Natural Resources Canada | Ressources naturelles Canada

In Brief

from the Canadian Forest Service – Laurentian Forestry Centre

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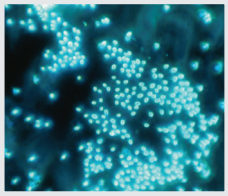


Does fire severity affect the decomposition of woody debris?

Researchers with the Canadian Forest Service and the Université du Québec à Rimouski studied post-fire woody debris in the spruce–lichen domain in Quebec to quantify the effect of the severity of fire on the process of decomposition of woody material. The data were collected from black spruce that had burned 17 years prior to the study.

The mean decomposition rate was relatively slow. Whereas the stand-level variables had a non-significant effect on decomposition rates, vertical position and fire severity were the most important tree-level variables influencing decomposition because of their strong influence on moisture content. Post-fire woody debris in contact with the ground and lightly burned debris had higher moisture content and therefore faster decomposition rates. The faster decomposition rates found in lightly burned trees could be partly attributable to increased colonization by xylophagous (wood boring or feeding) insects. The low moisture content in severely burned trees was linked to the more rapid loss of bark. A very severe fire would delay decomposition by allowing snags to remain standing longer.

Fire severity, owing to its considerable impact on the decomposition of woody debris, appears to strongly influence post-fire nutrient cycling as well as carbon emissions from burned stands.

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Scleroderris canker: reinterpreting the historical record

Scleroderris canker is a serious disease of hard pines that affects red pine in particular, causing seedling blight, branch dieback, stem cankers and tree mortality. The disease has destroyed hundreds of thousands of pine seedlings in nurseries and has devastated pine plantations.

The known distribution of scleroderris canker encompasses most of the forest land in Quebec. The causal fungus, *Gremmeniella abietina*, was first recorded in Canada in 1960. The disease is endemic in natural jack pine forests and undoubtedly spread with the intensification of reforestation efforts in the late 1980s. A recent study of archived documents by a Canadian Forest Service researcher has produced evidence that the disease was actually present in Canada at least 20 years earlier than previously thought.

By examining studies conducted in a plantation of 200,000 red pines in the Quebec City region reportedly devastated by summer frost, the scientist reached a very different conclusion about the cause of the destruction. Based on the description of the signs and symptoms, photographs of the damage and samples collected from residual pines, the scientist attributed the mortality of these pines, which were planted in 1934, to scleroderris canker.

Photo: R. Blais

Although scleroderris canker can cause major losses in nurseries and plantations, control measures such as pruning help to reduce its impact on red pines.

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Silviculture and regeneration of eastern white-cedar in mixedwood stands

The effect of silvicultural practices on the post-harvest regeneration and development of eastern white-cedar is not well documented. In mixedwood stands, eastern white cedar plays a crucial role in the maintenance of biodiversity and wildlife habitats in addition to being a commercially valuable species. Researchers with the Canadian Wood Fibre Centre of the Canadian Forest Service, the ministère des Ressources naturelles et de la Faune du Québec and Université Laval compared the effectiveness of three treatments – single-tree selection cutting, group selection cutting and shelterwood seed cutting – in terms of white cedar regeneration in three mixed stands of yellow birch and softwoods in the Outaouais region.

The single-tree selection method with 25% of the basal area removed made it possible to ensure natural regeneration and development of cedar seedlings. To achieve that, an adequate seed source must be present and browsing pressure must not be too strong. Group selection cutting proved to be the least effective treatment.

Direct seeding greatly increased the quantity of seedlings in all treatments, thereby confirming the importance of having an abundant seed source. There was a greater abundance of seedlings on disturbed seedbeds where the mineral soil was exposed. Planting of seedlings gave good results too, particularly with group selection cutting.

White-tailed deer population densities were low in the region studied; the authors nonetheless believe that browsing pressure may be a major impediment to eastern white-cedar regeneration.

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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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Growing hybrid poplars outside their comfort zone

Establishing hybrid poplar plantations in the boreal forest is viewed as a potential strategy for increasing forest productivity in zones suitable for intensive silviculture that are located fairly close to resource users. A team of researchers from the Canadian Forest Service and the Université du Québec à Montréal studied the effect of several silvicultural treatments (site preparation, vegetation control, fertilization) on the survival and juvenile growth of hybrid poplars in plantations established on sites in the Saguenay–Lac-Saint-Jean region in the balsam fir–white birch domain. The considerable sensitivity of hybrid poplars to competition for light, root competition, climatic conditions and soil fertility hinders their establishment and growth in the harsh conditions of the boreal forest.

Photo: P. Gagné

Mechanical site preparation is essential; it is the treatment that had the greatest influence on height and diameter growth together with a major positive impact on the seedling survival rate. The more intense the site preparation, the less effect vegetation control had on seedling growth. Fertilization had a significant effect only on sites subjected to the most intense preparation (mounding of mineral soil). Neither of these treatments can compensate for inadequate site preparation.

Mounding is the site preparation method that gave the best results by creating conditions favourable for root system expansion. Five years after the study began, the results can be considered satisfactory on sites where this approach was used, in light of the conditions characterizing the study area.

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Evolution of the boreal forest in the absence of fire

Even with the absence of fire over a long period, the composition and structure of the boreal forest, including in the oldest strata, is continually changing. Canadian Forest Service research scientists have studied vegetation dynamics in an area comprising 4,340 km^2 of boreal forest north of Baie-Comeau where the fire cycles are estimated to be nearly 300 years. Aerial photographs dating from 1930, 1965 and 1987 were used to characterize the changes that have occurred over a 57-year period.

Three post-fire succession patterns have been identified: predominance of intolerant hardwood stands followed by an increase in balsam fir over time; predominance of intolerant hardwood stands followed by an increase in black spruce; and predominance of black spruce from the beginning. Strata older than 120 years tend to be dominated by conifers, while younger stands are most often mixed. Secondary disturbances, such as insect outbreaks and windfall, play a major role in structural changes, particularly the respective percentages of black spruce and balsam fir. Factors such as the north-south gradient, slope and thickness of surface deposits influence composition and succession.

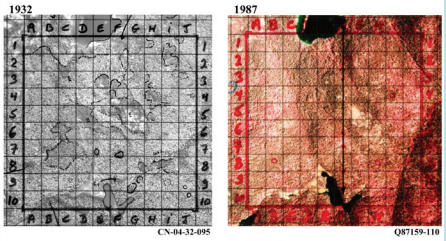

Photo: S. Gauthier

Knowledge of these dynamics is important for developing sustainable forest management strategies that will help to preserve landscape variability.

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Hemlock looper: more eggs, more parasitism?

The hemlock looper is a destructive pest of balsam fir. The parasitoid *Telenomus* plays a key role in hemlock looper outbreak dynamics by causing high levels of mortality in looper eggs. Researchers with the Canadian Forest Service, University of New Brunswick and Université Laval studied the effect of looper egg density on the behaviour of three *Telenomus* species in eastern Quebec and in western Newfoundland.

Given the small hemlock looper populations in these regions, the researchers installed traps containing different numbers of looper eggs. This trapping enabled them to determine that host egg density had little or no influence on the rate of parasitism by *T. flavotibiae* in the fall or by *T. droozi* in the spring. However, the percentage of eggs parasitized by *T. coloradensis* in the spring was found to be directly linked to looper egg density. *T. droozi* only parasitized eggs in traps that contained eggs parasitized by *T. coloradensis*, which suggests that it was reacting to a chemical substance released by the latter.

The study results suggest that *T. coloradensis* alone has the potential to regulate hemlock looper populations. Since this new knowledge provides insight into looper population dynamics, it can be harnessed in integrated pest management approaches for this insect.

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