Natural Resources Canada | Ressources naturelles Canada

InBrief

from the Canadian Forest Service – Laurentian Forestry Centre

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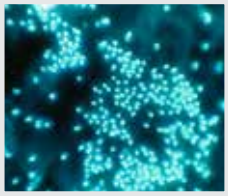


A new change-mapping tool

Most of Canada's managed forests, which cover close to 230 million hectares, are found in the boreal forest. On average, forest fires burn 1% of this territory annually, and annual harvesting covers 0.5%. These disturbances are part of the dynamics of these forests and must be taken into account when developing models for the prediction of forest attributes.

Although several remote sensing tools already exist, and cover Canada's forests in whole or in part at resolutions of 1 km or less, few are updated regularly or can be used to identify types of disturbances.

Researchers from the Canadian Forest Service and the Canada Centre for Mapping and Earth Observation have developed a tool for annual mapping of large forest disturbances throughout Canada (fire, harvests and areas flooded by the creation of reservoirs), at a resolution of 250 m x 250 m. Applied to MODIS satellite data, the models developed in this project detect between 75% and 80% of fires and harvested areas on the ground. The tool includes annual harvest, fire and flooded area maps from 2000 to 2011 for all of Canada.

This mapping tool enables the rapid development of strategic analyses requiring data on recent uniform disturbances over large areas. Harvest mapping, in particular, provides an unprecedented ability to analyze regional and national issues related to this activity.

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The balsam woolly adelgid renders fir foliage more attractive

The balsam woolly adelgid is an insect that originated in Europe, and has been present in Canada for the last 100 years. It mainly attacks balsam fir, which reacts to the insect's sting by forming compression wood, which alters the free flow of xylem and phloem in the affected branch. This adelgid is now found in most fir forests in the Atlantic Provinces. Because of climate change, the insect is moving more and more toward northern parts of the country, and its area of infestation extends from Nova Scotia toward New Brunswick and the island of Newfoundland.

Photo: NRCan

Researchers from Université Laval, the University of New Brunswick and the Canadian Forest Service sought to determine how the presence of this insect affected tree growth and the chemical composition of foliage. They noted that infested trees had fewer buds and shorter annual shoots. In addition, the researchers noticed a change in the chemical composition of old foliage (foliage from previous years). Indeed, there is a decrease in the chemical defense substances emitted by trees (monoterpenes), which makes the foliage more attractive to leaf defoliators such as the spruce budworm or the balsam fir sawfly. These changes could have an impact during outbreaks of these pests or other defoliators.

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Partial cutting: a good spruce budworm management tool?

Spruce budworm (SBW) outbreaks are the most significant natural disturbance affecting balsam fir stands in Canada. Silvicultural treatments, particularly partial cutting, have been proposed as a management tool to help mitigate the impacts of SBW.

In mature balsam fir-white birch stands, researchers from the University of Toronto, Université Laval and the Canadian Forest Service examined the effects of partial cutting on parasitoids that attack the SBW. Spruce budworm populations were endemic in these stands, and two different cutting intensities, 25% and 40% of the basal area, were carried out in 2009. The researchers introduced larvae and pupae into the stands during the 3 years following the cuts to study levels of parasitism.

Their findings were as follows: 1) In the pupae, the level of parasitism was too low to be able to establish a comparison between the two cutting intensities; 2) 2 years after the treatments, partial cutting had significantly reduced parasitism of the larvae; 3) 3 years after the treatments, no significant difference was found in parasitism of the larvae.

Partial cutting therefore has no lasting impact on parasitism in endemic SBW populations, but can reduce parasitism under certain conditions.

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In Brief
from the Canadian Forest Service – Laurentian Forestry Centre

Burned forests: a good source of biomass?

The demand for forest biomass for bioenergy production is on the rise. Logging residues (tree branches and crowns) and wood industry residues (bark, sawdust and black liquor) are currently the main sources of supply. However, forest disturbances such as fire could make large amounts of biomass available. In these burned forests, foresters can rapidly salvage trees to preserve their physical and chemical properties for the manufacture of traditional products such as sawtimber. However, maintaining these properties over time is limited: 1 to 2 years for sawtimber and 3 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 several years.

Photo: NRCan

In stands where the time limit for extracting traditional products has expired, researchers from the Canadian Forest Service assessed the potential for biomass production as well as the constraints (e.g. preservation of biodiversity) that limit salvage logging in these stands. Their studies focused on jack pine and black spruce in the boreal forest. The results indicate that these stands can provide biomass of suitable quality for bioenergy. It is possible to estimate the energy content of the stands, based on species. Jack pine has the best yield potential. The researchers also mentioned that during salvage operations, care must be taken to protect regeneration and leave debris that is already on the ground. Lastly, because the energy production capacity of black spruce is lower, it is necessary to verify if it would be better to leave the trees in place to maintain biodiversity rather than harvest them.

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Salvage logging: what are the effects on regeneration?

Fire is the dominant disturbance in the boreal forest, and causes significant losses in allowable cut for the industry. To minimize these losses, more and more post-fire salvage logging operations are being performed.

Researchers from Université du Québec à Montréal, Concordia University and the Canadian Forest Service wanted to predict regeneration in jack pine and black spruce in burned sites where salvage logging had been carried out and where it had not. To do this, they developed a model based on the quantity of seeds available before salvaging, by taking into account the number of trees present before the fire and the number of trees salvaged. This model makes it possible to evaluate the impacts of post-fire salvage logging on regeneration.

The results show that black spruce regeneration was more affected by rapid post-fire salvage logging than jack pine regeneration. The main cause is the fact that the dispersal of black spruce seeds takes longer to occur after a fire than for jack pine seeds. The researchers also noticed that if harvesting was delayed or fewer trees were salvaged, regeneration improved for both species.

The model that was developed makes it possible to quickly assess the following after a fire:

- if it will be necessary to reforest the burned plots;
- the best time to perform salvage logging;
- the number of seed trees to leave onsite in order to maximize regeneration of softwood species.

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Post-windthrow harvesting: what are the effects on the site?

Windfallen trees can be harvested in certain situations. Researchers from Université Laval, the University of Georgia and the Canadian Forest Service evaluated the impact of this operation in black spruce-moss stands in eastern Quebec. More specifically, they studied its effect on plant diversity, regeneration density and the quality of seedbeds for germination.

Photo: NRCan

Harvesting fallen trees creates multiple skid trails. The creation of these trails destroys mosses and sphagnum and increases the homogeneity of seedbeds. In addition, the researchers found that the act of working in the forest decreases the diversity of understory vegetation.

In order for forest operations to mimic natural processes as much as possible (ecosystem-based management), the researchers recommend that the planning of post-windthrow operations should include leaving portions of land intact. These sectors would contain areas with favourable conditions for regeneration and would contribute to maintaining plant diversity.

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