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# LAND-BASED GREENHOUSE GAS EMISSIONS AND REMOVALS

CANADIAN ENVIRONMENTAL  
SUSTAINABILITY INDICATORS



Canada 

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# CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

# LAND-BASED GREENHOUSE GAS EMISSIONS AND REMOVALS

**October 2025**

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# Land-based greenhouse gas emissions and removals

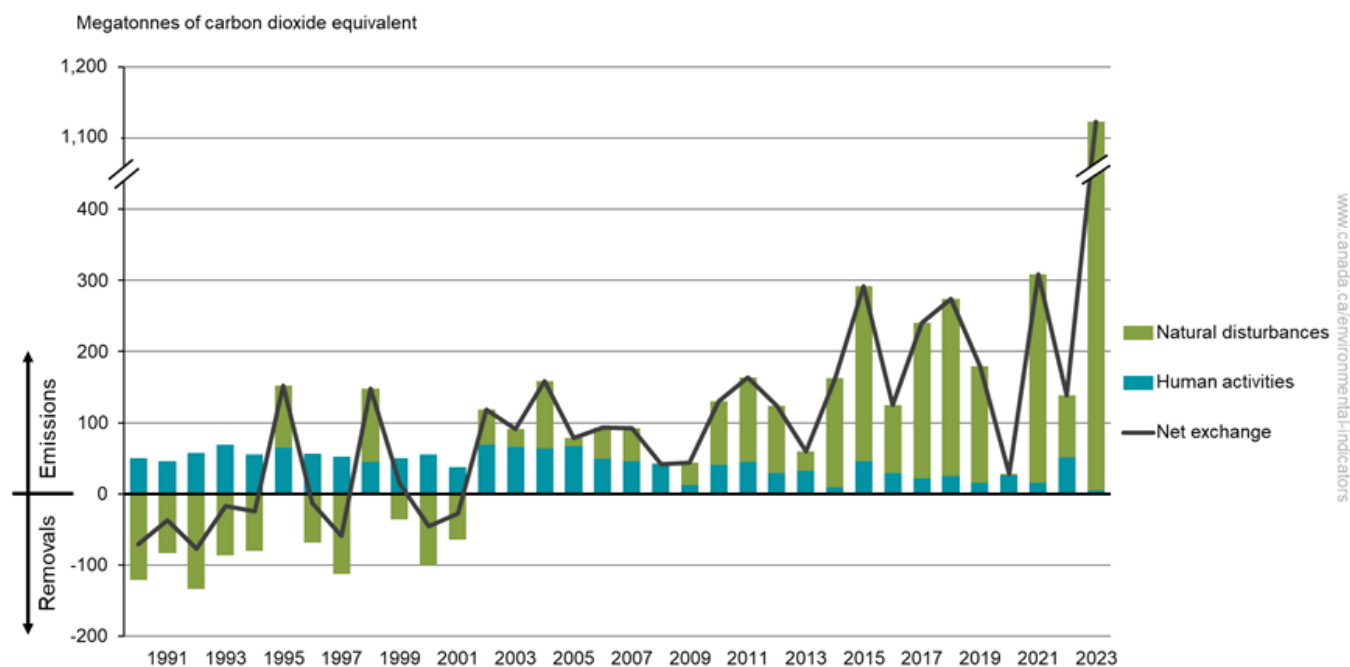
Greenhouse gas (GHG) emissions are the major drivers of climate change. Land use activities (such as timber harvesting and land conversion) as well as natural disturbances (such as forest fires and insect infestations) result in GHG emissions. Land use activities can also result in GHG removals. For example, as forests grow or recover, carbon is removed from the atmosphere and converted into biomass by trees. Tracking the trends in Canada's land-based GHG emissions and removals can help us understand how land management decisions could reduce emissions and increase removals over time.

The indicator provides annual estimates of Canada's GHG emissions and removals from managed lands. These are lands influenced by human intervention to perform production, ecological or social functions. Examples include agricultural land, wetlands, settlements, and managed forests.

## Key results

- In 2023,
  - Natural disturbances accounted for net emissions of about 1,100 megatonnes of carbon dioxide equivalent (Mt CO<sub>2</sub> eq)
  - Human activities accounted for net emissions of 4.6 Mt CO<sub>2</sub> eq
- Between 1990 to 2001, estimates of land-based GHGs showed more removals than emissions in all years except for 1995 (net emissions of 150 Mt CO<sub>2</sub> eq), 1998 (net emissions of 150 Mt CO<sub>2</sub> eq) and 1999 (net emissions of 14 Mt CO<sub>2</sub> eq)
- Since 2002, estimates show more emissions than removals, with net emissions ranging between 28 Mt CO<sub>2</sub> eq and 1,100 Mt CO<sub>2</sub> eq, driven mainly by wildfire emissions

**Figure 1. National land-based greenhouse gas emissions and removals, Canada, 1990 to 2023**



[Data for Figure 1](#)

**Note:** Natural disturbances refer to emissions and removals related to wildfires and large insect infestations of the forest. Human activities refer to emissions and removals from managed lands (such as settlements, forested lands, agricultural land and wetlands) as well as transfers to harvested wood products. For more information, see the section on [emissions and removals from human activities](#).

**Source:** Environment and Climate Change Canada (2025) [National Inventory Report 1990-2023: Greenhouse gas sources and sinks in Canada](#).

Natural disturbances, such as forest fires and large insect infestations, have occurred in Canada's forests for thousands of years. These disturbances are part of the natural life cycle of the forest and generally help the forest renew itself. However, evidence demonstrates that climate change is driving an increase in natural disturbances. These disturbances can contribute to emissions of large amounts of GHGs into the atmosphere through the burning and decay of dead trees, as well as significant removals as the forest regenerates over time.<sup>1</sup>

For the past 20 years, the total managed forest's net GHG exchange (that is, the land-based GHG emissions minus removals) has been significantly impacted by these natural disturbances. In 2002, the net exchange shifted from removals to emissions as a result of an increase in emissions from [natural disturbances](#).

In managed forests, emissions and removals due to natural disturbances are associated with human activities under specific circumstances. These circumstances are described in the [methods](#) section.

## Land-based GHG emissions and removals from human activities

Land-based GHG emissions and removals from human activities are commonly referred to as land use, land-use change and forestry (LULUCF) according to international standards.

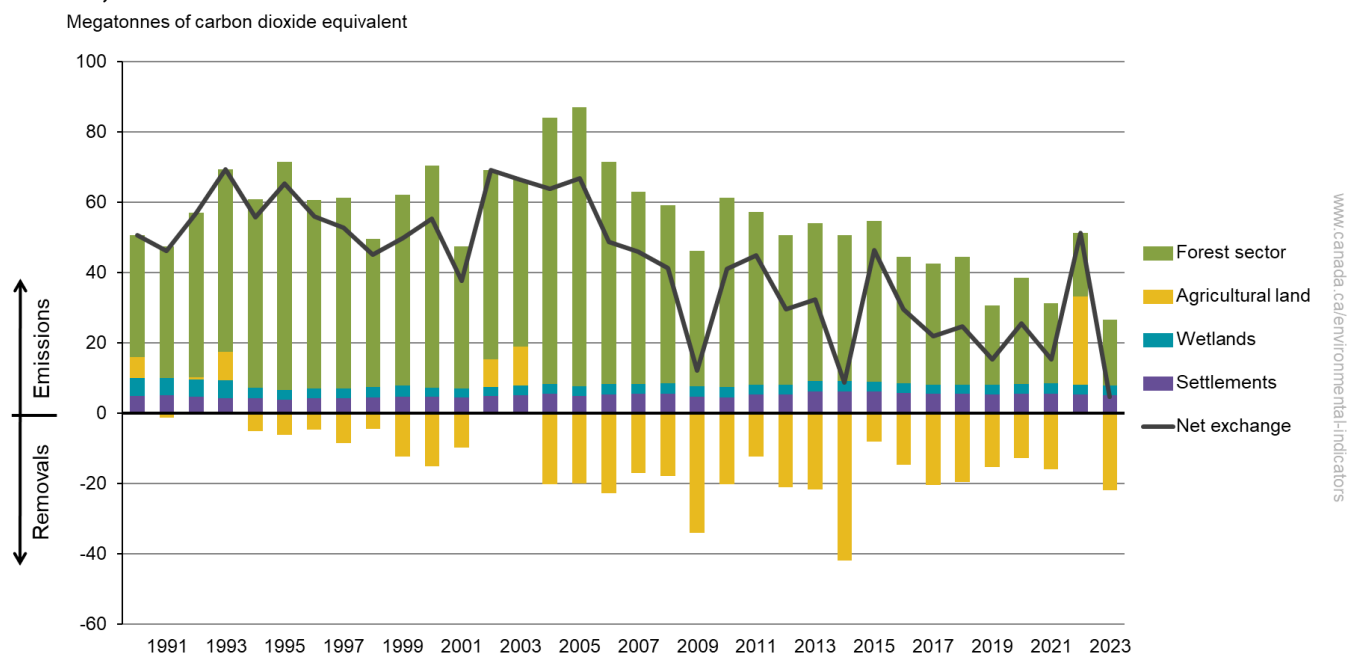
### Key results

- In 2023,
  - Most of the categories of land use activities emitted GHGs, with the [forest sector](#) being the largest emitter (19 megatonnes of carbon dioxide equivalent [Mt CO<sub>2</sub> eq])
  - [Agricultural land](#) recorded the largest removals of GHGs (22 Mt CO<sub>2</sub> eq)
- Between 1990 and 2023, human activities on managed lands resulted in net emissions for all years, ranging between 4.6 Mt CO<sub>2</sub> eq and 69 Mt CO<sub>2</sub> eq
- Human activities accounted for net emissions of 4.6 Mt CO<sub>2</sub> eq in 2023, which is lower than the level observed in 1990 (51 Mt CO<sub>2</sub>)

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<sup>1</sup> Warren FJ and Lemmen DS, editors (2014) [Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation](#). Government of Canada, Ottawa, ON, 286p. Retrieved July 7, 2025.

**Figure 2. Land-based greenhouse gas emissions and removals from human activities by activity sector, Canada, 1990 to 2023**



[Data for Figure 2](#)

**Note:** Greenhouse gas exchange from the forest sector considers emissions and removals from managed forests and transfers to and from the harvested wood products pool. Harvested wood products originate from forest trees with contributions of bioenergy from urban trees and agricultural land. As such, the reported forest sector emissions may differ at times from some information presented in the National Inventory Report. For more information, see Chapter 6.4 of the [National Inventory Report](#).

**Source:** Environment and Climate Change Canada (2025) [National Inventory Report 1990-2023: Greenhouse gas sources and sinks in Canada](#).

## Forest sector

The forest sector category refers to emissions and removals from forest management activities such as timber harvesting, thinning and replanting and ecological processes, such as tree growth and decomposition. It also includes transfers to and disposals from the harvested wood products pool, which are the wood materials removed from the harvested site and turned into consumer products, such as timber for construction, furniture or paper products. The carbon removed from the atmosphere by trees is stored in the harvested wood products and eventually emitted back into the atmosphere or transferred into the waste stream where the product is disposed.

In 2023, the human-driven GHG contribution from the forest sector was a net emission of 19 Mt CO<sub>2</sub> eq. While overall forest growth typically removes carbon from the atmosphere, natural disturbances and decomposition can result in net emissions from forests. For example, in 2023, natural ongoing ecological processes in Canadian forests resulted in net emissions of 24 Mt CO<sub>2</sub> eq. At the same time, 5 Mt CO<sub>2</sub> eq. of carbon was stored in harvested wood products.

GHG contributions from the forest sector varied between 1990 and 2023, peaking at 79 Mt CO<sub>2</sub> eq in 2005 and since, decreasing to 19 Mt CO<sub>2</sub> eq in 2023. These variations are related to harvest rates over the past several decades, particularly in the Mountain and Boreal regions, and had also increased indirectly due to a rise in natural disturbances. Natural disturbances indirectly impact GHG emissions in the forest sector through the decomposition of trees killed by low-level insect disturbances and reducing the areas of commercially mature growing trees that remove carbon.

As forest harvest expanded in Canada, in the decades prior to 2005, increasing areas were converted to emissions sources. When forests are harvested, the sites act as emission sources over many years following the disturbance because of the decaying debris left on the site and the slow regrowth of woody biomass. Furthermore, large proportions of harvested wood were used for short-lived products (such as paper) where the carbon is rapidly transferred out of the harvested wood product pool to the waste stream or used for bioenergy. These emissions were not fully offset by the removals from the regrowth of the historically harvested areas.

Since 2004, the rate of area harvested in Canada has leveled off, and in recent years removals from the land that was historically harvested are increasing at a greater rate than the emissions resulting from new harvests. Forest carbon emissions peaked in 2005 and have since decreased. This decreasing trend in emissions happened as carbon stocks in solid wood products have continued to increase, while those in paper products have declined since 2005. Additionally, since the early 2000s, most wood waste has been used for bioenergy production (converting biomass to energy), reducing transfers of wood to solid waste disposal where it is a source of methane.

### **The Forest Industry and Carbon**

Canada's forest industry is important and understanding how tree harvesting impacts emissions and removals of CO<sub>2</sub> to and from the atmosphere supports better decision making. Harvesting is part of a larger set of forest management activities, such as, forest inventory and planning, planting, thinning, fire control, and pest management, which are carried out by provinces and territories applying sustainable practices. Because these activities are connected and part of the forest planning process, the effects of harvesting can't be measured on their own. Instead, changes in forest carbon in the managed forests are tracked as a whole, according to international guidelines.

When trees are harvested, the existing dead material on the ground and new harvest residues break down, releasing carbon dioxide (CO<sub>2</sub>). As trees grow back, the new tree growth removes little carbon at first, but removals increase over time. After a period of time, CO<sub>2</sub> removals resulting from tree growth equal and become greater than the emissions from the decomposing material and harvested sites become carbon sinks again.

The trees that are harvested contain carbon that becomes forest products such as building lumber and paper, but also produce wood waste. Carbon stored in wood products can stay locked away for decades, adding to a global supply of stored carbon. Waste wood is burned for energy in homes and industries, releasing the carbon stored in wood as an emission. Wood products and bioenergy also help reduce fossil emissions by replacing more carbon intensive materials like coal, oil, concrete, and steel.

The carbon in forests is cycled between the trees, the wood products, the soil and the atmosphere. While the harvested forest regrows, it absorbs and stores carbon. When wood products reach the end of their use, whether short- or long-lasting, their carbon is reported as an emission.<sup>2</sup> Wood waste in landfills produces methane, a powerful GHG, but these emissions are counted in the Waste sector of the country where the wood products are buried. Since trees take in carbon from the air through photosynthesis, releasing it later doesn't add new CO<sub>2</sub> like burning fossil fuels does.

Like many industries, forest harvesting and the transformation of harvested trees into forest products involves a wide range of activities that result in fossil fuel emissions that are reported in different parts of Canada's National Inventory Report (NIR): Energy, Industry, and Waste. Where possible, the emissions from these activities are reported separately in Table 2–11 of the [National GHG Inventory Report](#) along with all emissions and changes in carbon associated with harvest. Fuel used by machines during tree harvesting is counted in the Energy-Transport sector. However, fuel used to transport the harvested wood away from the site isn't reported because the fuel used specifically by transport trucks for wood transport cannot be isolated in national fuel-use data.

### **Agricultural land**

The agricultural land category reports emissions and removals from annual and perennial cropland, as well as from forest lands and grassland converted to cropland. Cropland includes lands in annual crops, [summerfallow](#),<sup>3</sup> and perennial crops. Managed agricultural grassland refers to rangeland that is used only for grazing domestic livestock.

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<sup>2</sup> If wood is disposed of in landfills, the carbon can also be stored for decades, but the carbon is reported as an emission at the end of the products useful life.

<sup>3</sup> Fallow (also called summerfallow) is the practice of not planting a crop for one growing season. This helps build soil moisture reserves and can control problem weed infestation. However, fallow also contributes to environmental degradation by causing soil erosion, organic matter loss, carbon dioxide emissions, leaching of water and increased surface water runoff.



Since 1990, agricultural land has typically contributed to GHG removals and consistently did so between 2004 and 2021. Removals by agricultural land has ranged between 8.2 Mt CO<sub>2</sub> eq to 42 Mt CO<sub>2</sub> eq. These removals are due to changes in agricultural practices, such as the adoption of conservation tillage,<sup>4</sup> increases in crop yield, and the reduced use of summerfallow. However, the removal rate from agricultural land has been decreasing in recent years due to a decline in the adoption rate of conservation tillage and the area of land used to grow perennial crops as well as increases in the conversion of forested land to agricultural land. The shift from net removals to emissions in 2022 was primarily driven by a significant drought in 2021, which reduced crop yields and carbon inputs from residues resulting in a very small loss of soil carbon over large areas of the Prairies. In 2023, crop yields were more consistent with recent harvests and soils returned to a net carbon sink again.

## **Wetlands**

The wetlands category includes activities such as peat extraction for use in horticulture and land flooding to develop reservoirs for hydro-electric power development.

Trends in wetlands are mainly driven by the creation of large reservoirs occurring before 1990, resulting in higher emissions over the 1990 to 1993 period. Emissions from reservoirs declined from 1990 to 2023, while emissions from drained and excavated wetlands for peat extraction increased. Overall, during this time period, total emissions declined from 5.2 Mt CO<sub>2</sub> eq to 2.6 Mt CO<sub>2</sub> eq.

## **Settlements**

The settlements category refers to emissions and removals occurring on developed lands (such as urban environments, transport infrastructure, oil and gas infrastructure and mining) and from the conversion of forests and agricultural land to settlements.

Total emissions for settlements fluctuated between 3.7 Mt CO<sub>2</sub> eq and 6.1 Mt CO<sub>2</sub> eq. Emissions were mainly driven by rates of forested land converted to settlements and are offset by the storage of carbon in urban trees (annual removals of about 4 Mt CO<sub>2</sub> eq).

# **Regional land-based emissions and removals from human activities**

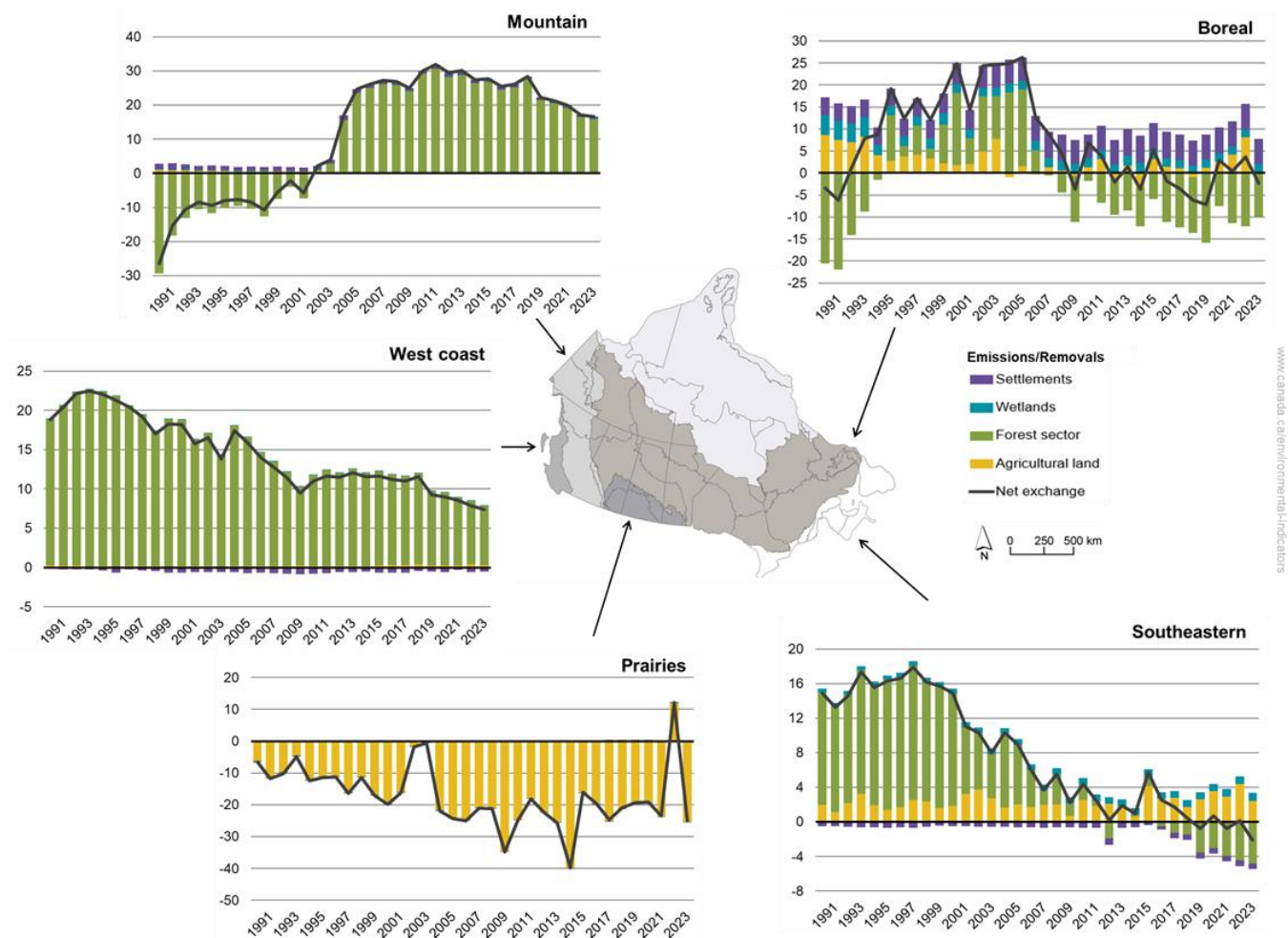
## **Key results**

- From 1990 to 2023,
  - The West coast region consistently emitted GHGs, but showed a decrease in emissions from 19 megatonnes of carbon dioxide equivalent (Mt CO<sub>2</sub> eq) to 7.4 Mt CO<sub>2</sub> eq
  - The Mountain region, which is important for forestry, shifted from removals to emissions. It had been the region contributing the most to removals in 1990 (26 Mt CO<sub>2</sub> eq) but switched to emissions in 2002 onward, with emissions peaking in 2011 (32 Mt CO<sub>2</sub> eq)
  - The Boreal region showed fluctuations in the net exchanges, switching from removals prior to 1992, to emissions until 2008, then fluctuating between removals and emissions after that
  - The Prairies region consistently showed removals from 1990 to 2021 (ranging between 0.62 Mt CO<sub>2</sub> eq and 40 Mt CO<sub>2</sub> eq) and experienced emissions for the first time in 2022 (12 Mt CO<sub>2</sub> eq) as a result of the 2021 drought
  - Southeastern region shifted from emissions of 15 Mt CO<sub>2</sub> eq to removals of 2.1 Mt CO<sub>2</sub> eq

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<sup>4</sup> The adoption of conservation tillage (examples include no till or minimum till practices) reduces soil disturbance and prevents the release of stable carbon that has built up in soils from past plant growth.

**Figure 3. Regional land-based greenhouse gas emissions and removals from human activities, Canada, 1990 to 2023**



[Data for Figure 3](#)

**Note:** Regions are based on the location of the human activities across the country. Forest sector regional estimates provided do not include the long-term impact of emissions from forest harvest or deforestation prior to 1990.

**Source:** Environment and Climate Change Canada (2025) [National Inventory Report 1990-2023: Greenhouse gas sources and sinks in Canada](#).

The overall increase in removals of GHGs on the Prairies between 1990 and 2014 can be attributed to changes in agricultural land management practices, such as the adoption of conservation tillage, the proportion of annual and perennial crops, and the reduced use of [summerfallow](#). These changes in land management decrease soil disturbance and thereby lower releases of carbon from the soil. In recent years, the decline in the proportion of perennial crops on the landscape and the rate of conservation tillage practices have been offset by increasing yields contributing to increased inputs of crop residue resulting in variable, but stable GHG removals for croplands as a whole. The transition from net removals to net emissions in 2022 stemmed largely from a major drought in 2021, reflecting how weather-related impacts can significantly affect crop production and reduce carbon inputs from residues. When crop yields decline due to drought, there are fewer plant residues to decompose and add organic carbon to the soil, leading to increased emissions instead of carbon storage (removals). The return to average yields in 2022 returned the soils to a carbon sink in 2023.

The increase in GHG emissions in the Boreal region and the shift from removals to emissions in the Mountain region are related to increased forest harvesting (in part to salvage timber from trees killed by the Mountain Pine Beetle and prevent its spread) as well as a reduction in net carbon removals from forests. The latter is due to insect infestations and fires in managed forests. The Boreal and the Mountain regions account for over 70% of the carbon transferred to harvested wood products. While timber harvesting transfers most of the carbon from stem

wood to harvested wood products, it also results in emissions at the harvest site in the years immediately following the disturbance, primarily due to decomposition. The disturbances reduce the area of mature growing trees, which is already known to be slow in these regions and increase decomposition and salvage logging (the harvest of dead or dying standing trees). For more information, see the [Forest sector](#) in Land-based emissions and removals from human activities.

In the West Coast and Southeastern regions, forestry management practices (changes in harvest rates and forest regeneration) contributed to the reduction in emissions. That said, the West Coast still has the highest rate of carbon transfers to harvested wood products per hectare in Canada. In recent years, net GHG emissions have decreased in Southeastern region, due to forest growth.

The previously reported carbon sink in 1990 and subsequent years have been adjusted based on corrections made to the pre-1990 Forest Land disturbance history data and now more accurately reflect a reclassification from human activity to natural origin. The Mountain, Boreal and Southeastern regions saw changes in emissions and removals from the forest sector as a result of these recalculations. Refer to the [Data sources and methods](#) section for more information.

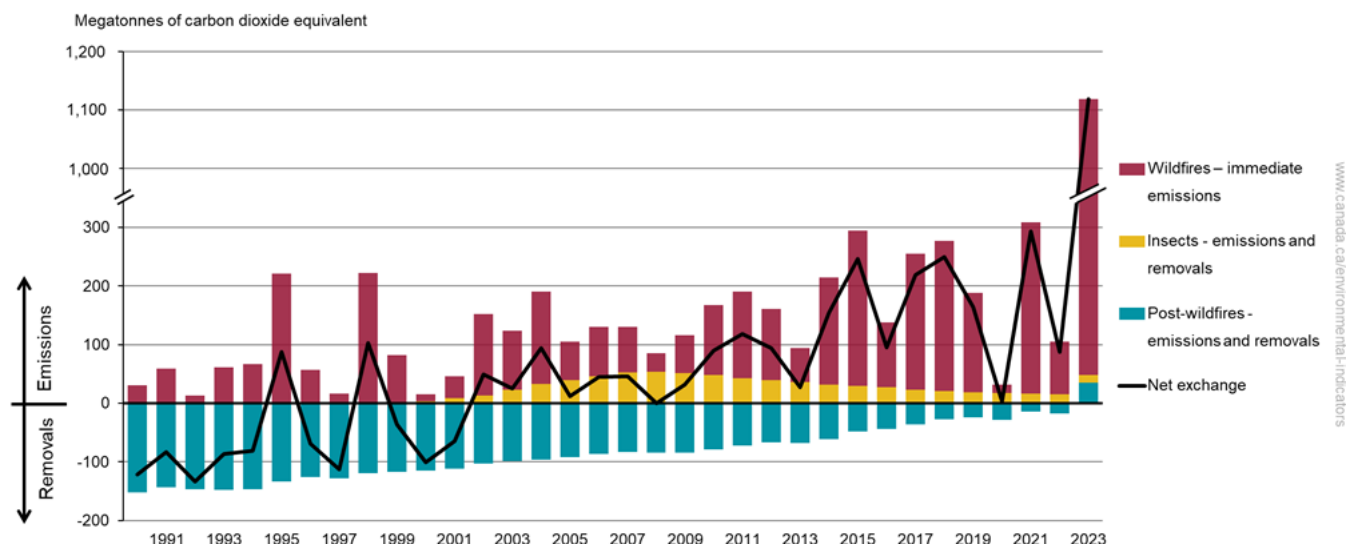
## Land-based emissions and removals from natural disturbances

Forests remove carbon from the atmosphere as they grow and release it along with other GHGs when they decay after dying or burning in forest fires.

### Key results

- In 2023,
  - Emissions from wildfires (immediate emissions) contributed 1,100 megatonnes of carbon dioxide equivalent (Mt CO<sub>2</sub> eq). These emissions were roughly four times observed wildfire emissions since 1990
  - Emissions caused by insect infestations were 13 Mt CO<sub>2</sub> eq
  - Despite forest regrowth, emissions from post-wildfires were 35 Mt CO<sub>2</sub> eq
- Since 2002, the net exchange from natural disturbances resulted in GHG emissions, ranging between 0.31 Mt CO<sub>2</sub> eq and 1,100 Mt CO<sub>2</sub> eq

**Figure 4. Land-based greenhouse gas emissions and removals from natural disturbances in managed areas, Canada, 1990 to 2023**



[Data for Figure 4](#)

**Note:** Wildfire emissions and removals are divided in 2 categories, (1) wildfire – immediate emissions and (2) post wildfire. Wildfire – immediate emissions include emissions from trees and soils from the burning of wildfires. Post wildfire includes emissions released by the decay of dead trees and soil organic matter and removals related to forest regeneration. Insect disturbances include emissions from the decay of organic matter and removals from natural regeneration.

**Source:** Environment and Climate Change Canada (2025) [National Inventory Report 1990-2023: Greenhouse gas sources and sinks in Canada](#).

Natural disturbances are an important factor in determining whether forests remove or release GHGs each year. These disturbances contribute to immediate emissions (for example, from the burning of trees), as well as post-disturbance emissions and removals. Post-disturbance emissions are from the gradual decay of dead organic matter. Post-disturbance removals are related to the natural regeneration and regrowth of forests.

The variability in emissions and releases from natural disturbances can vary greatly from year to year. For example, emissions from managed lands were lower in 2020 than in adjacent years because of the smaller area burned.<sup>5</sup> However, since the mid-2000s, emissions from wildfires and insect disturbances have been increasing. In 2023, emissions from wildfires were greater than emissions from all other human emissions of GHGs in Canada. Additionally, severe insect infestations in the early 2000s are having an effect on today's net GHG exchange and are expected to influence GHG emissions over the next few decades.

## About the indicator

### What the indicator measures

The Land-based greenhouse gas emissions and removals indicator tracks exchanges of greenhouse gas (GHG) emissions and removals between the atmosphere and Canada's managed lands. Reported GHG emissions and removals are annual totals from:

- Land use and land-use change activities
  - Forest sector (managed forested land and harvested wood products)
  - Agricultural land (cropland and agricultural grassland)
  - Wetlands (peat extraction and reservoirs for hydropower)
  - Settlements (developed land and land conversion to settlement)
- Natural disturbances (insect infestations and wildfires)

<sup>5</sup> Natural Resources Canada (2024) [The State of Canada's Forests 2024](#). Retrieved July 7, 2025.

The indicator does not report emissions from Canadian economic sectors: oil and gas, transport, buildings, electricity, heavy industry, agriculture (such as fuel use, and crop and animal production) and waste. For information on those GHG emissions, refer to the [Greenhouse gas emissions](#) indicator.

## Why this indicator is important

GHG emissions and their increasing concentrations in the atmosphere are having significant impacts on the environment, human health and the economy. Tracking the trends in Canada's land-based GHG emissions and removals provides a useful context for understanding how different management activities could reduce emissions and increase removals over time. This indicator could also help identify opportunities for mitigating the impacts of climate change and the potential for enhancing carbon sequestration.

The distinction between emissions and removals from human activities versus natural disturbances allows for a better understanding of emissions that could be directly managed in the near to medium term. The [National Inventory Report](#) has made this distinction since 2017 in the 2015 National Inventory Report.

## Related indicators

The [Greenhouse gas emissions](#) indicators report trends in total anthropogenic (human-made) GHG emissions at the national level, per person and per unit gross domestic product, by province and territory and by economic sector.

The [Global greenhouse gas emissions](#) indicator provides a global perspective on Canada's share of global GHG emissions.

The [Greenhouse gas emissions from a consumption perspective](#) indicator shows the impact of Canada's consumption of goods and services, regardless of where they are produced, on the levels of carbon dioxide released into the atmosphere.

The [Greenhouse gas emissions projections](#) indicator provides an overview of Canada's projected GHG emissions up to 2030.

The [Greenhouse gas emissions from large facilities](#) indicator reports GHG emissions from the largest GHG emitters in Canada (industrial and other types of facilities).

The [Greenhouse gas concentrations](#) indicators present atmospheric concentrations as measured from sites in Canada and at a global scale for 2 greenhouse gases: carbon dioxide and methane.

The [Forest management and disturbances](#) indicator presents a series of measures covering timber harvest, forest disturbances, and forest regeneration.

## Data sources and methods

### Data sources

This indicator is developed using data from Canada's [National Inventory Report](#) and includes emissions and removals associated with natural disturbances and with land use, land-use change and forestry (LULUCF) activity on managed lands. Managed lands are defined by the Intergovernmental Panel on Climate Change (IPCC) as "land where human interventions and practices have been applied to perform production, ecological or social functions".<sup>6</sup> Information on the land category definition and representation of managed lands is available in Chapter 6 of the [National Inventory Report](#).

Land-based greenhouse gas (GHG) emissions and removals include emissions and removals of carbon dioxide (CO<sub>2</sub>). It also includes emissions of methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and indirect CO<sub>2</sub> from the atmospheric oxidation of carbon monoxide (CO) due to controlled biomass burning; CH<sub>4</sub> and N<sub>2</sub>O emissions from wetland drainage and rewetting due to peat extraction; and N<sub>2</sub>O released following land conversion to cropland.

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<sup>6</sup> Intergovernmental Panel on Climate Change (2006) [2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 4: Agriculture, Forestry and Other Land Use](#). Retrieved July 7, 2025.

## More information

Data used to develop the land-based emission and removal estimates presented in the [National Inventory Report](#) are drawn from published and unpublished sources from various government departments, industry sources and scientific papers.

Land-based GHG emission estimates are provided at the national level, by sector and by region. Annual GHG emission estimates are updated each year; the most recent edition of the inventory reported estimates for the period from 1990 to 2023. Complete details of the temporal coverage for each data source used for the indicators can be found in Chapter 6 of the [National Inventory Report](#). Details on the role of Forest harvesting on forest carbon emissions and removals can be found in Chapter 2, Section 2.3.4.1.1.

Preparation of the GHG inventory, including the land-based emission and removal estimates, takes almost 16 months from the end of the reporting year because of the time needed to collect, validate, calculate and interpret the data. In keeping with good practice guidance for managing national inventories, methods and data are improved on an on-going basis to reflect new knowledge and improved data or methods. Inventory estimates are prepared by Environment and Climate Change Canada's Pollutant Inventories and Reporting Division with input from numerous experts and scientists across Canada. Preliminary estimates and draft text are reviewed extensively by experts and officials, before they are finalized. The final report is submitted electronically to the United Nations Framework Convention on Climate Change (UNFCCC) no later than mid-April, as required.

## Methods

Land-based GHG emissions and removals are quantified using methods that are consistent with an internationally agreed methodological framework set out in the [2006 IPCC Guidelines for National Greenhouse Gas Inventories](#) and [2019 IPCC Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories](#). The methodologies used to estimate emissions and removals are reviewed, updated and improved on a periodic basis. Collaborative work with sector experts from within and outside Environment and Climate Change Canada is undertaken to incorporate available expertise and the latest advancements in scientific knowledge. Further information on these methods is available through Environment and Climate Change Canada's [National Inventory Report](#).

## More information

Land-based GHG emissions and removals are reported in carbon dioxide equivalents (CO<sub>2</sub> eq), determined by multiplying the amount of emissions of a particular GHG by the global warming potential of that gas. GHGs differ in their ability to absorb heat in the atmosphere due to their differing chemical properties and atmospheric lifetimes. For example, over a period of 100 years, the potential of methane to trap heat in the atmosphere is 28 times greater than that of carbon dioxide. Therefore, methane is considered to have a global warming potential of 28. The [UNFCCC Reporting Guidelines](#) (PDF; 258 KB) publish the global warming potentials and atmospheric lifetimes to be used for each GHG reported in national GHG inventories; these can be found in Table 1-1 of the [National Inventory Report](#).

Areas within managed forests are subject to both forest management and natural disturbances. Emissions and removals from these areas are associated with human activities under specific circumstances. All stands harvested or that have been affected by stand-replacing natural disturbances in the past but have reached commercial maturity, or a minimum operable age (for a given region) are recognized to be under human influence. Commercially mature stands subject to natural disturbances causing less than or equal to 20% biomass mortality (for example some insects that cause defoliation but low mortality) remain associated with human activities. Large, uncontrollable natural disturbances (for example wildfires or insect outbreaks causing more than 20% biomass mortality) are recognized to result from natural occurrences and the associated emissions and removals are reflected in the natural

disturbance category. See Part II Annex 3 of the [National Inventory Report](#) for more information on the tracking and reporting of natural disturbances.<sup>7</sup>

### Spatial aggregation

Estimates for the land use, land-use change and forestry (LULUCF) sector in the [National Inventory Report](#) are provided for 18 reporting zones (Chapter 6, Figure 6-1 Canada's [National Inventory Report](#)). These reporting zones are similar to the ecozones of the National Ecological Framework, a hierarchical, spatially consistent national ecosystem classification.

In this indicator, the reporting zones were grouped into regional categories that better reflect trends in management practices. Table 1 shows the indicator regional categories and the corresponding National Inventory Report reporting zones.

**Table 1. Indicator regional categories and National Inventory Report reporting zones**

Indicator regional categories	National Inventory Report reporting zones
Mountain	Taiga Cordillera
	Boreal Cordillera
	Montane Cordillera
Boreal	Taiga Plains
	Taiga Shield West
	Boreal Plains
	Boreal Shield West
	Hudson Plains
	Boreal Shield East (excluding Newfoundland)
	Taiga Shield East
West Coast	Pacific Maritime
Prairies	Subhumid Prairies
	Semiarid Prairies
Southeastern	Boreal Shield East (Newfoundland)
	Atlantic Maritime
	Mixedwood Plains
Not reported	Arctic Cordillera
	Northern Arctic
	Southern Arctic

### Land-based greenhouse gas emissions and removals by land use categories

In this indicator, calculated emissions and removals data from the National Inventory Report are grouped into 4 broad classes. Table 2 shows the categories of Land-based GHG emissions and removals reported in the indicator compared with those reported in the National Inventory Report.

<sup>7</sup> Kurz et al. (2018) [Quantifying the impacts of human activities on reported greenhouse gas emissions and removals in Canada's managed forest: conceptual framework and implementation](#). Canadian Journal of Forest Research 48: 1-14. Retrieved July 7, 2025.



**Table 2. Land-based emissions and removals categories**

Land-based emissions and removals categories reported in the indicator	Land-based emissions and removals categories reported in the National Inventory Report
Forest sector	Forest land
	Harvested wood products (HWP)
Agricultural land	Cropland
	Agricultural grassland
Wetlands	Peat extraction and flooded lands
Settlements	Settlements

**Note:** Definitions for land-use change and forest land as reported in the [National Inventory Report](#) are consistent with the International Panel on Climate Change [land categories](#). Harvested wood product includes those that originate from forest trees, urban trees or agricultural land.

## Recent changes

Recalculations occurred for the forest sector, most significantly due to corrections made to the pre-1990 Forest Land disturbance history data. A multi-year analysis was completed to determine the area of forest land that had been historically harvested in Canada. The historical harvest area is a key factor in determining the area of land reported as anthropogenic and, consequently, the emissions and removals that are reported in the forest sector. The new compilation of historic (1889 to 1989) harvest data in Canada showed that the area of historically harvested forests was smaller by about 20%.<sup>8</sup> In other words, a smaller area of growing forest that actively removes CO<sub>2</sub> from the atmosphere is counted as a smaller anthropogenic sink (lower removals). The previously reported carbon sink in 1990 and subsequent years has been adjusted based on these recalculations and now more accurately reflects a reclassification from human activity to natural origin. The impact of these recalculations shifted the forest sector from a net sink (removals) to a net source (emissions) for the entire time series. Refer to Section 6.3.1.5 of the [National Inventory Report](#) (Part 1) for more information.

## Caveats and limitations

The methodologies for compiling land-based GHG emissions and removals improve over time. As a result, the land-based emissions and removals data reported in the indicator may be different from previously published estimates.

Harvested wood products are not limited to those that originate from forests and include those from urban trees and agricultural land. As such, the reported emissions from the forest sector may differ from the National Inventory Report. For more information, see Chapter 6.4 of the [National Inventory Report](#).

Canada is a vast country with heterogeneous landscapes and climates. Factors such as geographic location, climatic conditions, plant species and age, and management activities all play a role in influencing the net amount of GHG that is removed or released back to the atmosphere from each location in Canada. The land-based emissions and removals data provide a simplified representation of the complex reality and may not account for all relevant ecological processes.

Current reporting of land-based emissions and removals does not account for climate feedback other than what is captured through natural disturbances such as wildfires and insect infestations. Climate feedback mechanisms can either amplify (positive feedback) or diminish (negative feedback) the effects of a changing climate. For example, as rising concentrations of GHGs warm Earth's climate, permafrost begins to melt. This melting releases the organic carbon stored, contributing to GHG releases that cause more warming, which causes more melting, and so on, in a self reinforcing cycle.

For a complete discussion of the caveats and limitations with respect to land-based GHG emissions and removals data, refer to the methodological issues sections in Chapter 6 of Canada's [National Inventory Report](#).

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<sup>8</sup> Kurz et al. (2024) [Revised historic harvest data improve estimates of the impacts of human activities on reported greenhouse gas emissions and removals in Canada's managed forest](#). Canadian Journal of Forest Research. Retrieved on July 7, 2025.



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### Related information

[Canada's Action on Climate Change](#)

[Climate Change](#)

[Land-based greenhouse gas emissions and removals infographic](#)

# Annex

## Annex A. Data tables for the figures presented in this document

Table A.1. Data for Figure 1. National land-based greenhouse gas emissions and removals, Canada, 1990 to 2023

Year	Natural disturbances (megatonnes of carbon dioxide equivalent)	Human activities (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
1990	-120	51	-71
1991	-84	46	-38
1992	-130	57	-77
1993	-86	69	-17
1994	-81	56	-25
1995	87	65	150
1996	-69	56	-13
1997	-110	53	-60
1998	100	45	150
1999	-36	50	14
2000	-100	55	-45
2001	-65	38	-27
2002	50	69	120
2003	25	66	91
2004	94	64	160
2005	12	67	79
2006	44	49	93
2007	46	46	92
2008	0.31	41	42
2009	31	12	43
2010	89	41	130
2011	120	45	160
2012	94	30	120
2013	27	32	59
2014	150	8.7	160
2015	250	46	290
2016	95	30	120
2017	220	22	240
2018	250	25	270
2019	160	15	180
2020	2.7	26	28
2021	290	15	310

Year	Natural disturbances (megatonnes of carbon dioxide equivalent)	Human activities (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
2022	87	51	140
2023	1,100	4.6	1,100

**Note:** Data are accurate to 2 significant figures in accordance with Part III Annex 8 of the [National Inventory Report](#). Net exchange is calculated by subtracting removals from emissions. Natural disturbances refer to emissions and removals related to wildfires and large forest insect infestations. Human activities refer to emissions and removals from managed lands (such as settlements, forested lands, agricultural land and wetlands) as well as emissions from harvested wood products. For more information, see the section on [emissions and removals from human activities](#).

**Source:** Environment and Climate Change Canada (2025) [National Inventory Report 1990-2023: Greenhouse gas sources and sinks in Canada](#).

**Table A.2. Data for Figure 2. Land-based greenhouse gas emissions and removals from human activities by activity sector, Canada, 1990 to 2023**

Year	Forest sector (megatonnes of carbon dioxide equivalent)	Agricultural land (megatonnes of carbon dioxide equivalent)	Wetlands (megatonnes of carbon dioxide equivalent)	Settlements (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
1990	35	5.8	5.2	4.9	51
1991	37	-1.3	5	5	46
1992	47	0.78	4.9	4.6	57
1993	52	7.9	5.2	4.2	69
1994	54	-5.2	2.9	4.3	56
1995	65	-6.2	2.9	3.7	65
1996	54	-4.8	2.8	4.2	56
1997	54	-8.6	2.8	4.2	53
1998	42	-4.6	3.1	4.3	45
1999	54	-12	3.3	4.6	50
2000	63	-15	2.7	4.6	55
2001	40	-9.8	2.7	4.4	38
2002	54	7.8	2.6	4.8	69
2003	48	11	2.7	5.1	66
2004	76	-20	2.8	5.4	64
2005	79	-20	2.7	4.9	67
2006	63	-23	2.9	5.4	49
2007	55	-17	2.9	5.4	46
2008	51	-18	3	5.4	41
2009	39	-34	2.9	4.7	12
2010	54	-20	2.8	4.5	41
2011	49	-12	2.8	5.2	45
2012	43	-21	2.8	5.2	30
2013	45	-22	3.1	6.1	32
2014	41	-42	3.1	6.1	8.7

Year	Forest sector (megatonnes of carbon dioxide equivalent)	Agricultural land (megatonnes of carbon dioxide equivalent)	Wetlands (megatonnes of carbon dioxide equivalent)	Settlements (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
2015	46	-8.2	2.8	6.1	46
2016	36	-15	2.9	5.7	30
2017	34	-21	2.7	5.4	22
2018	36	-20	2.5	5.5	25
2019	22	-15	2.7	5.4	15
2020	30	-13	2.9	5.4	26
2021	23	-16	2.8	5.6	15
2022	18	25	2.6	5.3	51
2023	19	-22	2.6	5.2	4.6

**Note:** Data are accurate to 2 significant figures in accordance with Part III Annex 8 of the [National Inventory Report](#). Net exchange is calculated by subtracting removals from emissions. Greenhouse gas exchange from the forest sector considers emissions and removals from managed forests and transfers to and from the harvested wood products pool. Harvested wood products originate from forest trees with contributions of bioenergy from urban trees and agricultural land. As such, the reported forest sector emissions may differ at times from some information presented in the National Inventory Report. For more information, see Chapter 6.4 of the [National Inventory Report](#).  
**Source:** Environment and Climate Change Canada (2025) [National Inventory Report 1990-2023: Greenhouse gas sources and sinks in Canada](#).

**Table A.3. Data for Figure 3. Regional land-based greenhouse gas emissions and removals from human activities, Canada, 1990 to**

Region	Year	Forest sector (megatonnes of carbon dioxide equivalent)	Agricultural land (megatonnes of carbon dioxide equivalent)	Wetlands (megatonnes of carbon dioxide equivalent)	Settlements (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
Mountain	1990	-29	1	0.21	1.6	-26
Mountain	1991	-18	0.86	0.2	1.9	-15
Mountain	1992	-13	0.94	0.18	1.4	-10
Mountain	1993	-11	0.68	0.17	1.3	-8.4
Mountain	1994	-12	0.7	0.12	1.4	-9.4
Mountain	1995	-10	0.73	0.11	1.3	-8.1
Mountain	1996	-9.6	0.59	0.11	1.2	-7.7
Mountain	1997	-10	0.62	0.1	1.2	-8.5
Mountain	1998	-13	0.62	0.09	1.2	-11
Mountain	1999	-7.5	0.52	0.09	1.4	-5.6
Mountain	2000	-4	0.58	0.08	1.2	-2.2
Mountain	2001	-7.4	0.54	0.08	1.1	-5.7
Mountain	2002	0.61	0.48	0.08	1	2.2
Mountain	2003	2.2	0.58	0.07	1.1	3.9
Mountain	2004	15	0.49	0.07	1.2	17
Mountain	2005	23	0.45	0.06	1	25
Mountain	2006	24	0.5	0.06	1	26

Region	Year	Forest sector (megatonnes of carbon dioxide equivalent)	Agricultural land (megatonnes of carbon dioxide equivalent)	Wetlands (megatonnes of carbon dioxide equivalent)	Settlements (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
Mountain	2007	26	0.42	0.06	1.1	27
Mountain	2008	25	0.42	0.06	1	27
Mountain	2009	24	0.33	0.05	0.91	25
Mountain	2010	29	0.38	0.05	0.82	30
Mountain	2011	30	0.37	0.05	1.3	32
Mountain	2012	28	0.35	0.05	1.1	29
Mountain	2013	28	0.27	0.05	1.3	30
Mountain	2014	26	0.35	0.04	1	27
Mountain	2015	26	0.39	0.04	0.87	28
Mountain	2016	24	0.39	0.04	0.92	25
Mountain	2017	25	0.41	0.04	0.86	26
Mountain	2018	27	0.36	0.04	0.83	28
Mountain	2019	21	0.38	0.04	0.82	22
Mountain	2020	20	0.39	0.04	0.73	21
Mountain	2021	19	0.34	0.03	0.76	20
Mountain	2022	16	0.38	0.03	0.71	17
Mountain	2023	16	0.34	0.03	0.68	17
Boreal	1990	-21	8.7	4.5	4	-3.4
Boreal	1991	-22	7.5	4.3	4	-6.2
Boreal	1992	-14	7	4.2	4.1	1.2
Boreal	1993	-8.7	8.2	4.5	3.9	7.9
Boreal	1994	-1.6	4.1	2.3	4	8.8
Boreal	1995	10	2.7	2.3	3.9	19
Boreal	1996	2.4	3.8	2.2	4.1	12
Boreal	1997	6.6	4.2	2.1	4.1	17
Boreal	1998	2.3	3.3	2.4	4.3	12
Boreal	1999	8.8	2.2	2.6	4.5	18
Boreal	2000	16	1.8	2	4.7	25
Boreal	2001	5.9	2	1.9	4.5	14
Boreal	2002	13	4.9	1.9	5.1	24
Boreal	2003	9.6	7.8	2	5.2	25
Boreal	2004	18	-0.9	2	5.5	25
Boreal	2005	17	1.5	2	5.4	26
Boreal	2006	5.1	-0.37	2.1	5.8	13
Boreal	2007	-0.53	1.3	2.1	5.9	8.8
Boreal	2008	-4.4	0.55	2.2	6	4.4

Region	Year	Forest sector (megatonnes of carbon dioxide equivalent)	Agricultural land (megatonnes of carbon dioxide equivalent)	Wetlands (megatonnes of carbon dioxide equivalent)	Settlements (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
Boreal	2009	-11	-0.59	2.1	5.4	-3.6
Boreal	2010	-1.8	1.4	2	5.4	6.9
Boreal	2011	-6.8	3.2	2	5.5	3.9
Boreal	2012	-8.1	-1.4	1.9	5.5	-2.1
Boreal	2013	-8.6	1.7	2.2	6.2	1.5
Boreal	2014	-8.9	-3.3	2.2	6.3	-3.7
Boreal	2015	-5.9	3.2	2	6.2	5.5
Boreal	2016	-11	1.5	2	5.9	-1.8
Boreal	2017	-12	1.1	1.9	5.8	-3.6
Boreal	2018	-13	-0.9	1.6	5.8	-6.1
Boreal	2019	-16	1.2	1.8	5.7	-7.2
Boreal	2020	-7.5	2.5	2	5.9	2.9
Boreal	2021	-11	4.1	1.9	5.8	0.39
Boreal	2022	-12	8.1	1.7	5.9	3.6
Boreal	2023	-10	0.36	1.7	5.7	-2.3
West coast	1990	19	0.24	0.04	-0.08	19
West coast	1991	20	0.22	0.04	-0.24	20
West coast	1992	22	0.23	0.04	-0.2	22
West coast	1993	23	0.15	0.04	-0.26	22
West coast	1994	22	0.2	0.04	-0.39	22
West coast	1995	22	0.14	0.04	-0.62	21
West coast	1996	20	0.18	0.04	-0.22	20
West coast	1997	19	0.19	0.03	-0.37	19
West coast	1998	17	0.19	0.03	-0.43	17
West coast	1999	19	0.12	0.03	-0.67	18
West coast	2000	19	0.16	0.03	-0.66	18
West coast	2001	16	0.2	0.03	-0.56	16
West coast	2002	17	0.18	0.03	-0.57	17
West coast	2003	14	0.14	0.03	-0.56	14
West coast	2004	18	0.22	0.03	-0.62	17
West coast	2005	16	0.19	0.03	-0.73	16
West coast	2006	14	0.2	0.02	-0.65	14
West coast	2007	13	0.15	0.02	-0.74	13
West coast	2008	12	0.17	0.02	-0.77	11
West coast	2009	10	0.23	0.02	-0.83	9.5
West coast	2010	12	0.15	0.02	-0.82	11

Region	Year	Forest sector (megatonnes of carbon dioxide equivalent)	Agricultural land (megatonnes of carbon dioxide equivalent)	Wetlands (megatonnes of carbon dioxide equivalent)	Settlements (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
West coast	2011	12	0.22	0.02	-0.73	12
West coast	2012	12	0.19	0.02	-0.56	12
West coast	2013	12	0.16	0.02	-0.56	12
West coast	2014	12	0.2	0.02	-0.5	12
West coast	2015	12	0.29	0.01	-0.64	12
West coast	2016	12	0.33	0.01	-0.68	11
West coast	2017	11	0.35	0.01	-0.65	11
West coast	2018	12	0.42	0.01	-0.45	12
West coast	2019	9.5	0.24	0.01	-0.51	9.3
West coast	2020	9.3	0.25	0.01	-0.56	9
West coast	2021	8.6	0.28	0.01	-0.3	8.6
West coast	2022	8.1	0.37	0.01	-0.59	7.9
West coast	2023	7.5	0.34	0.01	-0.5	7.4
Prairies	1990	-0.46	-6.1	0	-0.14	-6.7
Prairies	1991	-0.52	-11	0	-0.15	-12
Prairies	1992	-0.47	-9.6	0	-0.15	-10
Prairies	1993	-0.37	-4.4	0	-0.15	-4.9
Prairies	1994	-0.2	-12	0	-0.15	-12
Prairies	1995	-0.11	-11	0	-0.15	-11
Prairies	1996	-0.07	-11	0	-0.16	-11
Prairies	1997	-0.08	-16	0	-0.16	-16
Prairies	1998	-0.23	-11	0	-0.16	-11
Prairies	1999	-0.17	-17	0	-0.16	-17
Prairies	2000	-0.07	-20	0	-0.16	-20
Prairies	2001	-0.18	-16	0	-0.16	-16
Prairies	2002	-0.1	-1.5	0	-0.17	-1.8
Prairies	2003	-0.19	-0.27	0	-0.16	-0.62
Prairies	2004	-0.05	-22	0	-0.16	-22
Prairies	2005	0.02	-24	0	-0.17	-24
Prairies	2006	0	-25	0	-0.17	-25
Prairies	2007	0.01	-21	0	-0.18	-21
Prairies	2008	0.03	-21	0	-0.18	-21
Prairies	2009	0.06	-35	0	-0.18	-35
Prairies	2010	0.08	-25	0	-0.18	-25
Prairies	2011	0.11	-18	0	-0.16	-18
Prairies	2012	0.09	-22	0	-0.14	-22

Region	Year	Forest sector (megatonnes of carbon dioxide equivalent)	Agricultural land (megatonnes of carbon dioxide equivalent)	Wetlands (megatonnes of carbon dioxide equivalent)	Settlements (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
Prairies	2013	0.03	-26	0	-0.12	-26
Prairies	2014	0.02	-40	0	-0.06	-40
Prairies	2015	0.12	-16	0	-0.02	-16
Prairies	2016	0.08	-20	0	-0.03	-20
Prairies	2017	0.41	-25	0	-0.03	-25
Prairies	2018	0.45	-21	0	-0.01	-21
Prairies	2019	0.36	-20	0	-0.04	-19
Prairies	2020	0.47	-20	0	-0.01	-19
Prairies	2021	0.3	-24	0	0	-23
Prairies	2022	0.32	12	0	0.01	12
Prairies	2023	0.32	-25	0	-0.04	-25
Southeastern	1990	13	2	0.41	-0.52	15
Southeastern	1991	12	1.2	0.43	-0.51	13
Southeastern	1992	13	2.2	0.44	-0.56	15
Southeastern	1993	14	3.3	0.46	-0.64	17
Southeastern	1994	14	1.9	0.47	-0.64	16
Southeastern	1995	15	1.4	0.47	-0.66	16
Southeastern	1996	15	1.7	0.49	-0.63	17
Southeastern	1997	16	2.6	0.53	-0.68	18
Southeastern	1998	14	2.4	0.58	-0.53	16
Southeastern	1999	14	1.6	0.57	-0.46	16
Southeastern	2000	13	1.9	0.59	-0.47	15
Southeastern	2001	7.7	3.2	0.61	-0.48	11
Southeastern	2002	6.5	3.8	0.63	-0.57	10
Southeastern	2003	5.1	2.8	0.65	-0.56	8
Southeastern	2004	8.5	1.7	0.67	-0.53	10
Southeastern	2005	6.8	2.1	0.69	-0.64	8.9
Southeastern	2006	4.2	1.7	0.71	-0.62	6
Southeastern	2007	1.6	2	0.72	-0.67	3.7
Southeastern	2008	3.4	2.1	0.72	-0.65	5.6
Southeastern	2009	1.5	0.69	0.73	-0.65	2.2
Southeastern	2010	1.8	2.6	0.75	-0.69	4.4
Southeastern	2011	0.56	1.8	0.76	-0.7	2.5
Southeastern	2012	-1.9	2.1	0.76	-0.73	0.23
Southeastern	2013	0.03	1.8	0.76	-0.68	1.9
Southeastern	2014	0.15	0.66	0.77	-0.59	0.99



Region	Year	Forest sector (megatonnes of carbon dioxide equivalent)	Agricultural land (megatonnes of carbon dioxide equivalent)	Wetlands (megatonnes of carbon dioxide equivalent)	Settlements (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
Southeastern	2015	1.2	4.2	0.78	-0.39	5.7
Southeastern	2016	-0.48	2.7	0.8	-0.43	2.5
Southeastern	2017	-1.3	2.8	0.81	-0.63	1.7
Southeastern	2018	-1.5	1.8	0.82	-0.64	0.47
Southeastern	2019	-3.6	2.6	0.84	-0.65	-0.76
Southeastern	2020	-3.1	3.5	0.85	-0.65	0.69
Southeastern	2021	-3.9	3	0.87	-0.67	-0.76
Southeastern	2022	-4.4	4.4	0.89	-0.69	0.14
Southeastern	2023	-4.8	2.5	0.89	-0.66	-2.1

**Note:** Data are accurate to 2 significant figures in accordance with Part III Annex 8 of the [National Inventory Report](#). Net exchange is calculated by subtracting removals from emissions. Regions are based on the location of the human activities across the country. Forest sector regional estimates provided do not include the long-term impact of emissions from forest harvest or deforestation prior to 1990.

**Source:** Environment and Climate Change Canada (2025) [National Inventory Report 1990-2023: Greenhouse gas sources and sinks in Canada](#).

**Table A.4. Data for Figure 4. Land-based greenhouse gas emissions and removals from natural disturbances in managed areas, Canada, 1990 to 2023**

Year	Wildfire – immediate emissions (megatonnes of carbon dioxide equivalent)	Post-wildfire – emissions and removals (megatonnes of carbon dioxide equivalent)	Insects – emissions and removals (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
1990	30	-150	0.24	-120
1991	59	-140	0.35	-84
1992	13	-150	0.41	-130
1993	61	-150	0.42	-86
1994	66	-150	0.48	-81
1995	220	-130	0.57	87
1996	56	-130	0.61	-69
1997	15	-130	0.62	-110
1998	220	-120	0.59	100
1999	81	-120	0.37	-36
2000	12	-120	3	-100
2001	38	-110	8.3	-65
2002	140	-100	13	50
2003	100	-99	23	25
2004	160	-96	32	94
2005	65	-92	39	12
2006	85	-86	46	44
2007	78	-84	52	46

Year	Wildfire – immediate emissions (megatonnes of carbon dioxide equivalent)	Post-wildfire – emissions and removals (megatonnes of carbon dioxide equivalent)	Insects – emissions and removals (megatonnes of carbon dioxide equivalent)	Net exchange (megatonnes of carbon dioxide equivalent)
2008	31	-85	54	0.31
2009	65	-85	51	31
2010	120	-79	49	89
2011	150	-72	43	120
2012	120	-67	39	94
2013	58	-67	36	27
2014	180	-61	32	150
2015	260	-49	30	250
2016	110	-44	27	95
2017	230	-36	23	220
2018	260	-27	21	250
2019	170	-24	19	160
2020	14	-29	17	2.7
2021	290	-15	16	290
2022	89	-17	15	87
2023	1,100	35	13	1,100

**Note:** Data are accurate to 2 significant figures in accordance with Part III Annex 8 of the [National Inventory Report](#). Net exchange is calculated by subtracting removals from emissions. Wildfire emissions and removals are divided in 2 categories, (1) wildfire – immediate emissions and (2) post wildfire. Wildfire – immediate emissions include emissions from trees and soils from the burning of wildfires. Post wildfire includes emissions released by the decay of dead trees and soil organic matter and removals related to forest regeneration. Insect disturbances include emissions from the decay of organic matter and removals from natural regeneration.

**Source:** Environment and Climate Change Canada (2025) [National Inventory Report 1990-2023: Greenhouse gas sources and sinks in Canada](#).

Additional information can be obtained at:

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