



## Canada's Forest Cover Under Investigation

It is quite a challenge to count the gains and losses of the entire forest cover of our planet! Nonetheless, results from methods with large but unknown biases can mislead users, with potentially serious national and international consequences.

Imagine the impact of a study published in *Science* that because such a bias would provide results showing Canada to be one of the worst country in the world for the loss of forest area!

That is exactly what happened in 2013.

### A first global high-resolution product showing the losses and gains of forest area

To quantify global changes in forest area, researcher M.C. Hansen of the University of Maryland (USA) and his team mapped for the first time the losses and gains in area of the world's forests from 2000 to 2012 at a resolution of less than one hectare (30 m) based on Landsat images. The results were published in *Science* in 2013. The article, entitled "High-Resolution Global Maps of 21st-Century Forest Cover Change", stated that the overall results provided a solid and consistent database and maps for the world's forests.

### Damaging numbers

For Canada, the **gross loss of 8.5%** in forest area over the 12 year of the study period seemed realistic given the extent of the harvesting activity and the vast areas burned in the country's northern regions. On the other hand, the **gross gains of 2.9%** in forest area seem very low. Based on these results, the **net loss of 5.6% in forest area** would be among the highest on the planet! Journalists calculated that Canada was the next worst country in the world after Brazil. Surprised by such an important forest loss compared to such a small gain, scientists from

the Canadian Forest Service (CFS) carefully analyzed the report. They found that these figures did not appear to be consistent with the following observations.

- According to Natural Resources Canada, the deforestation rate was approximately 45,800 ha/year in 2013, which is less than 0.05% of the forest area per year.
- Regulations regarding forest management practices in Canada require that harvested areas be fully regenerated.
- Wildland fires are natural disturbance for Canadian forest and play a role in the regeneration of boreal forest ecosystems.



Photo: NRCan.

The question then arose: could the figures presented in the *Science* article be biased? And if so, how?



Photo: NRCan.

### A little background...

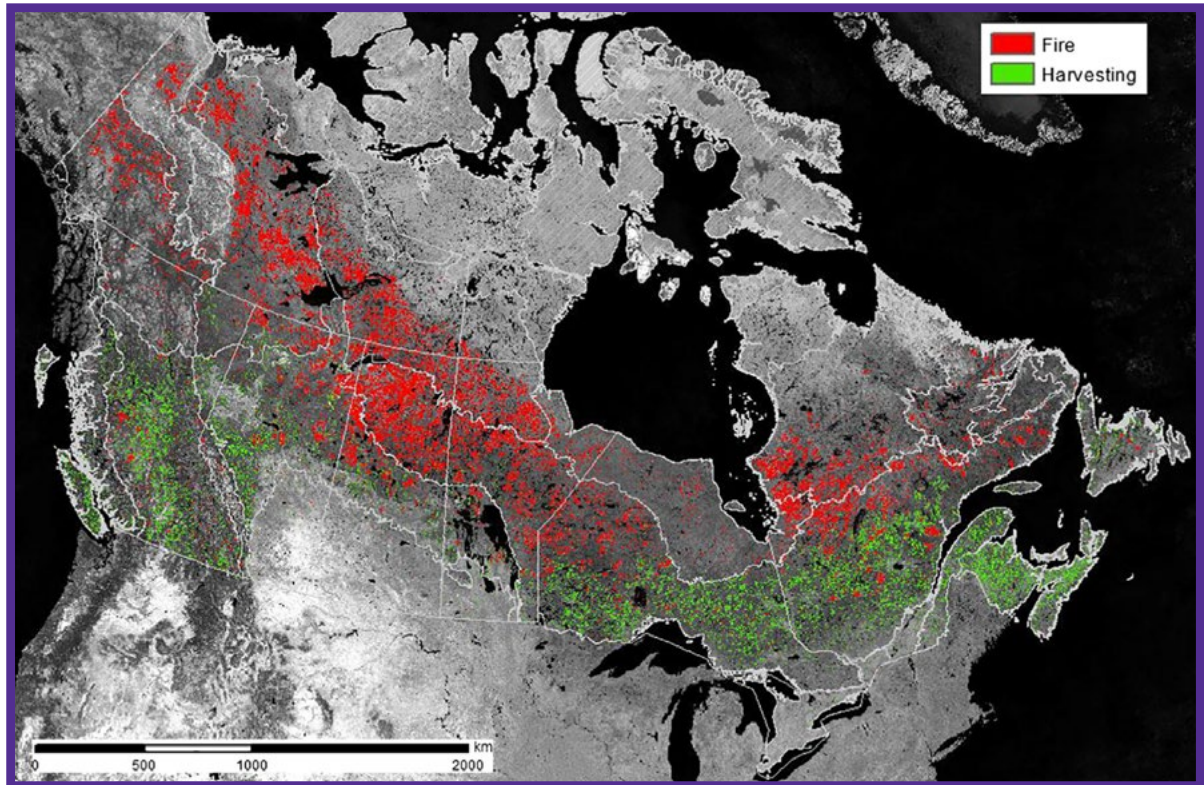
Other voices were also raised in response to the publication of Hansen's report - among them the Czech Republic and China - arguing that, with the method that had been used, the interpretation of the data could create significant biases. For Canada, the result was unfavorable national and international media coverage of our sustainable forest management, placing Canada behind Brazil in terms of deforestation.

### And an excellence award to boot!

In 2017, Natural Resources Canada gave the CFS team an award in the category "Outstanding Leadership in Research." This broad collaboration among specialists from various research centres throughout Canada has helped to re-establish the country's international reputation concerning forest management practices.

# Branching Out

from the Canadian Forest Service - Laurentian Forestry Centre



Map of fires and harvesting between 1984 and 2015 in Canada. Credit: NRCan.

## An impressive Canadian team!

As soon as Hansen's report was released, CFS experts from a range of disciplines launched an investigation that lasted over four years. They processed thousands of satellite images, developing and applying novel algorithms for image processing and analysis. The management of this massive database made it possible to map the areas affected by harvest and fire from 1984 to 2015 at a resolution of 30 m. In collaboration with other experts, they then undertook a series of studies, including data collection in the field, to account for the biophysical and forest contexts specific to Canada's forests.

## In search of lost shrubs

CFS scientists saw their doubts substantiated: the results of the analyses showed a general recovery of Canada's forest cover after harvest and fire. So why was the **gross gain of 2.9%** reported by Hansen so low? The answer lies in the observation

that most burned areas are found in northern forests where productivity is lower than in the areas where harvesting takes place. In these areas, the very low growth of regenerating forests is very difficult to detect by remote sensing. The **net gains** cited in the US report were therefore estimated using a methodology that systematically underestimated the regeneration of burned areas in low productivity forests, creating a false picture of large forest area losses.

Using the results of their work, the Canadian team published a scientific article in the journal *Ecosphere*, entitled "Missing Forest Cover Gains in Boreal Forests Explained" (Guindon et al., 2018). In addition, all fire and harvest data for Canada (1984 to 2015) is freely available: <https://open.canada.ca/data/en/dataset/add1346b-f632-4eb9-a83d-a662b38655ad>.



Data acquisition in the field. Photo: NRCan.

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