Branching out

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Old-growth boreal forests: unravelling the mysteries

Although old-growth forests were once a dominant component of some pre-industrial forest landscapes, even-aged forest management in the boreal forest has led to a scarcity of old-growth stands. But what do we actually know about old-growth forests? Canadian Forest Service researchers are working to increase overall understanding of these forests and address certain misconceptions about them.

Photo: B. Epp.

What is an old-growth boreal forest?
At the stand level, an old-growth boreal forest has a complex structure characterized by several successive or overlapping cohorts of trees originating from disturbance events. Mortality generally affects individual trees or small groups of trees, engendering gap dynamics. The start of the old-growth stage occurs when the dominant trees from the last severe disturbance begin to die off. At the landscape level, old-growth forests are composed mainly of coniferous stands that vary in density and height over time in response to partial disturbances and insect outbreaks.

Myth No. 1
Old-growth boreal forests are in a state of decline
The most widespread myth about old-growth boreal forests is that they have reached a stage of decline characterized by a steady decrease in the volume of standing timber. The use of yield tables in allowable cut calculations has largely contributed to this misconception because stand age is taken to represent the age of individual trees. In addition, since these tables have been developed for single-species stands with a regular structure, they do not provide an accurate picture of the compositional and structural changes that are specific to old-growth forests. As a result of the process of regeneration, the age reported in forest inventories and used in yield tables systematically underestimates actual stand age. The use of corrected yield curves would improve allowable cut calculations considerably, while also helping to dispel the notion that old-growth boreal forests are in a state of decline.

Myth No. 2
Old-growth boreal forests are more susceptible to forest fires and insect outbreaks

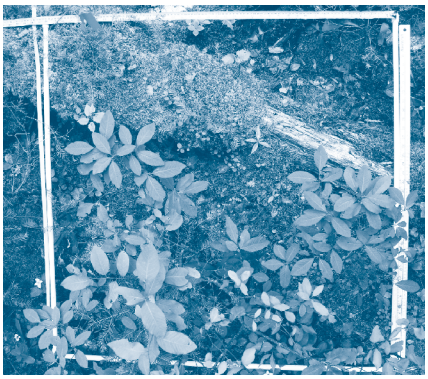
Old-growth boreal forests are often perceived as being more vulnerable to forest fires. A number of factors lend support to this belief, including the important accumulation of downed woody debris that could increase fuel loading, a more open structure that could stimulate drying, and a multi-storied structure that would make them more vulnerable to crown fires. However, the few studies conducted on this topic indicate that fire risk is independent of stand age. This calls into question the idea that there is an urgent need to harvest these stands in order to keep the timber from being destroyed by fire.

Allowing stands to mature beyond their commercial rotation age is thought by many to increase the risk of insect outbreaks at the landscape level. However, if we take for example the spruce budworm, a number of studies suggest that old-growth forests are not more susceptible to outbreaks than mature forests. Susceptibility to spruce budworm outbreaks appears to reach a plateau at the mature stage.

Myth No. 3
Old-growth boreal forests are carbon sources

According to this myth, the exchange of carbon between old-growth boreal forests and the atmosphere results in a carbon neutral situation, or even in a negative carbon balance. In other words, the release of CO_2 during respiration by decomposers and plants equals or exceeds the amount of CO_2 absorbed during photosynthesis. While it is true that carbon sequestration in old-growth forests is a slow process, recent studies have shown that old-growth forests can act as carbon sinks for centuries.

It is inaccurate to say that a landscape composed of old-growth forests is a carbon source. In fact, at the landscape level and under natural conditions, it is the disturbance regime that determines whether the carbon balance is negative or positive. Renewal of the forest landscape through an increase in disturbance intensity – or through the introduction of a new type of disturbance, such as harvesting – ultimately leads to a decline in carbon stocks over time at the landscape level. Conversely, a reduction in disturbance frequency causes a gradual ageing of the forest landscape and an increase in average stand-level carbon stocks.



Microplot for understorey plant survey.
Photo: L. De Grandpré (CFS)

Myth No. 4
Integral conservation is essential for old-growth boreal forests

The issue of old-growth forest conservation has resulted in a polarization of the debate between ecology and heritage groups, on the one hand, and social and economic interest groups, on the other. However, much more nuanced positions emerge when these groups explain their point of view. Forest certification, for example, takes market access into account while also promoting the conservation and sustainable management of old-growth stands.

When forest managers plan the harvesting of mature and overmature forests, they should adopt specific measures to maintain extensive tracts of old-growth forest or stands with old-growth forest attributes in managed areas. By protecting large tracts of forest that are past the mature stage, they will help to ensure the survival of species associated with old-growth forests, including certain mosses and lichens, as well as some bird species and the woodland caribou. Canadian Forest Service researchers are continuing their work in this area with the aim of increasing knowledge of old-growth boreal forests and guiding stakeholders in the decision-making process.

USEFUL LINKS:

Proceedings of the "Colloque sur les vieilles forêts boréales. Leur place dans l'aménagement durable" (in French only):
http://www.partenariat.qc.ca/pdf2/OT-127.pdf

Sustainable management of old-growth boreal forests: Myths, possible solutions and challenges:
http://article.pubs.nrc-cnrc.gc.ca/RPAS/rpv?hm=HInit&calyLang=eng&journal=tfc&volume=86&afpf=tfc86070-1.pdf

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