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CANADIAN FOREST SERVICE SCIENCE-POLICY NOTES

Does Harvesting in Canada's Forests Contribute to Climate Change?

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Concerns about climate change are increasing as scientists around the world have demonstrated it is indeed happening and that it is caused by human activity that results in substantial emissions of greenhouse gases like carbon dioxide into the atmosphere. Trees remove carbon dioxide from the atmosphere and use it to create wood, leaves or needles, and roots. When trees burn or decompose, they release the carbon dioxide back into the atmosphere; so the role of forests and how we manage our forests are naturally of great interest when trying to determine how humans are contributing to climate change and what we can do about it.

Canada has about 10% of the world's forests. The boreal forest is the most extensive forest type. Large amounts of carbon are stored in the trees and an even greater amount—80% of the total carbon in the boreal forest—is actually in the soils, stored as dead organic matter that results from decomposition. So what happens when we cut down trees to use them for forest products such as paper and lumber? Does this release large amounts of carbon dioxide into the atmosphere again, thereby contributing to climate change?

What Happens to Forest Carbon after Harvesting?

When trees are cut down, 40–60% of the carbon in them remains in the forest, while the rest is removed in the logs that are transported to mills. At the mills the logs are converted into forest products such as lumber or paper to serve the needs of society, and some of the bark and leftover wood pieces are burned for energy. Lumber is used in long-lasting structures like houses, therefore carbon in the lumber is not released back into the atmosphere until after many decades, when the houses have been torn down and the wood burned or sent to landfills. Paper products, however, may be disposed of quickly (newspapers, for example) or over a much longer time period (books, for example). The overall result is that each year more and more carbon is being stored in forest products.

Roots, branches, and leaves left after the harvest decompose over time, some of it quickly and some of it over many years, releasing carbon dioxide back into the atmosphere. As well, the disturbance of the soil during harvesting can cause some release of carbon dioxide. However, the area that was harvested also begins to store carbon again as young trees grow and remove increasing amounts of carbon dioxide from the atmosphere.

Would Reducing Harvesting Have a Significant Impact on Emissions?

No. Reducing harvesting would have very little impact on carbon dioxide emissions from Canada's forests for several reasons. As part of sustainable forest management, less than 0.5% of the managed forest is harvested in any given year in Canada. These harvested areas regenerate to become forests again, so that in any year there is substantial new storage of carbon occurring in the areas previously harvested. This combination of harvest and regrowth along with the storage of carbon in long-lasting forest products means that our forest management practices do not result in substantial emissions.

In addition, the amount of carbon released into the atmosphere from harvesting is small compared with the amount released due to forest fires and other natural disturbances such as insect infestations. The area burned annually is, on average, 2.5 times the area harvested, and a big portion of the carbon goes up in smoke. In fact, in extreme fire years the emissions from forest fires in the managed forest have

Coarse woody debris, Prince Albert Model Forest, Saskatchewan (*The Forests of Canada* photographic collection).

represented up to 45% of Canada's total greenhouse gas emissions. Foresters recognize that fire is an important part of the boreal forest life cycle and although governments and industry spend about half a billion dollars every year protecting forests from fires, we know that not all fires can be stopped nor should they be stopped. They help rejuvenate the forest, maintaining habitat for a wide range of wildlife as well as regulating the spread of insects and disease. However, if there were no fire protection measures in use and fires were allowed to occur naturally, a larger area would likely be burned each year. Thus harvesting may sometimes simply replace natural fires that are prevented by protection efforts of governments and industry.

Finally, the impact of reduced harvesting needs to be considered. Harvested forests are used to produce everyday products like paper, lumber, panels, and doors needed by society. Reducing harvesting in Canada could have negative impacts on emissions because there will still be a demand for products to meet these needs. Wood products are traded globally, therefore reductions in harvesting in Canada would likely result in increased harvesting and emissions elsewhere. As well, there could also be increased use of more emissions-intensive products such as concrete and steel in place of wood for building houses, and metal, plastics, and resins in place of wood for products like furniture, doors, and windows.

Wood framing for building houses (Natural Resources Canada Library).

Forest Management Practices Can Reduce Emissions

Although reducing harvesting in Canada's forest would not significantly slow climate change, how we harvest and renew the forest can affect how much carbon dioxide goes into the atmosphere. Reducing the forest disturbance associated with harvesting, reducing road widths, and helping trees get re-established faster after harvest are examples of forest management practices that reduce carbon dioxide emissions. Scientists with Natural Resources Canada's Canadian Forest Service, in cooperation with the Canadian Model Forest Network, have developed a user-friendly version of the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3) that can be used to understand how forest management can affect forest carbon. It is designed to help forest managers assess the carbon implications of their management actions and consider alternative approaches (see www.carbon.cfs.nrcan.gc.ca/cbm/operational_scale_e.html) that may have a lower impact.

Forests are an important source of products and services for society. We use carbon, or wood, to produce, for example, lumber, paper, and bioenergy. At the same time, because forests are a renewable resource, sustainable management allows regeneration of the forest after harvesting and ensures that the forest carbon rebuilds.

Private logging operations north of Athabaska, Alberta, managed in cooperation with the Canadian Forest Service (*The Forests of Canada* photographic collection).

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