



Climate Change

- The Role of Canada's Forests -



What is Climate Change

Human activity is changing our climate. We are warming the atmosphere by emitting increasing amounts of greenhouse gases into the atmosphere.

Our emissions come from fossil fuel use in our homes and businesses; from industrial and agricultural processes; and from deforestation and other human-caused losses of forest and soil carbon.

As a result, we are experiencing changes in temperature, precipitation, water levels, and the frequency and severity of storms and other extreme weather incidents.

Various Impacts

These changes are both regional and global in scope. The Intergovernmental Panel on Climate Change projects that the global mean temperature may rise 1.4 to 5.8°C in the next 100 years. This will impact most of the world's ecosystems.

Regionally, changes may range from altered habitats in coastal areas as a result of rising sea levels to the expansion northward of tree lines and decrease of permafrost zones in northern areas.



The Role of the Forest

Forest ecosystems remove carbon dioxide, the main greenhouse gas, from the atmosphere because trees and other vegetation need carbon (C) to live and grow. The C is stored in both living and dead vegetation, and in peat and soil. Forest ecosystems release C back into the atmosphere through decomposition or burning.

A forest that removes more C from the atmosphere than it releases is called a **sink**. A forest that releases more C than it removes is called a **source**. This status can change over time.



Climate Change Forest Impacts

Whether a sink or a source, forests can be affected by a change in climate through:

- More severe weather (e.g. floods, ice storms, heat waves, droughts)
- More frequent and/or more severe fires and pest infestations
- Changes to biodiversity

Predicting the severity and frequency of these incidents, as well as the regions most likely to be affected, is difficult.

Other Forest Impacts

A change in climate can also affect the productivity of our forests.

- Higher temperatures, longer growing seasons and higher C concentrations could enhance the productivity of some forests.
- An increase in natural disturbances, winter dieback and moisture stress could reduce forest productivity.

With 1 out of every 16 jobs in Canada connected to forestry, this can have profound social and economic implications.

Regional Impacts in Canada

Boreal Forest

- Forest may migrate northward and decrease in size
- For example, temperate forests may replace much of the southern boreal forest
- Increased fires in the western boreal, decreased fires in the eastern interior

Coasts

- Increased storms
- Increased growing season/warmer winters
- Increased incidents of fire and pest infestation

Prairies

- Some tree species may disappear at the edges of their current range
- Grasslands and temperate deciduous species may migrate northward

The North

- Shift northward of Canada's forest (100 km for every 1° of warming)
- Environmental conditions (soil, fertility, hours of daylight) may slow northern forest expansion into the tundra



What Can Be Done?

In 1992, the United Nations Framework Convention on Climate Change (UNFCCC) established a commitment by all countries to address climate change; as well, industrialized countries committed to limiting their greenhouse gas emissions.

The 1997 Kyoto Protocol to the UNFCCC set legally binding emission limitation targets for 38 industrialized countries for the 2008-12 period.

The Kyoto Protocol and Forests

The Protocol increased awareness of the role of forests in relation to climate change, and established a framework for accounting for forest carbon.

Industrial countries have the choice of accounting for forest management, and they must account for:

- Creation of new forests - afforestation/reforestation
- Permanent loss of forest - deforestation

Afforestation/reforestation projects in developing countries can also be counted through the innovative Clean Development Mechanism.



Canada's Role

Canada agreed in the Kyoto Protocol to reduce its greenhouse gas emissions to 6% below 1990 levels by 2008-2012. That's about 30% below projected levels for 2010. We signed the Protocol in 1998 and ratified it in 2002.

To meet our commitment, the Government of Canada adopted a National Implementation Strategy on Climate Change and in 2002 created a *Climate Change Plan for Canada*. Since 1997 the Government has invested \$3.7 billion to address climate change.

Canada's Forests and Kyoto

Canada's forests can play an important role in the global efforts to address climate change.

Forest management can increase the C stored in our forests. At the same time, natural disturbances - fires and insect infestations - result in emissions that cannot be controlled.

Canada's Forests and Kyoto

Creation of new forests - historically there has been little need to do this in Canada, but government initiatives are exploring the future potential.

- A feasibility assessment of afforestation is underway.
- A \$20 million investment to demonstrate the potential of fast-growing plantations is beginning - Forest 2020 initiative.

Deforestation - while the annual area involved is small the emissions are large. Work is underway to understand how best to address deforestation.

The CFS Contribution

The Government of Canada, through the Canadian Forest Service (CFS) of Natural Resources Canada, is working with provinces and territories and other stakeholders to:

- Improve estimates of the contribution forests can make to Canada's Kyoto target, and ways to increase it.
- Make the decision (needed by 2006) on whether to include forest management in our Kyoto accounting.
- Develop and implement a forest C measurement and monitoring system to meet international standards.
- Understand climate change impacts and how best to adapt to them.

Assessing Change

CFS science is making a major contribution. For example, the following four CFS initiatives provide credible factual information on Canada's forests to help in assessing climate change impacts:

- Forest Health Network
- Climate Change Impacts on the Productivity and Health of Aspen (CIPHA)
- Boreal Ecosystem Monitoring Sites (BERMS)
- Earth Observation for Sustainable Development (EOSD)



Information Gathering

To aid with Canada's reporting obligations under the Kyoto Protocol, the CFS is currently working on a National Forest Information System.

The system will enable access to a national forest inventory, a forest ecosystem classification system and other relevant information sources. CFS and partners will be able to access and integrate forest information located across the country.

Counting Our Carbon

The CFS is also working on an internationally acceptable National Forest C Accounting System to report on forest C stock changes.

The new system will:

- be in compliance with UNFCCC reporting requirements;
- provide top-quality information on Canada's managed forests; and
- assist in evaluating forest management decisions.

Counting Our Carbon

The National Forest C Accounting System will include:

- The National Forest Inventory and other inventories
- Remote sensing programs
- Growth and yield data for biomass dynamics
- Statistics on natural disturbances, forest management activities and land-use changes
- A landscape-level computer model to simulate the C dynamics of forest ecosystems, including dead organic matter C dynamics

CFS Partners

CFS is working with several partners to develop the National Forest C Accounting System. They include:

- Environment Canada
- Agriculture and Agri-Food Canada
- Provinces and territories
- University and government scientists

The goal for this project is the production of a full report on Canada's national forest carbon account by 2006.

Adapting to Climate Change

Despite all our efforts, climate change is inevitable and more research is now examining adaptation. The CFS is exploring

- Impacts and adaptation awareness initiatives.
- How forest practices can incorporate resiliency, flexibility and diversity.

The Canadian Climate Impacts and Adaptation Research Network (C-CIARN) Forest Sector plays a key role in these efforts.

Current CFS Research

Much of the research currently conducted at the CFS focuses on how the managed forest can sustain and enhance its capacity for carbon storage while adapting to change. For example:

- Research on “fire-smart” landscapes is aimed at forest fire management activities that can reduce the intensity and spread of wildfires.
- Ground-breaking work in biotechnology and biodiversity is exploring the introduction of new tree species and hybrids that are more resilient to heat, drought, pests and pathogens.

Fast Facts

- The total store of carbon in Canadian forests and related resources, including soils, peatlands and forest products, was over 225 billion tonnes (t) in the 1990s.
- 40% of the world's terrestrial carbon stocks are found in the boreal forests of Canada, Russia, Alaska and Scandinavia.
- In Canada, forest fires release an average of 27 megatonnes (Mt) of carbon per year – roughly 20% of what is released from fossil fuel use. After a fire, it takes 20 to 30 years for the carbon sink to recover.

To Learn More

To learn more about climate change and Canada's forests please visit the following websites:

- Government of Canada:
climatechange.gc.ca
- Natural Resources Canada:
climatechange.nrcan.gc.ca
- Canadian Forest Service - science research:
nrcan-nrcan.gc.ca/cfs-scf/science
- Canadian Forest Service - forest carbon accounting:
carbon.cfs.nrcan.gc.ca
- Impacts and Adaptation Research Network – Forests:
forest.c-ciarn.ca