Natural Resources Canada
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Branching Out

from the Canadian Forest Service - Laurentian Forestry Centre

Is It Mission Accomplished for the Mapping of Changes Occurring in Canadian Forests?

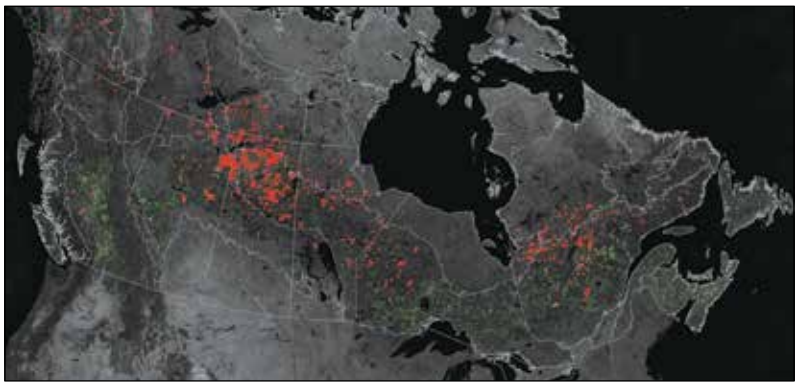
Are Canadian boreal forests and disturbances closely linked? They certainly are because disturbances, such as forest fires and logging, have a significant impact on the dynamics of boreal forests. It is quite a challenge to obtain information on these disturbances for all of Canada on a regular and timely basis. But not to worry: Natural Resources Canada research scientists have risen to the challenge with great success.

Creating a permanent record of changes

Forest community stakeholders support their decisions with maps describing various properties of the forest community. They are interested in obtaining annually produced maps of disturbances because of their many potential applications. For example, these maps give them a better understanding of the forest carbon balance, allow them to model fire regimes or, when combined with maps of forest properties[1], help them to estimate quantities of post-disturbance biomass. When produced on a nationwide scale, annual disturbance maps are used to quickly draw up a standard profile from province to province of the two principal disturbances in Canada.

From satellite to map production

Changes (fires, logging and creation of reservoirs) are detected across the territory concerned by using NASA MODIS satellite images. Through a collaborative agreement with the Canada Centre for Mapping and Earth Observation, Canadian Forest Service researchers have worked with images taken each year in the summer and winter from 2000 to 2011.



Cumulative map of changes caused by fires (in red), logging (in green) and flooding (in blue) between 2000 and 2011.

The ground resolution of these images is 250 m × 250 m (6.25 ha), a lower resolution than that usually used for regional requirements. However, this disadvantage is counterbalanced by the taking of daily images that provide full coverage of all of Canada, including very cloudy areas. The annual changes detected have been validated with higher resolution reference data, in many cases from provincial sources.

In search of accuracy

To obtain the best possible accuracy, the researchers sought a maximum reduction in the number of detection errors. They reduced as much as possible the number of errors associated with the detection of changes not targeted by the method (e.g. sudden defoliation caused by insects) or false changes (e.g. clouds), and they thoroughly assessed the detection rates based on the extent and intensity of the changes.

All of these activities made it possible to produce an annual pan-Canadian map. For each year, harvested areas can be differentiated from burned areas with about 80% accuracy overall.

1. This topic is discussed in *Branching Out* 91: http://cfs.nrcan.gc.ca/entrepotpubl/pdfs/35774.pdf.

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