Report 1

Reports of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada

Forests and Climate Change

Independent Auditor's Report | 2023

Office of the
Auditor General
of Canada

Bureau du
vérificateur général
du Canada

Performance audit reports

This report presents the results of a performance audit conducted by the Office of the Auditor General of Canada (OAG) under the authority of the *Auditor General Act*.

A performance audit is an independent, objective, and systematic assessment of how well government is managing its activities, responsibilities, and resources. Audit topics are selected on the basis of their significance. While the OAG may comment on policy implementation in a performance audit, it does not comment on the merits of a policy.

Performance audits are planned, performed, and reported in accordance with professional auditing standards and OAG policies. They are conducted by qualified auditors who

- establish audit objectives and criteria for the assessment of performance
- gather the evidence necessary to assess performance against the criteria
- report both positive and negative findings
- conclude against the established audit objectives
- make recommendations for improvement when there are significant differences between criteria and assessed performance

Performance audits contribute to a public service that is ethical and effective and a government that is accountable to Parliament and Canadians.

At a Glance

💬 Overall message

Given early tree planting results and issues with establishing partnerships, it is unlikely that the 2 Billion Trees Program will meet its objectives unless significant changes are made. While the department nearly met its goal to plant 30 million trees in 2021, the first year of the 10-year program, it fell well short of its second-year goal. In the best-case scenario, after 2 years, the program would reach only 2.3% of the overall 2 billion tree goal.

Natural Resources Canada did not have long-term project agreements in place with provinces and territories, which will be necessary to meet the program's 3 main objectives—to capture carbon, enhance biodiversity, and support human well-being. The department had also not determined how it would monitor planted trees over the long term, which means that it will not know whether these trees have survived or whether they are benefitting Canadians as intended. This is concerning, because planting trees is part of Canada's plan to tackle the twin crises of climate change and biodiversity loss.

Beyond the 2 Billion Trees Program, Natural Resources Canada and Environment and Climate Change Canada did not provide a clear and complete picture of the effects of Canada's greenhouse gas emissions from forests. For example, published reports did not provide sufficient information on how logging or changes in forest management affected Canada's emissions. Reporting on forests' contribution to Canada's emission reduction target was also inconsistent, as it was included in some reporting but not in all. This makes it difficult for decision makers to use the information to guide policy decisions and for Canadians to hold government to account.

There is no solution to climate change and terrestrial biodiversity loss that does not include forests. Given the current climate and biodiversity crises, the federal government must successfully implement solutions, such as the 2 Billion Trees Program, and communicate the full picture of how Canadian forests affect carbon levels in our atmosphere.

Key findings

- Given the early tree planting results, it is unlikely that the 2 Billion Trees Program will meet its objectives unless significant changes are made.
- The 2 Billion Trees Program is not expected to achieve its originally anticipated emission reductions, even if fully implemented, and biodiversity benefits could be better realized.
- The effects of Canada's forests on emissions have not been effectively communicated to support decision making and accountability toward meeting climate targets.

Key facts and figures

- Canada has nearly 362 million hectares of forests, making it the third most-forested country in the world.
- Canada's forests are becoming a net source of emissions because of forest fires and disturbances caused by insect outbreaks. In some recent years, these natural disturbances have released over 200 megatonnes of carbon dioxide equivalent per year into the atmosphere: for example, in 2018, emissions from these disturbances would have added 26% to the national total, if they had been included in reporting.
- The government plans to invest up to $3.2 billion for tree planting efforts, mainly through cost-shared partnerships, from 2021 to 2031. In addition to reducing greenhouse gas, tree planting can enhance biodiversity, improve human physical and mental health, and increase forests' resilience to climate change.
- Natural Resources Canada and Environment and Climate Change Canada did not clearly report on the effects of human activities on forest emissions.

See **Recommendations and Responses** at the end of this report.

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Introduction

Background

Forests and climate change

1.1   Climate change is widely regarded as one of the most significant concerns facing the economy, people's health, and the natural environment. Failure to reduce greenhouse gas emissions and to adapt to the effects of climate change will increase risks and negative effects for Canadians because of, for example, the number of heat waves and forest fires.

1.2   The United Nations' Conference of the Parties, held in Paris in 2015, brought Canada and 194 other countries together in signing the Paris Agreement, a historic international agreement to reduce greenhouse gas emissions. Signatories committed to strengthening the effort to limit the increase in global average temperatures to below 2 degrees Celsius (°C) and preferably to 1.5°C, compared with temperature levels in pre-industrial times.

1.3   In July 2021, the Government of Canada committed to reducing emissions to 40% to 45% below 2005 levels by 2030. In March 2022, the government published the 2030 Emissions Reduction Plan: Canada's Next Steps for Clean Air and a Strong Economy. This document outlined the measures that the government planned for meeting its 2030 target. To meet this target and its commitment to reach net-zero emissions by 2050, Canada will have to make a variety of changes in many sectors. While Canada's forests could help to reduce greenhouse gas concentrations in the atmosphere, this should not distract from the urgent need to reduce burning fossil fuels (Exhibit 1.1).

Exhibit 1.1—Carbon cycle and global warming

Atmosphere

CO_2 CO_2 CO_2

Natural carbon cycle

Human-driven emissions from fossil fuels
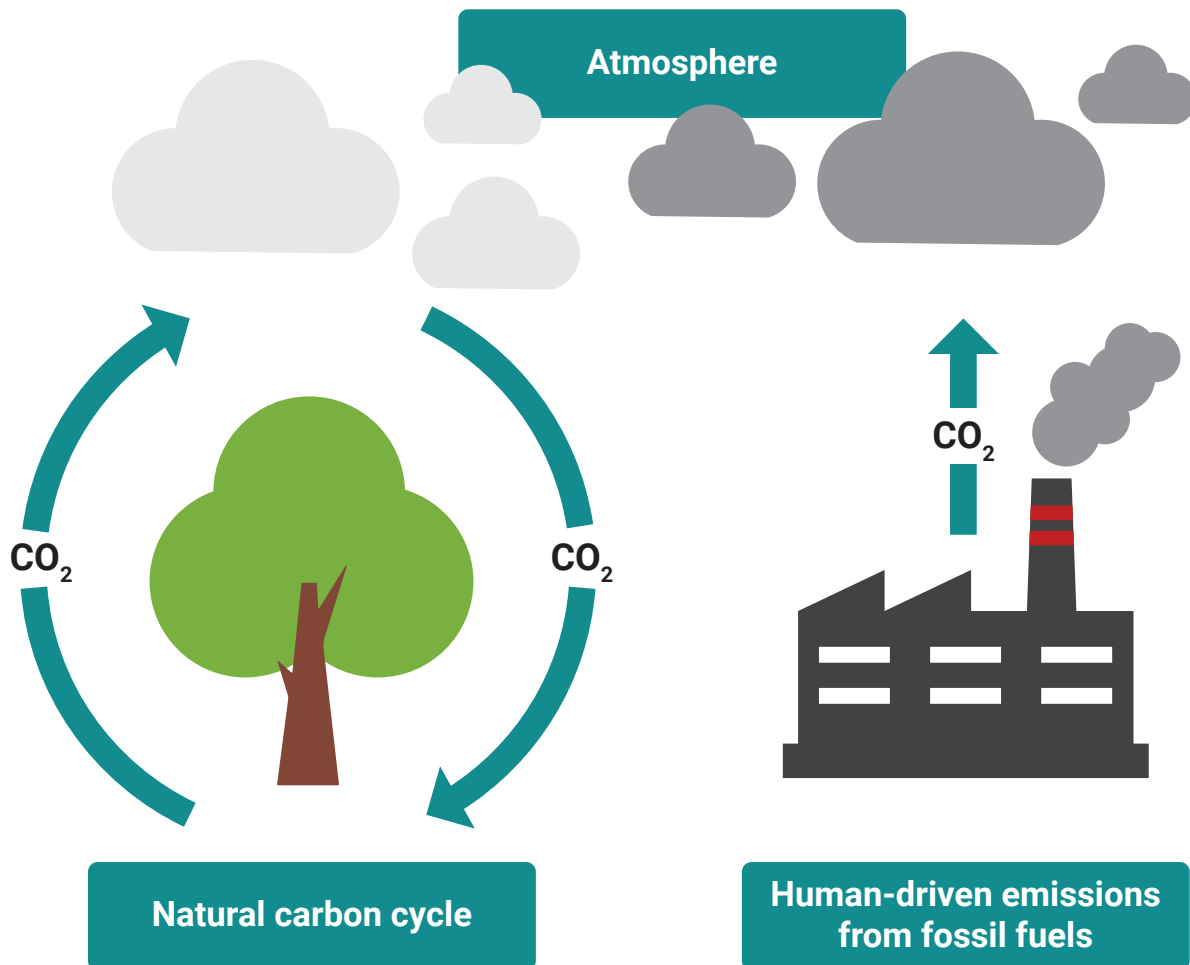
CO_2: carbon dioxide

1.4   Canada has nearly 362 million hectares of forests, making it the third most-forested country in the world. In 2020, the forest sector contributed more than $25 billion to Canada's nominal gross domestic product (at current prices, without adjustment for inflation). For this reason, Canada is well positioned to demonstrate international leadership in nature-based solutions. Nature-based solutions are actions that protect, restore, and sustainably manage ecosystems to provide benefits such as increased carbon sequestration (the process that captures carbon dioxide from the atmosphere and stores it) and improved biodiversity. The government first committed to using nature-based solutions to address climate change in 2019.

1.5   As part of this commitment, the federal government announced the Natural Climate Solutions Fund in 2020. The largest component of this fund is the 2 Billion Trees Program. Over 10 years, from 2021 to 2031, the government plans to invest up to $3.2 billion on tree planting efforts, mainly through cost-shared partnerships.

1.6   The program's objectives are to capture carbon to reduce greenhouse gas emissions, enhance biodiversity, and support human well-being. The trees will be planted across Canada, including on provincial, territorial, and federal Crown lands, Indigenous lands, in cities and communities, and on private lands, including farms.

Roles and responsibilities

1.7   **Natural Resources Canada**. This department is responsible for designing and leading the 2 Billion Trees Program, including developing and implementing calls for proposals, evaluating proposals, negotiating contribution agreements with partners, and monitoring and reporting on results. The department also develops estimates of greenhouse gas emissions and removals from the forest sector for Canada's reporting on national greenhouse gas emissions.

1.8   **Environment and Climate Change Canada**. This is the lead department for coordinating and implementing the government's climate change plan and reporting on national greenhouse gas emissions. The department also supports Natural Resources Canada in the 2 Billion Trees Program with activities related to biodiversity conservation, such as habitat restoration for species at risk and species of interest.

Focus of the audit

1.9   This audit focused on whether Natural Resources Canada, working with Environment and Climate Change Canada, adequately designed and implemented the 2 Billion Trees Program and estimated and reported on historical and future forest-sector carbon emissions and removals credibly and transparently.

1.10   This audit is important because there is no solution to climate change and terrestrial biodiversity loss that does not involve forests. For this reason, the role of forests in climate change is of interest to parliamentarians and Canadians. They need a clear picture—backed by rigorous measurement and reporting—of the forest sector's effects on climate change and of the effects of the federal investments in nature-based solutions involving forests.

1.11   More details about the audit objective, scope, approach, and criteria are in **About the Audit** at the end of this report.

Findings and Recommendations

Natural Resources Canada is unlikely to plant 2 billion trees by 2031 or achieve expected emission reductions

Why this finding matters

1.12   This finding matters because Canada's commitment to planting 2 billion trees is important to tackling the crises of climate change and biodiversity loss by capturing carbon, enhancing biodiversity, and supporting human well-being.

Context

1.13   The 2 Billion Trees Program was first announced in the 2019 Speech from the Throne. Natural Resources Canada received funding to establish the program in February 2021. To support its overall goal of planting 2 billion incremental trees, Natural Resources Canada provided estimates for the number of trees to be planted over each of the program's 10 years. At the time of our audit, the program was in its second year.

1.14   The department dedicated its funding to 5 streams:

- provinces and territories—$1.35 billion to plant an estimated 1.34 billion trees

- private lands—$660 million to plant an estimated 500 million trees

- Indigenous-led initiatives—$500 million to plant an estimated 180 million trees

- urban lands—$500 million to plant an estimated 5 to 7 million trees

- federal lands—$50 million to plant fewer than 1 million trees (estimated)

1.15   Through these streams, the department would support tree planting activities that are generally cost-shared with partners. Indigenous partners could be supported with a higher cost-share through any of these streams. Certain groups, such as Indigenous partners, non-profits, and municipalities, could also be supported with grants focused on capacity building, with no cost-sharing required. For most project funding, the department issued calls for proposals as its preferred approach for soliciting applications.

Tree planting estimate for 2021 nearly met

Findings

1.16   We found that in 2021, the first year of the 2 Billion Trees Program, Natural Resources Canada reviewed and approved projects in accordance with the program's design. The department funded 72 projects, and program partners planted 28.9 million (96.3%) of the estimated 30 million trees (Exhibit 1.2). More than 150 species were planted at more than 500 sites across Canada, as many of the projects involved planting trees at multiple sites. However, this amounted to only 1.5% of the program's 10-year goal of 2 billion trees.

Exhibit 1.2—More than half of the tree planting in 2021 occurred on provincial Crown land

Stream or funding mechanism	Number of projects	Number of trees planted	Total hectares planted
Provinces and territories	8	15,882,000	9,634
Private lands	34	4,764,000	3,247
Indigenous-led[1]	9	7,796,000	5,223
Urban lands	15	329,000	363
Federal lands	2	141,000	294
Grants[2]	4	6,000	3
Total	**72**	**28,918,000**	**18,764**

[1] Because the stream for funding Indigenous-led projects was not available in 2021, Indigenous-led projects were supported through other funding streams.
[2] Grants were available to focus on capacity building. Certain groups, such as Indigenous partners, non-profits, and municipalities, could be supported with these grants.

Source: Adapted from data provided by Natural Resources Canada

1.17   We found that in the first year, 9 of the 72 projects were Indigenous-led, with an additional 4 Indigenous organizations supported through grants. Around 7.8 million trees (almost 27% of the total) were planted under these projects, covering over 5,000 hectares.

## Tree planting estimate for 2022 unmet

Findings

1.18   We found that in the 2022–23 fiscal year, Natural Resources Canada was unlikely to plant 60 million trees, the figure it had estimated.

The department received more than 200 applications for the 2 Billion Trees Program's tree-planting and capacity-building streams in response to its December 2021 call for proposals. The December 2021 call for proposal was not open to the provinces or territories. The department had originally planned to start signing agreements in May 2022.

1.19   We found that by the end of our audit period, the department had signed 23 agreements with partners from the December 2021 call for proposals, some of which were multi-year agreements, covering 1.7 million trees, and 5 with federal partners, covering 424 thousand trees in 2022. An additional 71 agreements with partners were not yet signed by 31 October 2022. Moreover, the department had allowed 5 projects from 2021, covering 1.1 million trees, to carry over to 2022. The final number of trees planted in summer 2022 will be available after May 2023. We found that if all the signed agreements were implemented, partners would be expected to plant 16.5 million trees in 2022, for a total of 2.3% of the overall 2 billion tree goal in the first 2 years of the program (Exhibit 1.3).

1.20   Delays in signing agreements have not only significantly challenged Natural Resources Canada's ability to plant the number of trees that it had estimated for 2022, but will also affect subsequent years, which already have much more ambitious planting estimates. As of October 2022, we found that if all signed agreements with all partners were implemented, the program would be projected to plant 76.2 million trees by the end of the program, or 3.8% of the overall 2 billion tree goal.

Exhibit 1.3—Natural Resources Canada was behind on its estimated annual planting
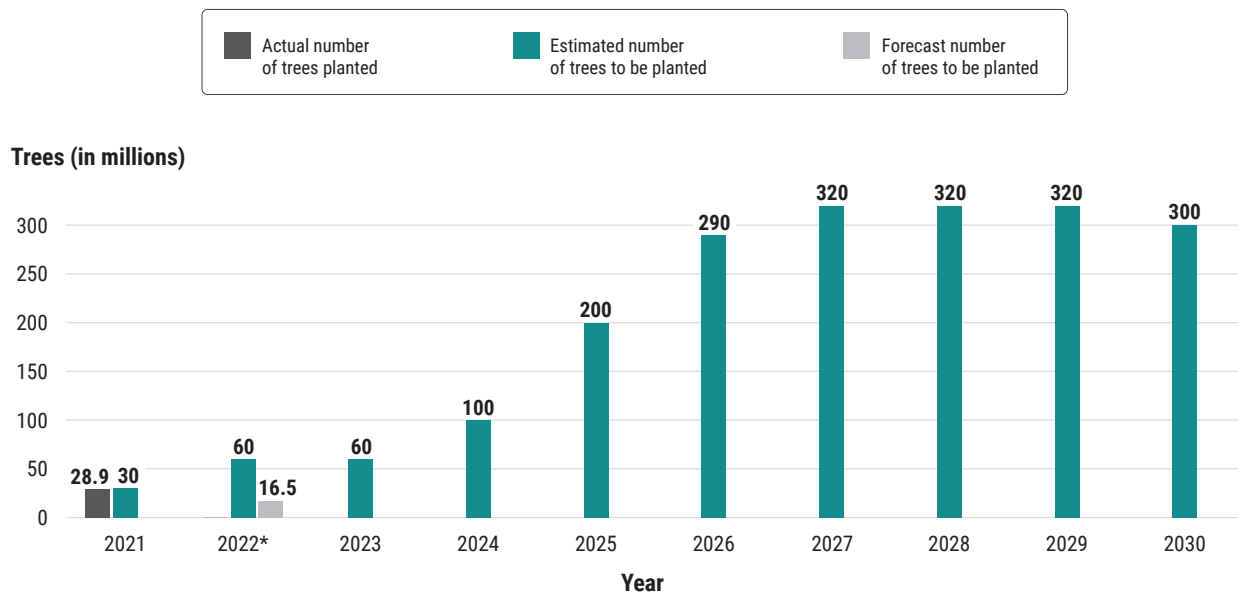
* The final number of trees planted in summer 2022 will be available after May 2023. The forecast represents the expected number of trees to be planted if the agreements signed by the end of our audit period had been implemented.

Source: Adapted from Natural Resources Canada

Expected emission reductions unlikely

Findings

1.21   We found that Natural Resources Canada's projections as of September 2022 showed that it did not expect to achieve its annual or long-term greenhouse gas emission reductions for the 2 Billion Trees Program. The department's targets, set at the beginning of the program, were to reduce emissions by up to 2 **megatonnes of carbon dioxide equivalent**[1] (Mt CO_2 eq) annually by 2030 and by up to 11 to 12 Mt CO_2 eq annually by 2050.

1.22   However, Natural Resources Canada projected that the program would be a net greenhouse gas source until 2031—generating 0.1 Mt CO_2 eq in 2030—and would capture 4.3 Mt CO_2 eq in 2050. This change is a result of the initial emissions caused by site preparation and planting activities, balanced by the increasing greenhouse gas capture capacity of trees as they grow (Exhibit 1.4).

Exhibit 1.4—Natural Resources Canada does not expect the 2 Billion Trees Program to capture greenhouse gases before 2031
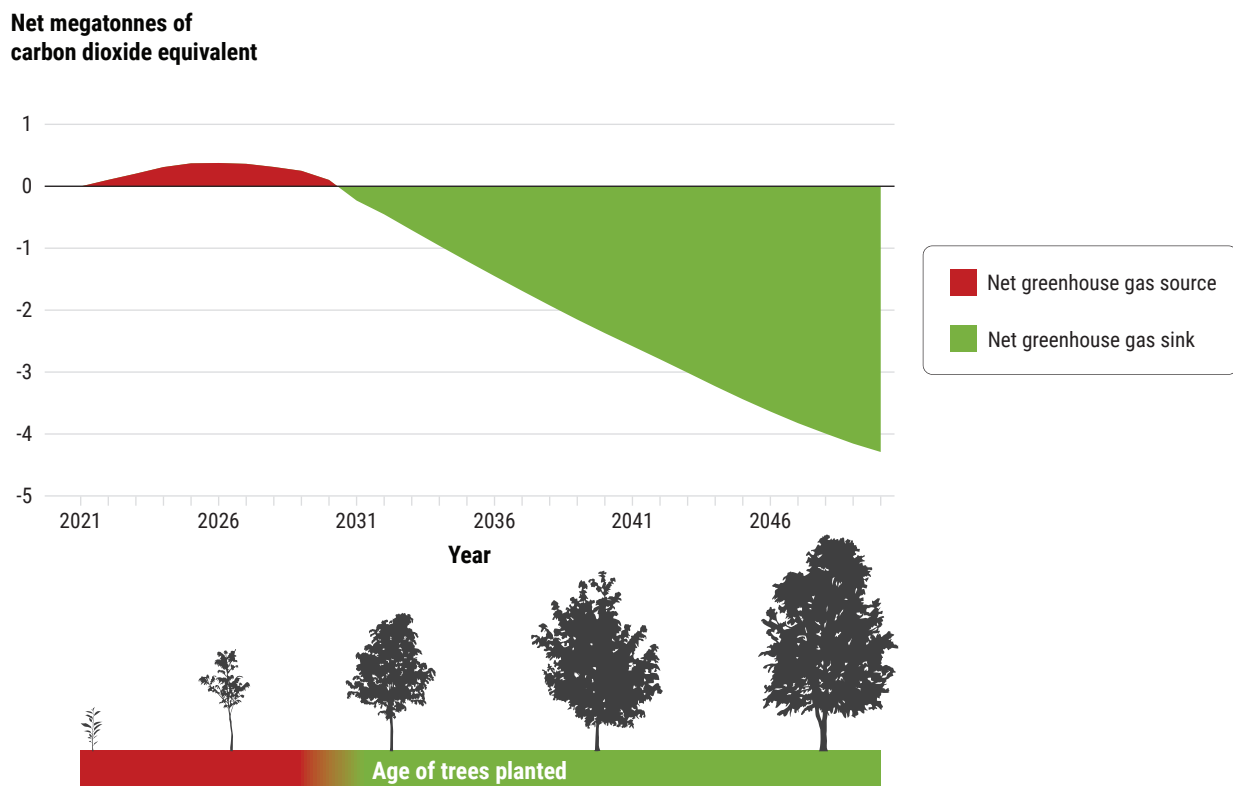
Source: Adapted from Natural Resources Canada

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1   **Megatonne of carbon dioxide equivalent**—The amount of a greenhouse gas that has the same warming potential as a million tonnes (a megatonne) of carbon dioxide over a specified period.

1.23   Natural Resources Canada is considering whether to allow recipients to participate in greenhouse gas offset systems, which could further decrease the greenhouse gas benefits of the program. Under the department's proposed approach, if a project were eligible under an offset system's rules, the recipient of federal funding to plant trees for that project could also sell a credit for planting those same trees. A buyer, such as an industrial facility, could use this credit, for example, to comply with carbon pricing systems for large emitters, instead of reducing emissions at the facility. In our view, allowing participation in offset systems could give a false impression that progress has been achieved—as offset credits could be purchased to plant trees that would have been planted anyway—and could compromise Canada's overall efforts to reduce emissions.

Program design could be improved

Why this finding matters

1.24   This finding matters because as designed, the 2 Billion Trees Program relies on strong partnerships across Canada to meet its tree-planting goal. Furthermore, knowing whether the program's objectives have been met depends on long-term monitoring of the survival or health of planted trees. It is important that Natural Resources Canada monitor and report holistically on tree planting to ensure that all of the program's benefits are realized for future generations.

Context

1.25   In addition to reducing greenhouse gases, planting trees can

- enhance biodiversity—for example, by providing critical habitat for many species, including species at risk

- contribute to human physical and mental health

- increase forests' resilience to climate change

1.26   To estimate and report on the greenhouse gas effects of planting 2 billion trees, Natural Resources Canada stated that it would monitor and verify tree planting and that it would establish processes to verify its partners' activities and monitor outcomes. Such verification is key to ensuring that estimates of carbon removal consider tree survival and to identifying where replacement planting may be necessary.

Engagement undertaken and risks identified

Findings

1.27   We found that Natural Resources Canada held engagement sessions and sought information from stakeholders and potential partners at the start of the 2 Billion Trees Program. This shaped the program's design because it allowed the department to better understand partners' needs and concerns and to identify risks. We found that the department undertook a **gender-based analysis plus**,[2] which also informed the program's design. The department included diversity and inclusion criteria in the application process and had considered Indigenous representation in the design.

1.28   We also found that the department adjusted the program in response to lessons that it had learned in the first year of the program. The department identified gaps, such as the lack of clear guidance on specific elements of the application and the short timeline to apply for proposals. The department adjusted the program to address some of these gaps.

Long-term partnerships lacking or delayed

Findings

1.29   We found that Natural Resources Canada had not yet signed any long-term project agreements with provinces or territories. As the department had designed the 2 Billion Trees Program with the expectation that 67.5% of all program funds would be used by provinces and territories (to plant 1.34 billon trees), this constituted a major program risk.

1.30   Natural Resources Canada has emphasized the importance of establishing long-term agreements, which would allow for long-term planning, provide assurance to the nurseries that are growing seedlings, and allow partners to attract and retain staff. The department designed the program to rely on project proposals for its understanding of the partners' capacities, expected project risks, and proposed mitigation measures. We found that this design affected the department's ability to plan for the long term, particularly in the absence of long-term agreements.

2   **Gender-based analysis plus**—An analytical process that provides a rigorous method for the assessment of systemic inequalities and a means to assess how diverse groups of women, men, and gender-diverse people may experience policies, programs, and initiatives. The "plus" acknowledges that gender-based analysis goes beyond biological (sex) and socio-cultural (gender) differences and considers many other identity factors, such as race, ethnicity, religion, age, and mental or physical ability.

Source: Adapted from Women and Gender Equality Canada

1.31 For example, we found that there was a risk that not enough seedlings would be available to plant 2 billion trees. The program will require increasing the demand of seedlings by up to 350 million seedlings per year. Canadian nurseries that were surveyed by the department indicated that they would require up to 2 years of preparation before planting seeds and 1 to 8 more years before seedlings would be available for planting. Nurseries also indicated that they would not invest in seedling production without a commitment to purchase the seedlings. The department was relying on establishing long-term agreements with large partners early in the program to provide the assurance nurseries needed. However, no such agreements with provinces and territories have been signed.

1.32 In December 2021, the department created a new requirement for provinces and territories to sign an "agreement in principle" before submitting project proposals, partly to demonstrate a joint long-term commitment to planting trees and enhancing biodiversity. This requirement led to provincial and territorial project proposals being put on hold for a full planting year in 2022. By the end of our audit period, Natural Resources Canada had signed 4 agreements in principle, and 1 province had indicated that it would not sign.

1.33 Although Natural Resources Canada has notionally allocated the funds for provinces and territories over the 10 years of the program, some jurisdictions have suggested they may limit agreements to a few years, depending on their ability to match the funding. Although the department can reallocate funds to different project streams, it does not have a documented strategy for mitigating the absence of provincial and territorial participation.

1.34 We found that Natural Resources Canada had developed detailed planning to 2023, but it did not have a long-term strategic plan that detailed how the program would be operationalized to meet its planting goals or its 2031 and 2050 greenhouse gas emission reduction targets.

1.35 Natural Resources Canada officials told us that the department would assess further gaps and adjust its delivery after receiving multi-year project proposals. In December 2022, to ramp up the signing of long-term agreements, the department began accepting proposals on an ongoing basis rather than having annual calls for proposals. However, in our view, if the continued delays in establishing long-term agreements persist, and no other specific measures are identified, the department will not meet its objective of planting 2 billion trees by 2031.

Recommendation

1.36   To ensure that it can meet the planting objectives of the 2 Billion Trees Program, Natural Resources Canada should

- clearly document how the program will be operationalized to meet its planting goals and its 2031 and 2050 targets for reducing greenhouse gas emissions
- promptly develop specific measures to address the lack of long-term agreements with project partners

Natural Resources Canada's response. Agreed.

See **Recommendations** and Responses at the end of this report for detailed responses.

No requirement for long-term monitoring of planted trees

Findings

1.37   **Permanence of planted trees**. We found that Natural Resources Canada had not required that the trees planted through the 2 Billion Trees Program remain in the ground over the long term. This was due to several factors, including the consideration that seeking long-term control on partners' land could reduce participation rates in the program and because the department did not have a mechanism in place to enforce permanence of any activity on land it does not own. Permanence was a contentious issue raised by stakeholders and partners, with some advocating a requirement and others opposing one.

1.38   **Long-term monitoring**. We found that for the first year of planting in 2021, the department did not clearly state its expectations for monitoring the health and survival of the planted trees. As a result, 43% of project partners (31 of 72) in 2021 did not commit to a specific time frame for monitoring (Exhibit 1.5). Since then, the department has asked all applicants to provide monitoring plans for an unspecified period beyond the scope of their agreements.

Exhibit 1.5—In 2021, 43% of project partners did not commit to a specific time frame for monitoring

Project partners' monitoring commitment	Number of projects	Percentage of projects
5 years or less	21	29%
Up to the end of the 10-year 2 Billion Trees Program	8	11%
Beyond the program duration	4	6%
No specific time frame for monitoring provided	31	43%
Not required, as no planting occurred	8	11%
Total	**72**	**100%**

Source: Adapted from data provided by Natural Resources Canada

1.39   For projects that began in the 2021 planting year, Natural Resources Canada indicated that it would not follow up with partners for monitoring beyond the end of the contract. Without monitoring the trees for health and survival, at least until the end of the program, it is unclear how the department can report comprehensively on the program's results, which are supposed to contribute to meeting Canada's 2050 net-zero emission commitment.

1.40   We found that Natural Resources Canada set out verification processes (such as verifying partners' reporting and conducting site visits) in its agreements with private and provincial and territorial partners but not for the federal partners. We found that the department did not have a documented plan as to how it would conduct on-site visits to verify results and had not yet taken any action to verify partners' work on site. While the department collected information to facilitate future monitoring of results through remote sensing or other means, it did not yet have a plan for this monitoring.

1.41   **Performance measurement**. We found that Natural Resources Canada developed a total of 19 indicators for all 3 program outcomes: reducing greenhouse gas emissions, achieving environmental benefits, and supporting human well-being. The department planned to report against most of these indicators in its departmental results report, starting in 2022. However, we found that the department had not yet developed final targets for 7 of the 19 indicators, including its biodiversity and environment indicators, and it had no interim targets for 3 of its indicators.

1.42   We also found that for 12 of the 16 indicators with interim targets, Natural Resources Canada did not have quantitative annual

targets required to meet the final targets. For example, the annual target to reach the goal of planting 2 billion trees is to be "annually increasing." In our view, without quantitative annual targets, the department cannot be held to account for annual progress toward planting 2 billion trees.

Recommendation

1.43   To ensure that Natural Resources Canada is meeting the objectives of the 2 Billion Trees Program, including its 2031 and 2050 targets for reducing greenhouse gas emissions, the department should have

- a long-term monitoring plan to assess the health and survival of the trees planted through the program

- clear quantitative interim and final targets for the program's performance indicators

Natural Resources Canada's response. Agreed.

See **Recommendations** and Responses at the end of this report for detailed responses.

Opportunities to improve biodiversity benefits

Findings

1.44   We found that in the 2021 planting season, Natural Resources Canada funded more than 270 monoculture sites (that is, sites with plantings of only 1 species), covering 3,136 hectares. Of these sites, 78 had more than 10,000 trees. These monoculture plantings accounted for 14.4% of the total trees planted in 2021 as part of the 2 Billion Trees Program. Monoculture plantings do sequester carbon, and may be appropriate in certain habitats. However, in the vast majority of circumstances, they do not support biodiversity and other benefits related to environmental and human well-being as much as more diverse plantings do. We found that the department did not have any specific guidance or limitations for applicants on monoculture planting.

1.45   We found that in March 2022, Environment and Climate Change Canada provided Natural Resources Canada with information to guide discussions among the federal, provincial, and territorial governments about potential sites for tree planting activities that would maximize conservation benefits. This included information on Canada's priority places and priority species, critical habitat for species at risk and birds. However, this information was not provided to partners under other funding streams (such as the urban or private streams), even though it might be useful to all program partners to best target their planting activities.

1.46   Natural Resources Canada considered habitat restoration to be more expensive than typical tree planting, mostly because of remote access, challenging growing conditions, and resource-intensive site preparation. The department set out a higher cost-share ratio (60% from the federal government) for habitat restoration for species at risk and species of interest for provinces and territories. However, the department did not design the program with specific funding considerations for habitat restoration for other funding streams, which might have encouraged all partners to undertake habitat restoration.

Recommendation

1.47   To enhance biodiversity and habitat-related benefits of the 2 Billion Trees Program over the long term and to contribute to Canada's biodiversity goals, Natural Resources Canada should

- develop criteria for monoculture planting projects to ensure that these projects do not hinder biodiversity goals

- make specific guidance and support about biodiversity and habitat needs available to all partners

- provide incentives to habitat restoration work for all project streams

- leverage information provided by Environment and Climate Change Canada to enhance reporting on biodiversity benefits

Natural Resources Canada's response. Partially agreed.

See **Recommendations** and Responses at the end of this report for detailed responses.

Greenhouse gas effects of forests were not effectively communicated to support decision making and accountability

Why this finding matters

1.48   This finding matters because accurate and consistent information on forest-related greenhouse gas emissions can support the development of policies, allow stakeholders and decision makers to assess progress, and determine whether any adjustments or further actions are needed.

Context

1.49   Natural Resources Canada developed a system, which uses models that integrate data from many sources, to estimate greenhouse gas emissions and removals in Canada's forests. The models and resulting estimates are used to support Canada's domestic and international reporting. The work to develop carbon estimates for Canadian forests is highly complex and specialized.

1.50   Environment and Climate Change Canada reports on national greenhouse gas emissions to Canadians and to the United Nations Framework Convention on Climate Change. One of the intended purposes of modelling and the associated reports is to support understanding of how human activities, such as tree planting programs or changes in forest management, are affecting emissions. However, other factors that might not be directly related to human activities can obscure the results.

1.51   For example, because of climate change, forest fires in Canada are expected to get bigger and happen more often. Canada's forests are becoming a net source of emissions because of forest fires and disturbances caused by insect outbreaks, such as the mountain pine beetle. In some recent years, forest fires and insect disturbances have released over 200 Mt CO_2 eq per year to the atmosphere. For example, in 2018, emissions from these disturbances would have added 26% to the national total. The large variations in emissions from forest fires and other disturbances year over year make it difficult to clarify the role of human activities in the overall data. The guidance from the United Nations' Intergovernmental Panel on Climate Change allows for countries to exclude forest fires and insect disturbances, to better clarify trends resulting from human activity. As a result, Canada excludes these emissions from its national reporting (Exhibit 1.6).

Exhibit 1.6—Environment and Climate Change Canada's reports on emissions did not include forest fires or insect disturbances in national totals

Greenhouse gas emissions from forests*
(megatonnes of carbon dioxide equivalent)
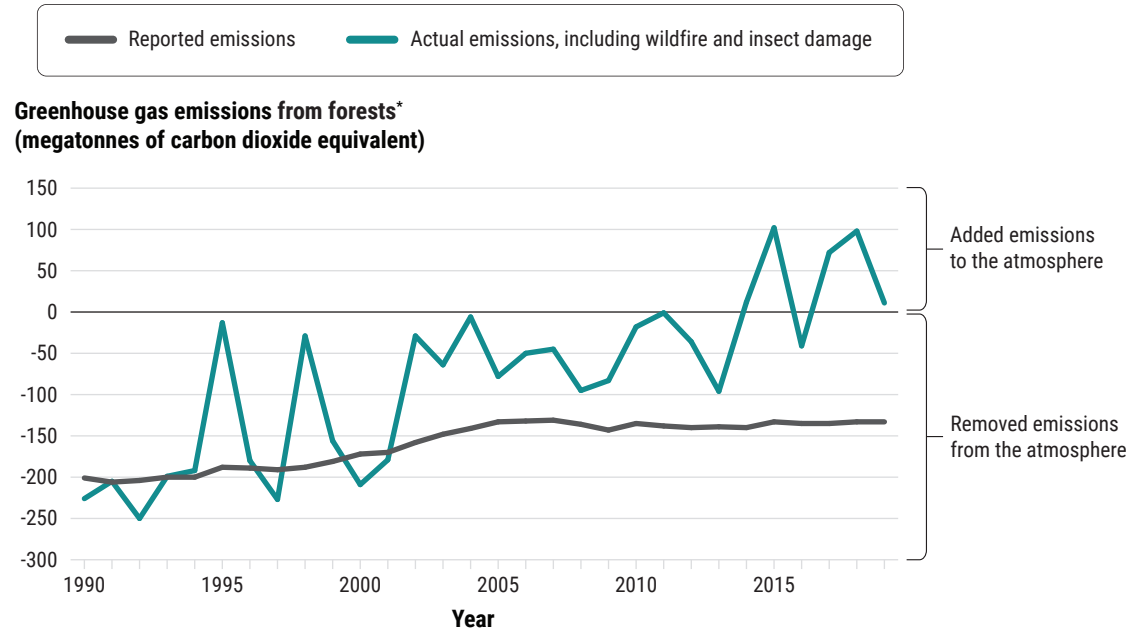
* Includes forest lands managed for timber production, conservation, or fire suppression.

Source: Adapted from Natural Resources Canada

1.52   Environment and Climate Change Canada develops 2 types of reports:

- historical emissions and removals reports, known as the national inventory reports, which provide estimates of annual emissions and removals dating back to 1990

- projected emissions reports, published as either emissions projection reports or biennial reports, which provide expected emissions to 2030

Environment and Climate Change Canada uses Natural Resources Canada's estimates of emissions and removals from forests and harvested wood products in these reports.

1.53   Additionally, under the *Canadian Net-Zero Emissions Accountability Act*, the Minister of Environment and Climate Change is responsible for publishing plans to achieve emission reduction targets, such as the 2030 Emissions Reduction Plan published in March 2022. The minister must also publish interim progress reports and assessment reports on how the measures and strategies described in the plans, including nature-based solutions, have contributed to meeting the relevant emission targets.

Lack of transparency about the effects of human activities on forest emissions

Findings

1.54 We found that the information produced by Environment and Climate Change Canada and Natural Resources Canada was primarily focused on meeting international reporting obligations and was not aimed at other critical public and private sector decision makers. For example, although Natural Resources Canada provided support to users of the information, such as provinces and environmental organizations, to help them assess the effectiveness of measures or to evaluate mitigation options, this information was not made widely available. The results of these assessments were generally uniquely tailored to the users or limited to the scientific literature.

1.55 We found that the government had several opportunities to improve information about forest emissions to support accountability and decision making and thus improve the value for money of the government's modelling of emissions.

1.56 **Emissions Reduction Plan**. We found that Environment and Climate Change Canada was not transparent in its reporting on the effects that human activities on forest land have on greenhouse gas emissions. For example, we found that the 2030 Emissions Reduction Plan lacked transparency and consistency in reporting on nature-based solutions, which often include actions related to forests. The plan stated that the expected contribution of nature-based solutions toward Canada's 2030 target is 30 Mt CO_2 eq, but elsewhere in the plan, this value can be calculated as 6 Mt CO_2 eq. The plan did not detail how the department had estimated these contributions. We found that these estimates were largely based on literature reviews or analyses that relied on assumptions that were either overly optimistic or had no rationale.

1.57 We also found that the projection reports and emissions plan provided scant information on the changes in reported values, in comparison with those of previous reports. For example, although the estimate of the effect of nature-based solutions and agricultural measures increased from 10 Mt CO_2 eq in the 2020 emissions plan to 19 Mt CO_2 eq in the 2022 emissions plan, the reason for the change was not explained in the plan.

1.58 **Forest management practices**. We found that the departments' reporting on how changes in forest management affected emissions was incomplete. Forest management activities include clear-cutting, partial harvesting, burning of post-harvest residuals (slash burning), creating reserves for biodiversity, and managing areas for non-timber use, but these were not clearly or separately reported on (Exhibit 1.7).

Exhibit 1.7—Slash burning is a forest management activity that was not separately reported in federal reports

In some circumstances, prescribed or controlled fires can be a valuable tool to reduce wildfire risk, enhance wildlife habitat, conduct site preparation, or use for Indigenous cultural purposes. However, burning of post-harvest residuals (slash burning) can create significant greenhouse gas emissions. For example, in British Columbia in 2020, slash pile burning, which is one component of slash burning, represented 4% of the overall greenhouse gas emitted annually.

We found that federal reports did not clearly distinguish the emissions associated with slash burning from other forms of controlled burning. In our view, separately communicating emissions related to slash burning at the federal level could better inform related forest-sector policy decisions, including investigating alternative uses for post-harvest residues.

Photo: Ben Weinstein

1.59   Furthermore, historical emission reports noted that forested lands have been influenced by recent management trends. However, we found that the reports described neither what the trends were nor the trends' effects on emissions. While Natural Resources Canada used modelling to assess the effects of specific forest management activities or mitigation options, the results were often published in academic articles only, making them difficult for the public and many stakeholders to access or understand.

1.60   **Forestry sector emissions**. We found that Environment and Climate Change Canada did not separately report total emissions from the forestry sector in Canada. Instead, these emissions were dispersed throughout the national inventory reports, making it impractical to determine their aggregate effects. For example, some emissions were included under the land-use category, but emissions from equipment

used in forestry operations and logging were included under a different category.

1.61 Many stakeholders, such as academics and environmental and health groups, have expressed concern about the lack of transparency about greenhouse gas emissions from logging. One stakeholder report estimated that net emissions from logging accounted for approximately 10% (75 Mt CO_2 eq) of Canada's total in 2020. This estimate was largely based on information reported publicly by the departments. Natural Resources Canada and Environment and Climate Change Canada disagreed with this estimate but provided no alternative estimate that was specific to logging. They also indicated that producing a logging estimate would be outside of international reporting obligations.

1.62 In our view, sector-specific reporting, as is done for the oil and gas industry, would support the development of effective policy measures to reduce emissions from the forestry sector.

1.63 **Provinces and territories**. We also found that forest emissions were not presented publicly by province and territory, even though the information was available. Trends in emissions related to forests and their expected contributions toward Canada's 2030 target vary considerably across provinces and territories. For example, some provinces have planned to expand their forestry industries, which would add to projected emissions, while others expected harvest rates to decline. According to Natural Resources Canada and Environment and Climate Change Canada, provincially disaggregated data is not reported because 1 province prefers it to remain confidential. Providing this information publicly would help users to better understand trends.

Recommendation

1.64 Given the importance of forests to greenhouse gas emissions and removals, and in consideration of Canada's unique national circumstances, Natural Resources Canada and Environment and Climate Change Canada should commission and publish an independent expert review and take action to address any gaps or opportunity for improvements. This review should

- consider Canada's approach to estimating and reporting emissions related to forests and specifically to logging

- include a formal engagement process with users, such as researchers and environmental and industry groups, on how to better meet their needs and support accountability and decision making

The departments' response. Agreed.

See **Recommendations and Responses** at the end of this report for detailed responses.

Recommendation

1.65   To inform policy decisions that support emission reductions and improve transparency, Environment and Climate Change Canada, working with Natural Resources Canada, should, in its reports on historical and projected emissions,

- state the greenhouse gas effects of changes in forest management

- work with provinces and territories to report data by province and territory, so that the effects of forest management practices are more evident

- present information in ways that the public can readily access and easily understand

and, in its projection reports,

- more clearly state which policies and measures are included and their greenhouse gas effects

- more clearly describe the methods, information, and assumptions it uses to estimate and account for emissions and removals

Environment and Climate Change Canada's and Natural Resources Canada's response. Agreed.

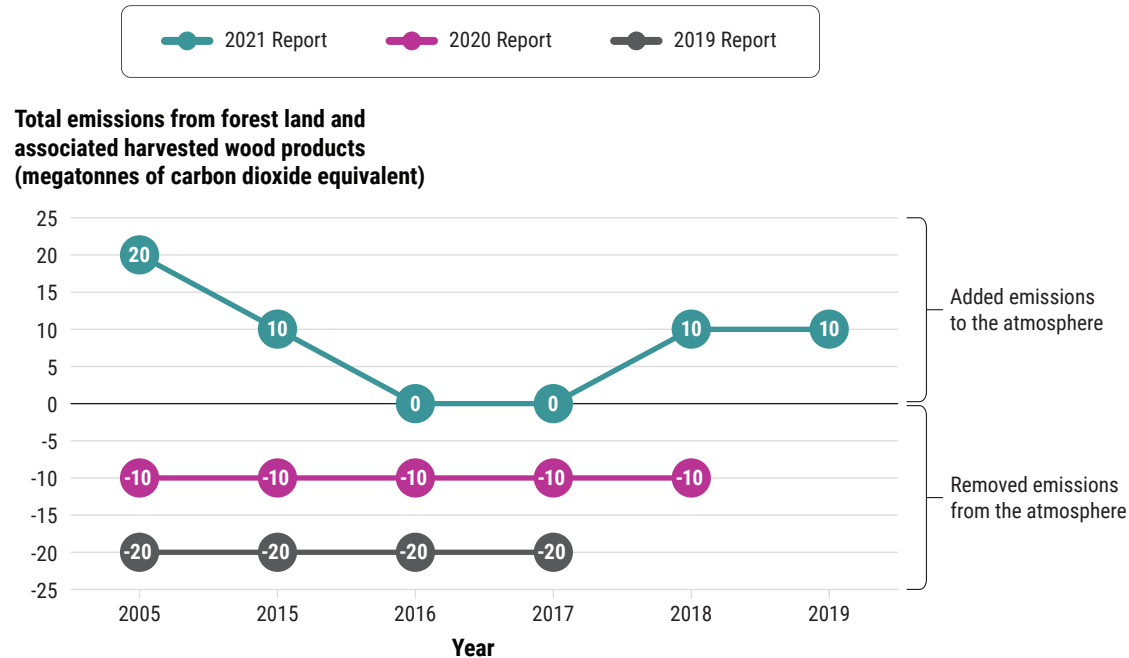See **Recommendations** and Responses at the end of this report for detailed responses.

Inconsistent progress reporting

Findings

1.66   We found several inconsistencies in the reporting about forest-related emissions that made results more difficult to access and understand, both by the public and decision makers.

1.67   **Recalculations**. We found that continuing recalculations, in response to updates in data or methods, could change whether forests were reported as sources or sinks (when forests absorb more carbon from the atmosphere than they release): The value for the same year changed significantly from report to report (Exhibit 1.8). The national inventory report identified the most important changes, but it did not describe the effects of these changes. While improving information is important, this continuous and significant changing of values makes it difficult for decision makers to rely on the reporting for designing and planning measures.

Exhibit 1.8—Estimates of emissions from forest land use in national inventory reports varied significantly from report to report

Legend: 2021 Report, 2020 Report, 2019 Report

Total emissions from forest land and associated harvested wood products (megatonnes of carbon dioxide equivalent)

Source: Based on data from Environment and Climate Change Canada

1.68   **Approaches to accounting**. We found that Canada's approach for calculating the effects of forests on Canada's national emission target was different than for other sectors, such as electricity or oil and gas. According to policy guidance developed by the Intergovernmental Panel on Climate Change, countries can use different sets of rules to report on the contributions of forests toward emission targets.

1.69   The rules that Canada uses, known as reference-level accounting, are intended to better reflect a change from a business-as-usual management of forests. Projected emissions are compared against a scenario (the reference level), which assumes that historical harvest rates would continue. Under reference-level accounting, the difference between the projection and the scenario is reported as the contribution that forests provide toward the climate target.

1.70   By 2026, reference-level accounting will be used by few other developed countries. Some other countries, such as the United States, use a "net-net" approach, which is similar to what Canada uses for the rest of its economy. Under the net-net approach, when assessing whether an emissions target was met, emissions in 2030 are compared against actual emissions in a base year, such as 2005. Natural Resources Canada developed the reference-level approach, which Canada proposed internationally in 2008. Department officials told us that the department chose the reference-level approach to remove the effect of the age of its forests, because older trees capture less carbon annually than younger trees do.

1.71   By comparing against a scenario that assumes that historical harvest rates would continue, in our view, Canada's approach presented an artificial emission reduction that counted toward its 2030 target without any mitigation action or policy changes in the forestry sector. Moreover, reference-level accounting is difficult to understand and lacks transparency.

1.72   Recently, the European Union announced that as of 2026, it would no longer use reference-level accounting to report its progress. After that announcement, the Canadian government initiated an internal review of its accounting approach.

1.73   Moreover, we found that while Canada used reference-level accounting to estimate the effects of forests toward its 2030 target, it had not used this approach in its historical reports. The information was available only in the projection reports, which are less timely and are published in several report types that are hard to compare. Canada's historical reports are commonly used to assess whether progress is being made toward national targets. Furthermore, Canada's legislation to improve accountability on climate action names the historical reports as the source for assessing whether Canada has met its targets.

1.74   The departments disagree that the accounting approach for estimating the contribution of forests toward meeting the 2030 target should be reported in Canada's historical reports. According to Natural Resources Canada, the choice of accounting approaches is a policy decision, and the resulting information should not be published in historical reports. However, other countries, such as Australia and the United Kingdom, include this information in their historical reports for tracking progress. In our view, the inconsistency between historical and projection reporting on the effect of forests on emissions, which is unlike other sectors, creates confusion and limits Canadians' ability to hold the government to account.

Take urgent action to combat climate change and its impacts.

Source: United Nations

1.75   **Performance indicators and targets**. The United Nations' Sustainable Development Goal 13 (Climate Action) commits to taking urgent action to combat climate change and its impacts. We found that Environment and Climate Change Canada did not include forests in other key greenhouse gas indicators—such as indicators under the Sustainable Development Goals and the Federal Sustainable Development Strategy— even though those frameworks have the same 2030 target. Calculating greenhouse gas indicators differently or excluding different components create inconsistencies that can hinder the monitoring and reporting of progress and the identification of needed adjustments.

1.76　　For its reporting to better support the limiting of greenhouse gas emissions and global temperature rise, Environment and Climate Change Canada should

- consider and report publicly on which accounting approach best meets criteria related to supporting better-informed policy decisions and actual emission reductions
- provide additional estimates in the historical reports that use the same accounting approach for estimating the effects of forests that it plans to use for meeting its 2030 target
- consistently include forested land in the relevant greenhouse gas indicators for frameworks that report against Canada's greenhouse gas emission targets, such as the Canadian Indicator Framework for the Sustainable Development Goals and the Federal Sustainable Development Strategy

Environment and Climate Change Canada's response. Agreed.

See **Recommendations** and Responses at the end of this report for detailed responses.

Natural Resources Canada's quality control and review for estimating the future effects of forests were limited

Why this finding matters

1.77　　This finding matters because complete and accurate data is fundamental to developing credible emission reduction plans to help Canada meet its greenhouse gas emission targets. This, in turn, depends on rigorous modelling, supported by a comprehensive **quality control**[3] framework.

Context

1.78　　The Commissioner of the Environment and Sustainable Development's 2014 report, Mitigating Climate Change, identified issues with clarity and consistency in the government's estimates and reporting on greenhouse gas emissions and carbon removals by the forest sector. Other recent reports by the Commissioner, such as the 2022 report, Hydrogen's Potential to Reduce Greenhouse Gas Emissions, identified issues with the transparency, assumptions, external review, and reporting of Canada's emission modelling for other sectors.

3　　**Quality control**—Routine technical activities to assess and maintain the quality of an inventory of data, performed by personnel compiling the inventory. Activities include performing consistency checks of data correctness, identifying errors, and documenting work.

Source: Adapted from the Intergovernmental Panel on Climate Change

Weak quality control and review for projected estimates

Findings

1.79   We found that Natural Resources Canada and Environment and Climate Change Canada's quality control system was more comprehensive for historical estimates than for projected estimates. For example, the departments did not have detailed documentation of steps taken with the quality checks for their projected estimates. Furthermore, Natural Resources Canada did not document the outcomes of these checks and the resolution of potential errors for its projected estimates. Natural Resources Canada told us that processes and procedures for the projected estimates analysis are less mature and are carried out with fewer dedicated resources than the historical estimates.

1.80   We found that a formal continuous improvement plan was in place to track progress in addressing recommendations from internal and external reviews of historical estimates. We found that all of the recommendations from the United Nations Framework Convention on Climate Change expert reviews of the historical estimates were addressed or in the process of being addressed. We found that while projected estimates had some continuous improvement measures, no formal plan was in place.

1.81   We found that many of the departments' quality control checks were completed manually and relied on specific individuals' technical expertise and judgment. In 2015, Natural Resources Canada performed an internal audit that recommended identifying key and critical scientific research positions and undertaking succession planning. Seven years later, we found no adequate evidence that these critical positions had been identified and that corresponding succession plans had been developed. In our view, this posed a risk that it would not meet international reporting obligations because retirements for some individuals were imminent.

1.82   During our audit period, we found that external review of the historical and projected estimates was limited to the international expert reviews required under the United Nations Framework Convention on Climate Change. Formal consultations with stakeholders were limited, as was public scrutiny. For example, the departments convened an international expert panel in 2016 to review methodological changes. However, the departments have not undertaken consultations with outside experts in recent years as part of their quality assurance related to estimates of forest emissions and removals.

1.83   The United Nations' Intergovernmental Panel on Climate Change's guidance on external reviews notes that for important categories of emission sources, there should be expert peer review beyond that of the convention's review team. According to Canada's national inventory reports, emissions from forested land have the strongest influence on the national trend, more than emissions from road transportation. Therefore, additional external review procedures, such as more extensive peer reviews or audits, would bolster confidence in the estimates.

Recommendation

1.84   To improve quality, transparency, and trust in climate change modelling, Natural Resources Canada, working with Environment and Climate Change Canada, should strengthen the quality control and review process for its projected estimates by increasing

- documentation of the control processes in place

- knowledge transfer and succession planning for key and critical positions

- periodic external review, especially following significant methodological change

Natural Resources Canada's response. Agreed.

See **Recommendations** and Responses at the end of this report for detailed responses.

Conclusion

1.85   We concluded that Natural Resources Canada, working with Environment and Climate Change Canada, did not adequately design and implement the 2 Billion Trees Program. Given the early trends and issues establishing partnerships, it is unlikely that the program will meet its objectives unless significant changes are made.

1.86   We also concluded that Natural Resources Canada, working with Environment and Climate Change Canada, did not provide a full and transparent picture of how Canada's forests remove carbon from the atmosphere or contribute carbon to it. Natural Resources Canada developed a system to estimate greenhouse gas emissions and removals in Canada's forests, and the departments' reporting answered to international obligations. However, there were several opportunities to make the estimates and the resulting reporting more consistent, easier to understand, and more accessible and useful to decision makers and the public.

About the Audit

This independent assurance report was prepared by the Office of the Auditor General of Canada on forests and climate change: the 2 Billion Trees Program and Canada's estimating, accounting, and reporting on greenhouse gas emissions from the forest sector, led by Natural Resources Canada, working with Environment and Climate Change Canada. Our responsibility was to provide objective information, advice, and assurance to assist Parliament in its scrutiny of the government's management of resources and programs and to conclude on whether the 2 Billion Trees Program and Canada's estimating, accounting, and reporting on greenhouse gas emissions from the forest sector complied in all significant respects with the applicable criteria.

All work in this audit was performed to a reasonable level of assurance in accordance with the Canadian Standard on Assurance Engagements (CSAE) 3001—Direct Engagements, set out by the Chartered Professional Accountants of Canada (CPA Canada) in the CPA Canada Handbook—Assurance.

The Office of the Auditor General of Canada applies the Canadian Standard on Quality Management 1—Quality Management for Firms That Perform Audits or Reviews of Financial Statements, or Other Assurance or Related Services Engagements. This standard requires our office to design, implement, and operate a system of quality management, including policies or procedures regarding compliance with ethical requirements, professional standards, and applicable legal and regulatory requirements.

In conducting the audit work, we complied with the independence and other ethical requirements of the relevant rules of professional conduct applicable to the practice of public accounting in Canada, which are founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality, and professional behaviour.

In accordance with our regular audit process, we obtained the following from entity management:

- confirmation of management's responsibility for the subject under audit

- acknowledgement of the suitability of the criteria used in the audit

- confirmation that all known information that has been requested, or that could affect the findings or audit conclusion, has been provided

- confirmation that the audit report is factually accurate

Audit objective

The objective of this audit was to determine whether Natural Resources Canada, working with Environment and Climate Change Canada,

- adequately designed and implemented the 2 Billion Trees Program

- estimated and reported on historical and future forest-sector carbon emissions and removals in a credible and transparent manner

Scope and approach

The audit focused on the first year of implementation (2021–22) of the 2 Billion Trees Program and the program's overall design. The audit also focused on the estimating, accounting, and reporting of greenhouse gas emissions from the forest sector. We gathered audit evidence through document review; interviews with federal officials, external experts, and stakeholders; system and process walkthroughs; and data analysis.

We did not examine accounting or reporting related to land use, land-use change, or forestry-sector emissions or removals from crop lands, wetlands, grasslands, or other lands; we focused on the forest component of the sector only.

This audit considered relevant United Nations' Sustainable Development Goals and targets, including targets in the Canadian Indicator Framework for the Sustainable Development Goals. The audit also considered the availability of reliable, disaggregated data for measuring progress toward these goals and targets.

Criteria

We used the following criteria to conclude against our audit objective:

Criteria	Sources
Natural Resources Canada, supported by Environment and Climate Change Canada, adequately designed the 2 Billion Trees Program to plant 2 billion trees and meet its intended outcomes, which include capturing carbon, enhancing biodiversity and supporting human well-being.	• Policy on Results, Treasury Board • Policy on Transfer Payments, Treasury Board • A Healthy Environment and a Healthy Economy, Environment and Climate Change Canada, 2020 • Minister of Natural Resources Mandate Letter, 2019 • Minister of Natural Resources Mandate Letter, 2021 • Speech From the Throne, 2019 • Speech From the Throne, 2020 • 2022–23 Departmental Plan, Natural Resources Canada • IUCN Global Standard for Nature-based Solutions, International Union for Conservation of Nature, 2020

Criteria	Sources
Natural Resources Canada is effectively implementing the 2 Billion Trees Program.	• Policy on Results, Treasury Board • Policy on Transfer Payments, Treasury Board • A Healthy Environment and a Healthy Economy, Environment and Climate Change Canada, 2020 • Minister of Natural Resources Mandate Letter, 2019 • Minister of Natural Resources Mandate Letter, 2021 • Speech From the Throne, 2019 • Speech From the Throne, 2020 • 2022–23 Departmental Plan, Natural Resources Canada • IUCN Global Standard for Nature-based Solutions, International Union for Conservation of Nature, 2020
Natural Resources Canada and Environment and Climate Change Canada have systems and practices in place to ensure the quality of the information they have used for their estimates of historical and future forest greenhouse gas emissions and removals.	• 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change • 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change • Paris Agreement, United Nations, 2015 • 2014 Fall Report of the Commissioner of the Environment and Sustainable Development, Chapter 1—Mitigating Climate Change
Natural Resources Canada uses methods for estimating historical and future greenhouse gas emissions and removals from the forest sector that are suitable for the intended purpose.	• *Canadian Net-Zero Emissions Accountability Act* • Policy on Results, Treasury Board • Paris Agreement, United Nations, 2015 • United Nations Framework Convention on Climate Change, United Nations, 1992 • Handbook for the Review of National Greenhouse Gas Inventories, United Nations Framework Convention on Climate Change, 2021 • 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change • 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol, Intergovernmental Panel on Climate Change, 2014 • 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change

Criteria	Sources
Environment and Climate Change Canada prepares reports that communicate the information about historical and future greenhouse gas emissions and removals from the forest sector in a transparent and consistent way.	• Pan-Canadian Framework on Clean Growth and Climate Change, Environment and Climate Change Canada, 2016 • *Canadian Net-Zero Emissions Accountability Act* • 2014 Fall Report of the Commissioner of the Environment and Sustainable Development, Chapter 1—Mitigating Climate Change • 2017 Fall Reports of the Commissioner of the Environment and Sustainable Development, Report 1—Progress on Reducing Greenhouse Gases—Environment and Climate Change Canada • Paris Agreement, United Nations, 2015 • National Inventory Reporting Guidelines, United Nations Framework Convention on Climate Change, 2013 • Biennial Reporting Guidelines, United Nations Framework Convention on Climate Change, 2011 • National Communications Reporting Guidelines, United Nations Framework Convention on Climate Change, 1999 • 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change

Period covered by the audit

The audit covered the period from 1 December 2019 to 31 October 2022. This is the period to which the audit conclusion applies. However, to gain a more complete understanding of the subject matter of the audit, we also examined certain matters that preceded the start date of this period.

Date of the report

We obtained sufficient and appropriate audit evidence on which to base our conclusion on 14 February 2023, in Ottawa, Canada.

Audit team

This audit was completed by a multidisciplinary team, from across the Office of the Auditor General of Canada led by Kimberley Leach, Principal. The principal has overall responsibility for audit quality, including conducting the audit in accordance with professional standards, applicable legal and regulatory requirements, and the office's policies and system of quality management.

Recommendations and Responses

In the following table, the paragraph number preceding the recommendation indicates the location of the recommendation in the report.

Recommendation	Response
1.36 To ensure that it can meet the planting objectives of the 2 Billion Trees Program, Natural Resources Canada should • clearly document how the program will be operationalized to meet its planting goals and its 2031 and 2050 targets for reducing greenhouse gas emissions • promptly develop specific measures to address the lack of long-term agreements with project partners	Natural Resources Canada's response. Agreed. Natural Resources Canada agrees that robust planning is essential to the long-term success of the program. The program will build on the design and implementation framework developed in 2021 as a blueprint for program implementation. The program will further document and enhance its long-term planning using lessons learned to develop a long-term operational plan. This will be completed by December 2023. Natural Resources Canada agrees that long-term agreements are crucial for successful program implementation. The program will implement an ongoing call for proposals to encourage proposals for long-term agreements and will place special focus in 2023 on securing agreements with provinces and territories. It will also leverage its 2 Billion Trees online portal to speed up the application process. The program depends on stakeholder interest to fund tree planting projects; however, all efforts will be made to engage as many stakeholders as possible and process proposals as quickly as possible when received with an aim to sign agreements representing the majority of planting by June of 2027.
1.43 To ensure that Natural Resources Canada is meeting the objectives of the 2 Billion Trees Program, including its 2031 and 2050 targets for reducing greenhouse gas emissions, the department should have • a long-term monitoring plan to assess the health and survival of the trees planted through the program • clear quantitative interim and final targets for the program's performance indicators	Natural Resources Canada's response. Agreed. Natural Resources Canada will complete its efforts to establish a 2 Billion Trees long-term monitoring plan by leveraging the allocated funding dedicated to science toward monitoring and reporting. This includes activity verification and monitoring systems, as well as new methods of monitoring planting outcomes, resulting from advanced research by the Canadian Forest Service. Natural Resources Canada will build on its experience to initiate remote sensing-based monitoring and verification systems for the program as tree planting activity ramps up. This plan will be completed by March 2024. Natural Resources Canada will set quantitative interim and final targets for the program's performance indicators and will work with Environment and Climate Change Canada and Agriculture and Agri-Food Canada to implement and communicate these targets through the 2024–25 Departmental Results Report.

Recommendation	Response
1.47 To enhance biodiversity and habitat-related benefits of the 2 Billion Trees Program over the long term and to contribute to Canada's biodiversity goals, Natural Resources Canada should • develop criteria for monoculture planting projects to ensure that these projects do not hinder biodiversity goals • make specific guidance and support about biodiversity and habitat needs available to all partners • provide incentives to habitat restoration work for all project streams • leverage information provided by Environment and Climate Change Canada to enhance reporting on biodiversity benefits	Natural Resources Canada's response. Partially agreed. Natural Resources Canada will develop criteria for monoculture planting projects and communicate to stakeholders by December 2023. Natural Resources Canada will work with Environment and Climate Change Canada to make specific guidance and support about biodiversity and habitat needs available to all program stakeholders by April 2024. Natural Resources Canada will also continue to make eligible costs for professional services (ecologists, biologists, and so on) and encourage applicants to consult professionals for habitat restoration projects. Natural Resources Canada disagrees with providing additional incentives, either in the form of new funding or preference for awards of projects. Given that habitat restoration is significantly more expensive, additional incentives for habitat restoration work would reduce funding available to meet the core objectives of the program regarding number of trees planted and climate mitigation objectives. Natural Resources Canada will work with Environment and Climate Change Canada to enhance reporting on biodiversity benefits by May 2024.
1.64 Given the importance of forests to greenhouse gas emissions and removals, and in consideration of Canada's unique national circumstances, Natural Resources Canada and Environment and Climate Change Canada should commission and publish an independent expert review and take action to address any gaps or opportunity for improvements. This review should • consider Canada's approach to estimating and reporting emissions related to forests and specifically to logging • include a formal engagement process with users, such as researchers and environmental and industry groups, on how to better meet their needs and support accountability and decision making	Natural Resources Canada's and Environment and Climate Change Canada's response. Agreed. The departments agree with the importance of independent review. Each annual National Inventory Report and Biennial Report is reviewed by an international expert review team. The reviews are published online. The science underlying carbon reporting is peer-reviewed and so are future improvements to carbon models prior to implementation in the inventory system. The departments also agree with the importance of engagement. The government has engaged with experts and stakeholders through multiple forums to identify knowledge and information gaps and prioritize input to the scientific process that underlies carbon reporting: A Blueprint for Forest Carbon Science in Canada, Climate Science 2050, The 2019 Canadian Carbon Cycle Research Workshop, or the recent Council of Canadian Academies report on Nature-Based Climate Solutions. Further, the departments have engaged in dialogues with environmental groups who have published reports critical of forest carbon reporting and accounting.

Recommendation	Response
	In the short term, the departments will rely on existing consultations. Known knowledge gaps established through these recent expert consultations and issues raised by environmental groups will be clearly addressed and published in future versions of the interdepartmental Improvement Plan for Forest and Harvested Wood Products Greenhouse Gas Estimates.
1.65 To inform policy decisions that support emission reductions and improve transparency, Environment and Climate Change Canada, working with Natural Resources Canada, should, in its reports on historical and projected emissions,

• state the greenhouse gas effects of changes in forest management

• work with provinces and territories to report data by province and territory, so that the effects of forest management practices are more evident

• present information in ways that the public can readily access and easily understand

and, in its projection reports,

• more clearly state which policies and measures are included and their greenhouse gas effects

• more clearly describe the methods, information, and assumptions it uses to estimate and account for emissions and removals | Environment and Climate Change Canada's and Natural Resources Canada's response. Agreed. Environment and Climate Change Canada with Natural Resources Canada agree that reporting greenhouse gas emissions and removals must be consistent and transparent, ensuring information is clearly communicated and readily accessible by the public.

Canada's National Inventory Report is a scientific document that conforms to international standards, reporting historical emissions by emission source category. This ensures precision of communication and transparency among the international greenhouse gas reporting community. The departments will maintain the precise language of the document and will explore opportunities to improve consistency, clarity, and accessibility among different greenhouse gas reports. The departments will also continue to work with provinces and territories to report data.

In Canada's Eighth National Communication and Fifth Biennial Report submitted to the United Nations Framework Convention on Climate Change on 31 December 2022, all policies and measures included in the modelling were listed and estimates of projected emissions reductions associated with these measures were provided. In future reporting, Environment and Climate Change Canada will continue to work with Natural Resources Canada and other responsible or relevant departments to communicate more clearly how past and future changes in land management practices affect projected greenhouse gas emissions and removals, to the degree that this is possible.

More detailed data on land use, land-use change, and forestry emissions and accounting projections were published on Environment and Climate Change Canada's open data portal in 2022 and will continue to be published annually. |

Recommendation	Response
1.76 For its reporting to better support the limiting of greenhouse gas emissions and global temperature rise, Environment and Climate Change Canada should • consider and report publicly on which accounting approach best meets criteria related to supporting better-informed policy decisions and actual emission reductions • provide additional estimates in the historical reports that use the same accounting approach for estimating the effects of forests that it plans to use for meeting its 2030 target • consistently include forested land in the relevant greenhouse gas indicators for frameworks that report against Canada's greenhouse gas emission targets, such as the Canadian Indicator Framework for the Sustainable Development Goals and the Federal Sustainable Development Strategy	Environment and Climate Change Canada's response. Agreed. Environment and Climate Change Canada and Natural Resources Canada agree that Canada's forest carbon accounting approach must be one based on the best available data and science, ensuring a strong foundation to inform policy decisions on climate change mitigation. Environment and Climate Change Canada, Natural Resources Canada, and other responsible departments are conducting a review of Canada's land use, land-use change, and forestry accounting approach, including the reference-level approach used for the managed forests and harvested wood products. Environment and Climate Change Canada and Natural Resources Canada note that presenting reference-level accounting numbers in parallel to historical forest emissions in Canada's National Inventory Report for estimating the contribution of forests toward meeting Canada's 2030 greenhouse gas emission reduction target may not effectively improve clarity for policy makers. However, the departments agree that the clarity of the contribution of forests to reduction targets could be improved among the international and domestic reporting documents. Environment and Climate Change Canada will clearly and consistently report on the 2030 greenhouse gas target. In addition to the National Inventory Report and in alignment with other reports, Environment and Climate Change Canada provides accessible and transparent information about Canada's greenhouse gas emissions and projections through the Canadian Environmental Sustainability Indicators program. Environment and Climate Change Canada will consider including contextual information, such as the Canadian Environmental Sustainability Indicators land-based greenhouse gas emissions and removals indicator, when reporting on progress toward the 2022 to 2026 Federal Sustainable Development Strategy greenhouse gas target.

Recommendation	Response
1.84 To improve quality, transparency, and trust in climate change modelling, Natural Resources Canada, working with Environment and Climate Change Canada, should strengthen the quality control and review process for its projected estimates by increasing • documentation of the control processes in place • knowledge transfer and succession planning for key and critical positions • periodic external review, especially following significant methodological change	Natural Resources Canada's response. Agreed. Natural Resources Canada, working with Environment and Climate Change Canada, agrees that quality control and review are crucial elements to ensuring transparent production of greenhouse gas estimates. The departments have developed a quality assurance and quality control process for forest-related greenhouse gas projection estimates that aims to strike a balance between automated checks, standard operating procedures, and expert judgment. The departments will work to formally document the quality assurance and quality control process for the forest greenhouse gas projections, ensuring it is transparent and easily communicated. Further, Natural Resources Canada will continue to enhance knowledge transfer and succession planning for key and critical positions related to the production of forest greenhouse gas projections. Both actions will be completed by December 2024 and updated regularly thereafter. Natural Resources Canada agrees to work with Environment and Climate Change Canada to ensure periodic external review following significant methodological changes as those occur. Any such review would be in addition to existing review mechanisms, including that Canada's Biennial Reports to the United Nations Framework Convention on Climate Change are subject to international review conducted by international expert teams, coordinated by the United Nations Framework Convention on Climate Change Secretariat. These detailed reviews include specific recommendations for Canada on how to improve its approach. In addition to the United Nations Framework Convention on Climate Change review process, forest greenhouse gas projections are subject to external consultations and review through the National Forest Sinks Committee, composed of expert peers from provincial and territorial governments.