Natural Resources Canada | Ressources naturelles Canada

InBrief

from the Canadian Forest Service – Laurentian Forestry Centre

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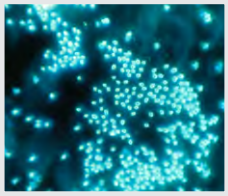


Estimating merchantable volume using a historical statistical approach

The use of a historical *k*-Nearest Neighbour (*k*-NN)-based statistical approach to estimate merchantable volume gives results similar to those obtained using the operational method employed in public forests in Quebec, which involves the establishment of new plots. This is the conclusion of a study by researchers at the Canadian Forest Service, Université Laval and the ministère des Ressources naturelles et de la Faune du Québec in two forest management units located in the Outaouais and Portneuf regions.

The historical *k*-NN-based approach was used to quantify, on the basis of common photo-interpreted attributes, the degree of similarity between target forest cover polygons and reference polygons from the second and third 10-year inventory, each containing a sample plot from one of these programs. Sample plots located in the most similar reference polygons were then used to calculate the average volume per hectare of the target polygons. A parallel exercise was conducted with the operational method used in Quebec.

The results show that it is possible to use data from plots from previous decades to estimate the characteristics of current forest polygons. The number of new plots necessary could be reduced, as could the substantial costs associated with their establishment.

The results also suggest that the accuracy of the two approaches is limited by uncertainties associated with photo interpretation. The significant increase in the number of field plots cannot compensate for these uncertainties. Although limited, the historical *k*-NN-based approach provides a valid alternative to other currently available methods.

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Potential for the introduction and spread of sudden oak death in eastern Canada

Sudden oak death disease is well-established in the western United States, particularly in the state of California, where eradication efforts have been abandoned. Although major phytosanitary measures have been implemented across North America, concerns persist about the ability of the disease to become established in eastern North America. A study conducted by researchers with the Canadian Forest Service, the Canadian Food Inspection Agency, McGill University and Université Laval has provided a more accurate estimate of the risk of establishment of *Phytophthora ramorum*, the causal agent of sudden oak death, in eastern Canada.

Photo: M. Simard

Inoculation trials were performed on balsam fir, sugar maple, yellow birch, white ash, tamarack and red oak. The amount of necrosis and sporulation were measured. The results show that under favourable temperature and moisture conditions, often present in eastern Canada, *Phytophthora ramorum* could infect the studied species in their natural environment and could lead to the development and spread of sudden oak death. White ash, yellow birch, balsam fir and tamarack are the most susceptible species in eastern Canada.

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Pest control - Easier detection of sudden oak death

Sudden oak death (*Phytophthora ramorum*) is a disease originating in Europe that attacks over 100 plant species, including red oak. The genus *Phytophthora* comprises a large number of species, the most common of which are major plant pathogens that cause damage to crops and forests.

A team of molecular biology researchers from the Canadian Forest Service and Agriculture and Agri-Food Canada has developed a tool that facilitates the detection of the fungus, particularly in horticultural nurseries. It involves the use of gene probes (small piece of synthesized DNA) that provide an easier, quicker and less costly way to confirm the presence of *Phytophthora ramorum*, while minimizing the risk of error.

This new tool could be used to ensure quicker and more effective implementation of the various protection and pathogen eradication measures in Canada. For example, in 2009, the Canadian Food Inspection Agency issued a quarantine and eradication order for nursery material infected with this fungus in British Columbia. The pathogen has been present in the southwestern United States since the 1990s, where it has caused extensive damage.

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In Brief
from the Canadian Forest Service – Laurentian Forestry Centre

Successional paludification dynamics

A study conducted by researchers from the Canadian Forest Service, Université du Québec en Abitibi-Témiscamingue and Université du Québec à Montréal in 12 stands on the clay plains of northwestern Quebec with postfire ages ranging from 90 to 714 years provided a better understanding of successional paludification, a natural phenomenon involving the accumulation of a thick organic layer over time.

Photo: D. Paré

The results show that postfire stand age and slope significantly influence the rate of soil organic matter accumulation. However, accumulation is not confined to flat sites and, in the absence of fire, all black spruce stands evolve towards greater degrees of paludification.

The results indicate that organic layer depth in a given stand can be assessed as a function of tree basal area and percent cover of *Sphagnum* moss, two variables that can be easily measured in the field. Because these variables can be evaluated through satellite imagery, it may be possible in subsequent work to quantify the degree of paludification at the landscape scale.

The study demonstrates that site productivity is inversely proportional to organic layer depth. A significant decline in site index occurs during the period in which organic layer depth increases from 20 to 40 cm.

Forest management activities designed to reduce organic layer depth should be carried out on sloped sites given that accumulation is slower at such sites and potential productivity gains are greater. The method developed in this study could be used for the selection of the most suitable sites.

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Impact of fire on organic-layer depth and regeneration

Forest fires play an important role in the dynamics of boreal forest ecosystems. The soil of the boreal forest generally contains a thick organic layer. Forest fires reduce the depth of the organic layer and create localized seedbeds that are more favourable to tree seeds.

Researchers with the Canadian Forest Service and several Canadian universities compared pre- and post-fire organic-layer depth and characterized regeneration at 14 sites in the boreal forest of Quebec, Ontario, Saskatchewan and Alberta. After fires, a roughly 60% reduction in organic-layer depth and a significant increase in the area occupied by thin organic layers were observed.

Photo: D. Greene

The results also show that the reduction in organic layer thickness is greater near burned tree boles, resulting in increased seed germination and seedling survival rates and more abundant regeneration at these sites. This phenomenon is believed to be due to the latent heat around trees. The researchers also observed that the ability of seeds to germinate in the organic layer is inversely proportional to their size.

This research promotes a better understanding of the mechanisms governing the establishment of young trees and of post-fire forest dynamics.

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Old-growth boreal forests - Harvesting influences insect populations

The boreal forest of the North Shore comprises a large proportion of virgin stands of irregular structure. Researchers at the Canadian Forest Service and Université Laval have found that Coleoptera species richness was more closely associated with stand composition heterogeneity than with stand structure heterogeneity, particularly for ground-dwelling species. This discovery is important, because these two sources of heterogeneity are usually integrated into a single so-called stand structure index. It also means that stand structure depends largely on composition.

A high diversity of insects has been observed in old-growth stands in which the presence of balsam fir indicates that a significant amount of time has elapsed since the last fire. Balsam fir is also associated with several characteristics of old-growth forests, such as the abundance of dead wood and the presence of deciduous and shrub species.

When harvesting is carried out in these stands, flying insects are at an advantage because their ease of movement increases their capacity to adapt. In contrast, due to their limited mobility, ground-dwelling insects are more significantly affected than flying insects by changes in forest cover following harvesting, for example. These insects could become good indicators of biodiversity conservation.

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