitibi and Lac-Saint-Jean regions. The data analysis also showed that past landscape conditions and their variability can be considered as evolutionary markers for defining reference conditions.

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Carbon stocks go up in smoke

The climate changes predicted for the end of this century could increase the intensity and severity of forest fires. It is fairly well known that there is a direct relationship between forest fires and the quantity of forest carbon stocks. However, what are the forecasts in this regard for Quebec's boreal forest?

Researchers from Université Laval, the Universidad Nacional Autónoma de México and the Canadian Forest Service sought to develop a method for predicting carbon stock quantities following the occurrence of forest fires. Their study was carried out within the spruce-moss woodland in Quebec's boreal forest (412,400 km^2). They obtained data (density, diameter, height and regeneration) from Quebec's Ministère des Forêts, de la Faune et des Parcs with respect to 3,249 single-species black spruce sample plots. The Société de protection des forêts contre le feu (SOPFEU) provided a historical database on forest fires in Quebec for the period from 1994 to 2010 (with information on the date of detection, location, fuel type and fire intensity).

Using these data, researchers created a simulation model predicting, among other things, that in approximately 27% of the black spruce domain, carbon stocks in pure black spruce stands will decrease up to 2% by 2071-2100, particularly in the northern regions.

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