

SFI CONSERVATION GRANT EXPLAINER



CANADIAN FOREST CARBON ASSESSMENT – ROADMAP FOR COMPREHENSIVE CARBON-STOCK ASSESSMENT ACROSS SFI-CERTIFIED LAND



Project Lead	Saskatchewan Research Council (SRC)
Awarded	2017-2020
Location	Canada — SFI-certified forests in British Columbia, Alberta, Saskatchewan, Manitoba, and New Brunswick
Partners	Canadian Forest Service - Natural Resources Canada Forest Products Association of Canada SFI-Certified Organizations: Louisiana-Pacific Canada Ltd. Tolko Weyerhaeuser Company

SFI collaborated with the Saskatchewan Research Council and Natural Resources Canada to quantify carbon storage in different forest ecosystems using national and regional data. This project helped identify best available forest carbon inventories for parts of Canada.

KEY POINTS

- This study provides a roadmap for carbon-stock assessments across SFI-certified forests in Canada by using national and regional forest carbon accounting models (i.e., CBM-CFS3 and NFCMARS) and disturbance history (fire, harvesting, land-use change).
- Total ecosystem carbon stocks increased between 1990 and 2015 despite the emissions from large wildfires and the carbon removal from harvest which demonstrated that, even under pressure from natural disturbances, SFI-certified forests maintained stable or increasing carbon storage.
- Despite harvesting and wildfire events, the modelled SFI-certified forests remained a carbon sink in 20 out of 26 years.
- Between 1990 to 2015 the CO2 removal in the selected SFI-certified Canadian forests (22.3 Mha) was 648.1 Mt CO2e.



WHY IT MATTERS

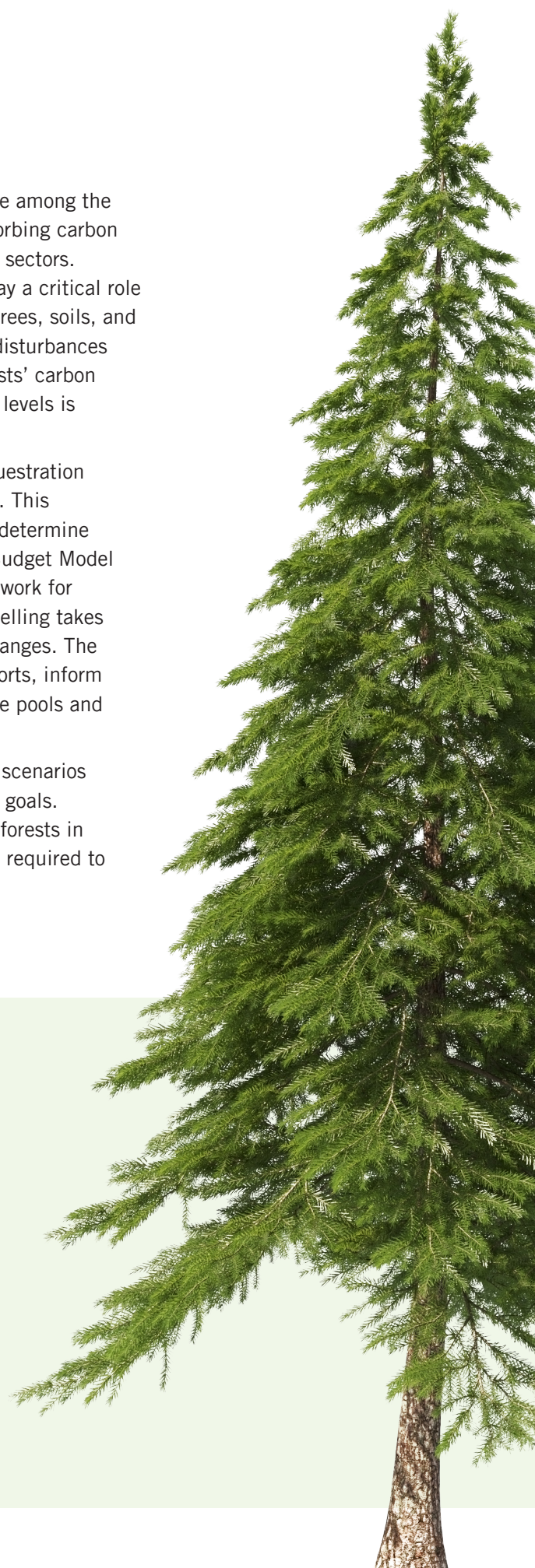
Climate change is a major challenge, and sustainably managed forests are among the most powerful tools for mitigation. Forests have an important part in absorbing carbon dioxide from the atmosphere, thus helping to offset emissions from other sectors. Canadian forests account for 9% of the world's forested area and thus play a critical role in the global carbon cycle because they store vast amounts of carbon in trees, soils, and dead organic matter. These forests act as a major carbon sink; however, disturbances such as wildfires, insect outbreaks, and timber harvesting can affect forests' carbon storage capacity. Understanding these dynamics at regional and national levels is essential to building effective climate strategies.

Sustainable forest management has the potential to enhance carbon sequestration in forests and is a key focus within the SFI Forest Management Standard. This project assessed carbon on a portion of SFI-certified Canadian forests to determine historical trends and baseline values. Tools and models like the Carbon Budget Model for the Canadian Forest Sector (CBM-CFS3) provided the scientific framework for estimating and tracking over time carbon storage and fluxes. Carbon modelling takes into consideration tree growth, harvesting, disturbances, and land-use changes. The outcomes of the models provide support to climate change mitigation efforts, inform sustainable forest management, and enhance reporting on the greenhouse pools and fluxes.

These tools enable forest managers and policymakers to evaluate various scenarios and make decisions that balance ecological health with carbon reduction goals. This assessment was an effort to estimate carbon stocks on SFI-certified forests in Canada, and it aimed to ensure that the forest sector has the information required to demonstrate its contribution to climate solutions.

HOW IT RELATES TO THE SFI STANDARDS

This project advances knowledge of carbon accounting across large forest landscapes and the use of available tools and resources to undertake GHG estimates in forestry. It directly supports the [SFI 2022 Forest Management Standard](#) Objective 9 (Climate Smart Forestry) by providing the scientific foundation needed to demonstrate the role of SFI-certified forests in addressing climate change. The project supports Objective 12 on forestry research, science, and technology by leveraging new modeling approaches (e.g., GCBM) on forestlands related to climate change mitigation that also support knowledge sharing and partnerships across science, sector, and government.



ABOUT THE PROJECT

The Saskatchewan Research Council led a multi-partner initiative to develop a carbon-stock assessment roadmap for Canadian SFI-certified forest regions. Objectives included using national and regional datasets to estimate stocks, removals, emissions, and disturbance history. They assessed carbon stock and fluxes across five provinces (British Columbia, Alberta, Saskatchewan, Manitoba, and New Brunswick) over a 26-year period. The project used the National Forest Carbon Monitoring, Accounting and Reporting System (NFCMARS), which is Canada's forest carbon reporting system, together with the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3).

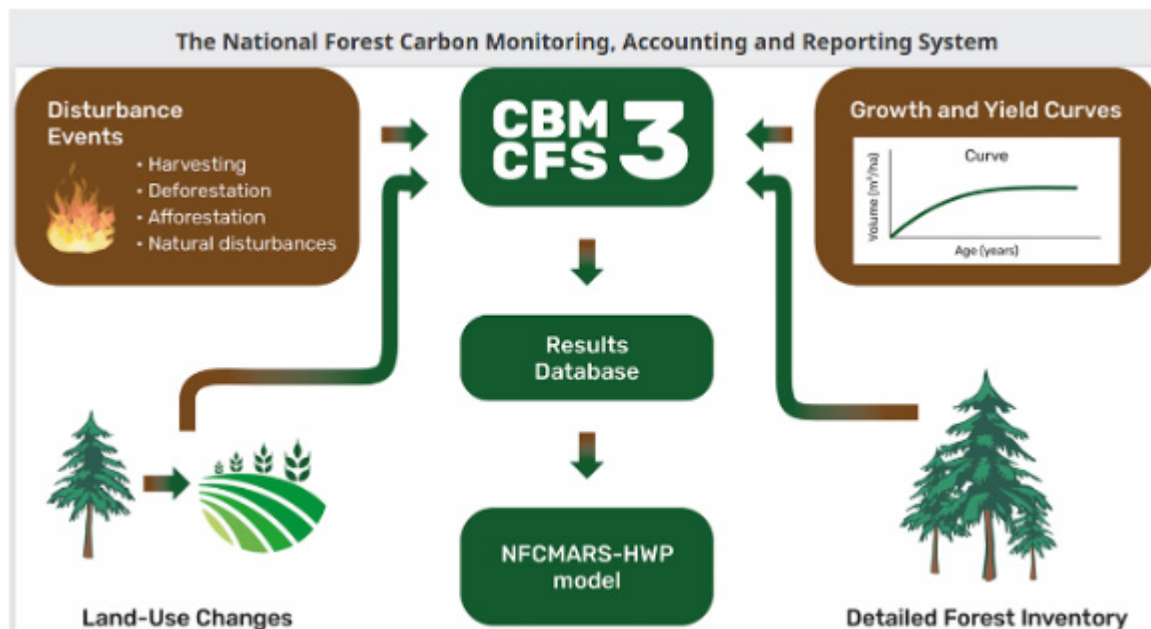
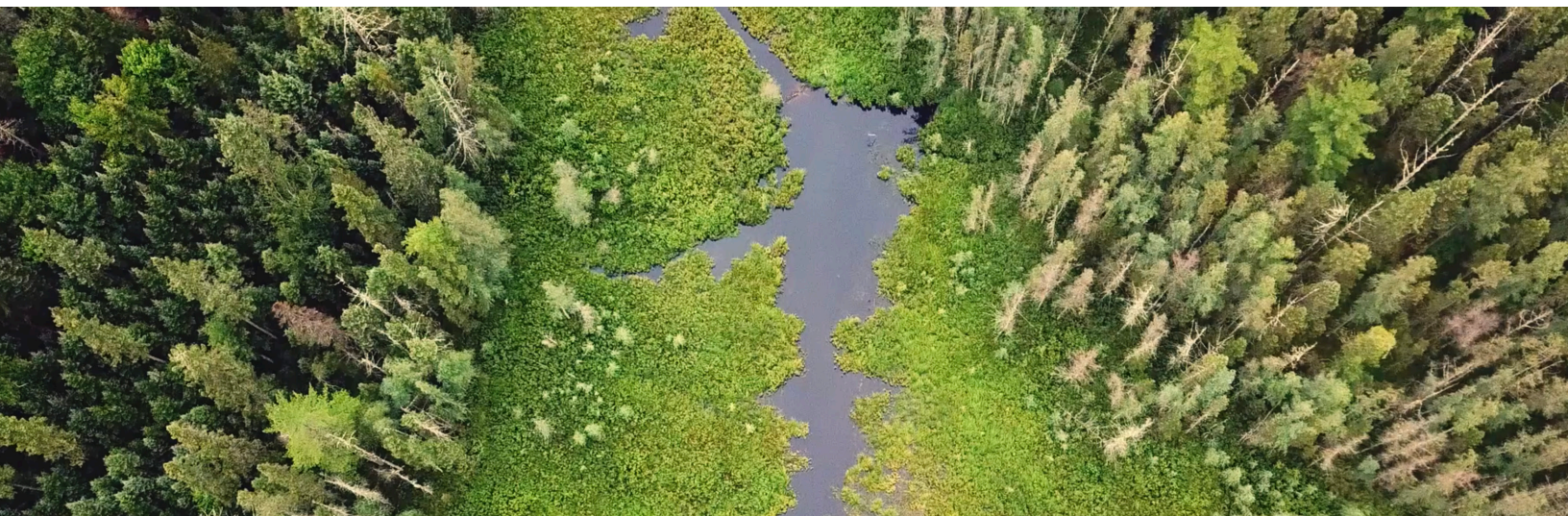


Figure 1. National Forest Carbon Budget Model. Credit: Natural Resources Canada

The [Generic Carbon Budget Model \(GCBM\)](#), a spatially explicit model that integrates [FLINT \(Full Lands Integration Tool\)](#), analyzed datasets at a one-hectare resolution. This fine resolution enabled simulations of forest carbon dynamics affected by natural and anthropogenic disturbances (e.g. harvesting, wildfire). The model tracked above- and below-ground live biomass as well as dead organic matter pools including litter, woody debris, and soils. Harvested wood products and their substitution benefits were not included in this assessment, meaning that the results reflect a conservative estimate of the full carbon benefits.



RESULTS AND OUTCOMES

This study highlighted that actively managed SFI-certified forests stored more carbon in 2015 compared to 25 years prior despite the negative impact of natural disturbances (e.g., wildfire). SFI-certified forest area modeled on 22.3 million ha, which represents 18% of SFI-certified forest land in Canada for 2020, in parts of British Columbia, Alberta, Saskatchewan, Manitoba, and parts of New Brunswick (Figure 2). Between 1990 and 2015, ecosystem carbon stocks increased the total ecosystem carbon stocks by 32.3 million tons of carbon (MtC) (i.e., 118.2 Mt CO₂e). This amount is comparable to the annual greenhouse gas emissions of tens of millions of vehicles with an internal combustion engine.

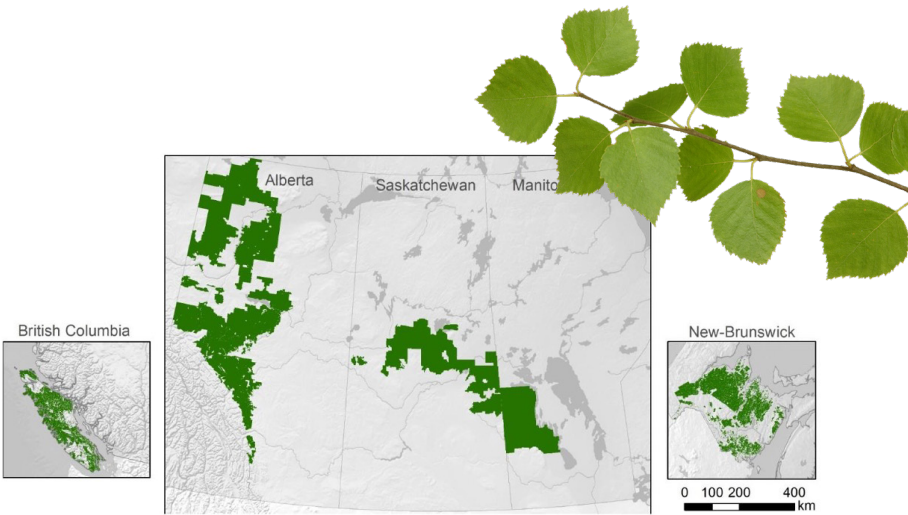


Figure 2. SFI-certified area modelled across Canada.

An ecosystem is considered a carbon sink when it absorbs more carbon from the atmosphere than it releases. This study found that, despite harvesting and wildfire events, the modelled forests remained a carbon sink in 20 out of 26 years. The carbon stored in long-lived wood products (e.g., lumber) reduces the overall net atmospheric carbon, with the model showing that carbon transferred from forest ecosystems to harvested wood products was 144.5 Mt C (i.e., 529.9 Mt CO₂e). When coupled with the ecosystem stock increases, the average annual removal of carbon from the atmosphere was 24.9 Mt CO₂e. This means that the SFI-certified forests in this study, provided a positive contribution to long term carbon storage.

High severity wildfires quickly release large amounts of stored carbon into the atmosphere, and in this study, wildfires represented a significant disturbance, releasing 47.6 Mt C, with peaks in 1995, 1998, 2001, 2002, 2011, 2012, and 2015 (Figure 3). Nevertheless, carbon stocks rebounded in subsequent years, underscoring that forest recovery can offset carbon losses when forests are sustainably managed (e.g., prompt reforestation). Over the same period, harvesting disturbed 3.63 million ha (i.e., 16.3% of the study area), which is three times larger than the area burned. However, unlike wildfire, harvesting allows the transfer of a large amount of carbon into wood products with longer shelf life (e.g., lumber).

Carbon pools in forest ecosystems represent the various reservoirs where carbon is stored over time. Carbon turnover is relatively rapid in foliage and fine roots, whereas woody biomass and soil organic carbon retain carbon for much longer periods. Thus, larger long-lived pools provide more climate change mitigation benefits. In this study, carbon stock increases were particularly evident in above- and below-ground biomass pools, while dead organic matter declined slightly over time due to decomposition and combustion. This project demonstrated that, even under pressure from natural disturbances, SFI-certified forests maintained stable or increasing carbon storage. These findings also highlighted the importance of sustainably managed forests to achieve climate change mitigation goals.

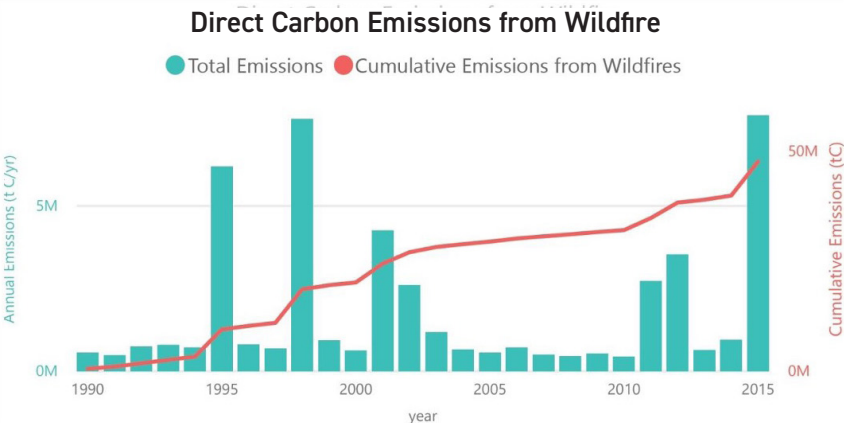


Figure 3. Direct annual (left axis) and cumulative (right axis) direct releases of carbon to the atmosphere from wildfires in the SFI-certified study area.



HOW THE PROJECT HELPS FOREST MANAGERS

By providing a roadmap for comprehensive carbon-stock accounting, this project empowers forest managers to assess sustainable forest management strategies towards greenhouse gas mitigation. For SFI-certified organizations, the carbon modeling approaches used here can be applied to meet SFI Forest Management Standard requirements. Forest managers can better balance timber production with long-term climate mitigation goals, and policy makers can rely on robust, spatially explicit data for regional strategies and for climate reporting. Moreover, conservation specialists can benefit from these regional metrics to support biodiversity and carbon co-benefits. <https://forests.org/forestmanagementstandard/>

RESOURCES

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SFI-CERTIFIED FORESTS
STORE
230 BILLION
METRIC
TONS OF CO₂e
IN CANADA ALONE*

**based on the outcome of collaborative work by SFI with Natural Resources Canada and other partners, published in Sothe et al. 2021*