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In Brief

from the Canadian Forest Service – Laurentian Forestry Centre

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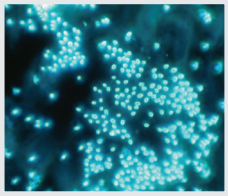


Fires in the eastern boreal forest of North America over the past 7000 years

Six researchers affiliated with the Canadian Forest Service, the Centre européen de recherche et d'enseignement des géosciences de l'environnement (CNRS, Université Paul Cézanne, Collège de France), the Centre de bioarchéologie et d'écologie (CNRS, Université Montpellier 2, École Pratique des Hautes Études de Paris) and the Université du Québec en Abitibi-Témiscamingue produced a historical reconstruction of forest fires over the past 7000 years based on the sedimentary charcoal series from five lakes located south of Hudson Bay, in the eastern boreal forest of North America.

The reconstruction shows a significant downward trend in the frequency of large fires, from a 164-year fire return interval (i.e., time elapsed between two successive fires at the same location) 5000 years ago to a return interval of 303 years at present. Simulations of fire risk and reconstructions of climate show an increasing trend in available moisture in the region between the mid-Holocene and today. The researchers conclude that the declining trend in forest fire activity was ultimately caused by the steady orbitally-driven reduction in summer insolation (energy received on a given surface in a given time).

The projected high temperatures – not compensated by significant precipitation increases – will bring fire frequency back toward its upper limit, which was recorded between 6000 and 2000 years BP.

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Photo: S. Bergeron, Le monde en images, CCDMD

Is Labrador tea beneficial to black spruce in the Abitibi region?

Researchers at the Canadian Forest Service and the Université du Québec en Abitibi-Témiscamingue conducted a study north of La Sarre, in the Abitibi region, to assess the effect of manual control of Labrador tea, a heath species. They found that this treatment did not stimulate the growth of black spruce; in fact, it slowed it down.

The scientific literature contains reports dating back many years that mention the negative impact that Labrador tea has on black spruce. It is thought that Labrador tea affects the soil chemistry and has a detrimental effect on mycorrhizae.

The goal of this research was to test new methods for increasing the productivity of black spruce stands growing on the clay soils of northwestern Abitibi. The experiment, which lasted three years, showed that mechanical control of competing Labrador tea plants resulted in slower tree growth rather than faster growth. The study also showed a decrease in the concentration of nutrients in spruce needles, which points to an impact on their mineral nutrition.

This unexpected finding raised many questions. Is root competition increased when the aerial part of Labrador tea is mowed? Does this stimulate the growth of sphagnum, making the soil cooler? What is the effect on complex mycorrhizal relationships? Further work should be done and the same experiment should be repeated in other regions of Quebec to answer these questions.

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Expanding forest modelling perspectives in Quebec

In the future, forest modelling will be carried out by multidisciplinary teams, and models will have to be designed for broader applications. For example, in addition to focusing on forest productivity, these models will have to take biodiversity, wildlife habitats, soils and climate change impacts into account. Researchers at the Canadian Forest Service and the ministère des Ressources naturelles et de la Faune du Québec have produced a synthesis article on a forest modelling workshop that was held in May 2008 in conjunction with the ACFAS conference.

In Quebec, a number of simulation models have been used in forestry over the years for decision-making purposes, with most of them focusing on growth and production. The workshop participants pointed to the need for user-friendly, transparent models that are accessible to users with different backgrounds. These broad-application models should aim to minimize or give a clearer assessment of the uncertainty inherent in forest modelling.

Multidisciplinarity will be achieved when specialists from different fields get together to work toward a common goal in a team environment characterized by transparency and communication. From a technical standpoint, the new models should be able to integrate satellite data. In view of the current interest in climate change, new models could be developed to investigate topics such as soil nutrient cycling and the capacity of forest ecosystems to sequestrate more carbon.

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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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Adapting forest management to climate change

Climate change is already having an effect on the ecological integrity of forest ecosystems. Researchers at the Canadian Forest Service and the FAO Forestry Department have prepared a synthesis report on the international conference on forest adaptation and forest management held at Umeå, Sweden, in 2008.

Global warming is an irrefutable fact and its anthropogenic origin has been established almost beyond doubt. Droughts and extreme climatic events are occurring more frequently, and there has been an increase in major forest impacts around the world. The mountain pine beetle outbreak in western Canada, which has been linked to a series of mild winters, is a good example.

The adaptation of forests and forestry is essential in the present context of climate change. Sustainable forest management is viewed as a pillar of adaptation, but a new approach is required to put it into practice owing to the uncertainty associated with future growing conditions and production targets. In developing countries, international support aimed at reducing deforestation and forest degradation should allow the implementation of a forestry regime that enables communities to increase their capacity to adapt to climate change. Adaptation could include an expanded agroforestry component. Governance takes on considerable importance in such a context.

In a broader perspective, adaptation of the forest sector also includes the response to social pressure to mitigate greenhouse gas emissions through a marketing approach aimed at promoting the environmental benefits of wood products compared with alternative products. Wood value in relation to carbon, especially bioenergy, also creates development opportunities for adapting the resource to the new market realities resulting from climate change.

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Edible forest mushrooms - Gaining insight into the ecology of the lobster mushroom

In Quebec and around the world, the market for edible forest mushrooms is growing rapidly. A recent study by researchers at Université Laval and the Canadian Forest Service has shed light on the ecology of the lobster mushroom and the impact of certain forestry practices on the species' productivity.

Although mushrooms in the genus Russula are edible, their commercial potential is limited. However, when these mushrooms are infected with the parasitic fungus *Hypomyces lactifluorum*, their colour and shape changes, as does their flavour. They become so delicious that they are sought after by restaurants.

Photo: C. Rochon

Every mushroom species has specific forest-related requirements. In jack pine stands growing on acidic sandy soil, the proximity of pioneer species such as white birch, speckled alder and trembling aspen has a positive influence on the productivity of the lobster mushroom (i.e., the *Russula brevipes/Hypomyces lactifluorum* complex). The presence of sweet-fern is also beneficial to the lobster mushroom because it fixes atmospheric nitrogen. However, a high abundance of sheep-laurel could be detrimental.

The study revealed that lobster mushroom density is greater on trails than under the forest canopy; however, mushroom biomass values tend to be higher under the canopy. Precipitation had a positive influence on productivity under the canopy. An annual average productivity of 21.6 kg/ha was observed. The average life span of the lobster mushroom was 13 days.

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Genetically improved white spruce plantations produce economic benefits

Photo: J. Beaulieu

Researchers at Université Laval and the Canadian Forest Service set out to evaluate various factors influencing the benefits derived from plantations composed of genetically improved white spruce. From the forest landowner's perspective, the optimal approach is to establish a white spruce plantation on a productive site using genetically improved stock, and to practice intensive forest management. Site quality is the most important parameter.

The benefits to the landowner are 61% greater when a productive planting site is selected compared with a poor quality site. The use of genetically improved stock provides an additional increase in benefits of 17%. Intensive silviculture, such as the use of thinning, provides an additional gain of 8%. Today, more than 85% of the 25 to 30 million white spruce trees planted in Quebec consist of genetically improved stock.

In Quebec, the trend in forest management is toward increasing production through more intensive silviculture on fertile areas of land located near mills. This reduces harvesting pressure on large expanses of forest land and allows tracts of forest to be set aside for biodiversity conservation. The new knowledge acquired concerning the benefits of genetic improvement and intensive silviculture enhances our ability to make informed decisions.

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