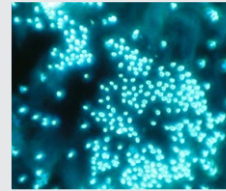




In Brief

from the Canadian Forest Service – Laurentian Forestry Centre



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Climate change: no benefit for white-cedar

Currently available data suggest that the northernmost region of the boreal forest as well as the tundra located even farther north are exposed to more significant increases in temperature than other forests. In theory, this should lead to the increased growth of forest species in those areas, including the eastern white-cedar.

However, researchers from the Université du Québec en Abitibi-Témiscamingue, the Université du Québec à Montréal, the École pratique des hautes études in France and the Canadian Forest Service found that global warming would not lead to a higher growth rate in white-cedar growing north of the 47th parallel in Quebec.

This research showed that tree growth is not only limited by the length of the growing season and by the cold, but also by dry summer weather and excess water in the soil in the spring and fall. This explains the fact that white-cedar is found in peatlands at its northern limit in Quebec. By studying tree growth rings, researchers were able to determine that white-cedar growth had decreased in the area rather than increasing alongside temperatures.

This is due, in part, to increased dry spells in the summer and changes in precipitation seasonality, both of which are attributed to climate change. These unfavourable conditions have thereby led to a decrease in white-cedar growth.

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Carbon sequestration in the boreal forest varies according to treatment

Boreal mixedwood forests have the potential for sequestering large amounts of carbon. Over a 9-year period, researchers from the Université du Québec en Abitibi-Témiscamingue and the Canadian Forest Service studied carbon distribution in the different components of boreal mixedwood forests according to four scenarios: clearcutting, partial cutting at two different intensities, and no cutting. Researchers found that in partially harvested stands, the quantity of dead trees (standing or on the ground) was similar to that of non-harvested stands.

As for soil carbon flow, the type of soil litter inputs resulting from partial cutting and clearcutting varied substantially. In all harvested stands, the quantity of leaf litter quickly became the same as that of non-harvested stands. However, during the nine years following harvest, the production of dead wood in the partially cut areas was similar to that observed in the non-harvested stands, but was practically nil in the forests that had been clearcut. The result is that the quality of the litter falling to the ground in clearcut forests is different from that of all the other treatments. After partial cutting, the forest continues to be a carbon sink, whereas it becomes a carbon source for a few years after clearcutting.

None of the treatments had a detectable impact on mineral soil carbon.

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Boreal forest productivity: beyond site conditions

A stand's ability to regenerate, site characteristics (climate, soil and drainage) and disturbances all influence its capacity to produce wood fibre. For forest management to be considered "sustainable", a forest must be productive enough to face fires and it must be able to regenerate itself in order to maintain or improve its production capacity.

By combining the site characteristics of forest stands and their burn rates, researchers from the Université Laval, the ministère des Forêts, de la Faune et des Parcs du Québec, the Université du Québec en Abitibi-Témiscamingue and the Canadian Forest Service noted an abrupt transition in the proportion of productive stands in the ecological districts of the black spruce closed forest located in the north of the Quebec province. A "closed" forest mainly comprises stands measuring 7 m or higher and its canopy density is above 40%. The decrease in the proportion of closed forests seems to be related to fire frequency.

These results will impact strategic forest management planning. Contrary to what has been stated in the past, the productivity of a given area can no longer be considered solely dependent on the site's conditions; it also seems to be influenced by the disturbance rate. Hence, this study helps to assess the capacity of a site to withstand forest management activities while taking into account natural disturbances occurring in the area.

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Post-disturbance harvests: a natural source of energy

The demand for forest biomass for the production of bioenergy is on the rise worldwide. Logging residues (tree branches and crowns) and wood industry residues (bark, sawdust and black liquor) currently are the main sources of supply.

However, researchers at the Université Laval, the University of Toronto and the Canadian Forest Service have found that forest disturbances such as fires and spruce budworm outbreaks could result in significant amounts of additional biomass. Between 1970 and 2010, the average area affected by fires alone in eastern Canada is estimated at 2,900 km² per year.

By rapidly salvaging trees after a disturbance, their physical and mechanical properties can be preserved. However, it is only possible to maintain these properties for a period of 1 to 2 years for sawtimber and of 3 to 4 years for pulpwood. After this period, the properties of the wood change, making it unfit for the production of these products. Nevertheless, this wood remains an adequate source of biomass for bioenergy production for several years.



Photo: A. Achim

The bioenergy produced with this biomass could prove to be an interesting option in terms of optimizing forest resource use by giving value to lower-quality wood fibres.

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Gaining a better understanding of the development of scleroderris canker in red pine

The European strain of scleroderris canker was first reported in North America in 1975. This disease mainly attacks red pine, causing trunk cankers and shoot blight. It also causes the relatively rapid death of young pines measuring less than 6 m.



Photo: NRCan

In the 1980s, researchers from the Canadian Forest Service monitored 1,183 plantations in the region located north of the Ottawa River in Quebec, and detected the disease in 121 plantations. Two of those infected plantations were selected to monitor disease development in the crowns of trees growing on flat terrain, to measure the height of the damage on trees growing on a slope, and to measure the horizontal distance over which the disease could spread.

Researchers were thus able to show that the disease spreads over 0.5 m per year, on average, in the crown and that the height infected varies. Under favourable conditions (e.g. fog, which naturally wets pine foliage), symptoms can spread over several metres in the crown. When trees grow in depressions, the disease can reach higher elevations, which promotes its vertical spread. Researchers also noted that the disease spreads horizontally over short distances, i.e. approximately 7 m per year.

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The impact of climate change on the boreal forest

Climate change will affect forest ecosystems by impacting tree growth and fire regimes, among other things.

In this study, researchers from the Université du Québec en Abitibi-Témiscamingue, Université Laval, Université du Québec à Montréal, the University of Helsinki and the Canadian Forest Service assessed the impact of climate change on timber supplies in Eastern Canada's boreal forest. They developed a model that simulates the effect of two climate scenarios on three commercial tree species (black spruce, jack pine and trembling aspen) and studied two forest management scenarios (ecosystem management and traditional forest management).

According to the management scenario studied, the timber supply could be reduced by 35 to 79% within 100 years, depending on the magnitude of the forecasted temperature increases. This assessment combines growth reductions and losses caused by fires. However, ecological indicators show that ecosystem management provides greater potential for adaptation to climate change, at least in the short term, than traditional forest management.

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