Natural Resources Canada | Ressources naturelles Canada

In Brief

from the Canadian Forest Service – Laurentian Forestry Centre

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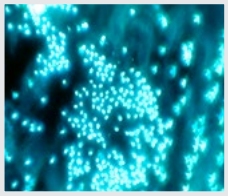


When to salvage burned black spruce and jack pine?

Forest fires are considered the most significant disturbances in the boreal forest. After a fire, the forest contains many dead trees that are still of good enough quality to be salvaged. However, they quickly fall prey to insects, such as longhorned beetles, which threaten to degrade the quality of these remaining trees. By studying burned black spruce and jack pine, researchers from Université Laval, the Université du Québec à Chicoutimi, and the Canadian Forest Service observed that the section of the tree having the highest market value was heavily infested by whitespotted sawyer larvae. The larvae tunnel into the wood, thereby decreasing the stem's market value.

Photo: NRCan

In this study conducted in the eastern Canadian boreal forest, lightly burned black spruce stands were the most heavily infested. They should therefore be salvaged only if they can be quickly harvested and processed at the mill, ideally within three months of the fire. Easy access to recently burned stands is therefore an important factor in determining the commercial value of a stand.

More severely burned black spruce stands and jack pine stands (regardless of how severely burned they are) can be salvaged later since they are less affected by longhorned beetles.

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Is biomass greater in mixed stands?

Stands consisting of mixed species may provide greater ecological benefits than single-species stands. Such is the case of mixed stands of white spruce and trembling aspen, among others.

The purpose of the study was to establish whether the structure of the canopy (distribution of branches and foliage) of pure white spruce stands differed from that of stands comprising both white spruce and trembling aspen.

Researchers from Lakehead University, the Ontario Ministry of Natural Resources and Forestry and the Canadian Forest Service measured different characteristics on 13 20-year-old white spruce trees, i.e. seven in pure stands and six in mixed stands. Among other characteristics, they studied the biomass of branches and needles, the leaf surface exposed, the ratio of needle biomass to branch biomass, as well as various data on each tree as a whole, including its height and diameter at breast height.

The results of this study, which was carried out in the Thunder Bay area, in Ontario, suggest that tree characteristics do not generally differ between white spruce trees in pure stands and those in mixed stands. However, a significant effect was observed in terms of branch distribution and foliage biomass within the canopy depending on stand composition (pure or mixed) and crown position (bottom, mid-tree or top).

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Is the boreal forest still a carbon sink?

In Canada, the boreal forest occupies an area of 3.3 million km^2, which represents 77% of the country's entire forest cover. This forest's ability to sequester carbon depends mainly on the climate and on natural disturbances. In 1989, its carbon content was estimated at more than 335 tonnes/ha.

In this study, researchers from Nanjing University, McMaster University, the University of Toronto, the University of Alberta and the Canadian Forest Service measured the impact of disturbances, climate variability, seasonal temperatures, and the fertilizing effects of CO_2 on carbon dynamics for the 1928–2008 period. The region under study measures over 6,000 ha and is located near Chibougamau, in the boreal forest of eastern Canada.

Prior to 1963, this entire area was considered a minor carbon sink since it absorbed more CO_2 from the atmosphere than it released. During the year 1963, the cumulative effect of logging and insect epidemics resulted in the forest becoming a major carbon source. Since 1964, the forest can generally be considered a carbon sink due to the increase of its biomass.

The researchers also pointed out that the increase in summer temperatures in undisturbed forests could have a negative impact on growth, which could counteract the positive effect of higher springtime temperatures.

This study helps explore the effects of various climate change and forest management scenarios on the boreal forest as a whole.

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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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from the Canadian Forest Service – Laurentian Forestry Centre

Forecasting wood harvesting in private forests

Historically, private forest owners have harvested wood for their own personal use or to sell it to the industry. In recent years, private forest owners have seemed reluctant to harvest trees. Researchers from the Fédération des producteurs de bois du Québec, Groupe AGÉCO and the Canadian Forest Service conducted a survey to define the profile, values and behaviour of present-day woodlot owners in general, and to identify trends and differences in comparison with similar surveys conducted in 1973 and 1985.

Photo: NRCan

The results of this study show that it is possible to predict whether woodlot owners will harvest wood or not by tracking variations in certain characteristics over the years. The size of the woodlot, its distance from the owner's home as well as the owner's gender and education level all are factors that influence wood harvesting. A change in these characteristics, combined with demographic and sociological changes such as urbanization and rising education levels, could lead to a decrease in wood harvesting in private forests.

However, such changes occur slowly, which gives governments and organizations operating in private forests the opportunity to develop policies in order to minimize impacts. It may therefore be possible to develop programs based on this new forest owner profile so as to promote wood harvesting. Economic conditions and public policies can influence forestry activities in private woodlots, provided that they are compatible with the owners' personal motives. Managers of programs targeting private owners could therefore focus on wood production and environmental considerations.

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Albedo and climate change

Albedo is the measure of the amount of solar energy reflected back into space by a surface such as forest or snow. This physical property plays an important role in climate regulation, as unreflected light is absorbed by surfaces and transformed into heat. Forest management changes the nature of these surfaces by opening the forest cover and exposing the soil or, in winter, the snow. The measurement of changes in the albedo of a forest landscape caused by forest management is therefore useful in assessing the effects of this climate impact, but it must be measured on the same basis as other impacts, such as carbon emissions.

This study conducted by researchers from the Norwegian Institute of Bioeconomy Research and the Canadian Forest Service introduces two new measurements for incorporating the climate impacts caused by changes in the albedo into an overall assessment of the effects of forest management. The two new measurements introduced, i.e. time-dependent and time-independent equivalent emissions, also represent an improvement over our traditional methods of representing the temporal dynamics of albedo.

The mapping of these new albedo measurements should help identify areas where taking albedo into account could make a difference in guiding forest management decisions aimed at mitigating climate change. Over time, forest managers will be able to incorporate these new data into their planning tools in order to optimize the climate benefits of their initiatives.

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Poplars fight back against leaf rust

Poplars are used in agroforestry for wood production, but their vulnerability to the fungus that causes European poplar leaf rust, *Melampsora larici-populina*, results in high mortality rates in plantations. European leaf rust was discovered in Canada in 2002 and appears to be spreading quickly to several regions in Quebec. This study, conducted by researchers from the Université de Lorraine, the Sainsbury Laboratory, the Université du Québec à Trois-Rivières and the Canadian Forest Service, showed that a protein secreted by the poplar during the infection process has antifungal properties.

Photo: NRCan

The protein, whose function was previously unknown, was identified in the course of a study on poplar leaf reaction to a leaf rust infection. Researchers found that this protein stopped the germination of fungal spores on poplar leaves. This protein had not been found in any other plant.

The study of this protein could result in a better understanding of the defence mechanisms developed by poplars to protect themselves against this exotic pest and against other indigenous leaf rusts in Canada.

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