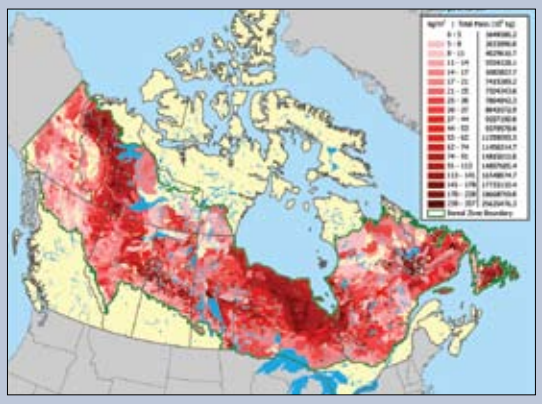
Canada's Boreal Forest
SHIELD AGAINST GLOBAL WARMING

Global Boreal Forest

The world's forests store over one trillion tons of carbon.[1] The circumpolar Boreal ecosystem is comprised of forests, wetlands, and peatlands that make up much of this global carbon storehouse. The carbon stored in the Boreal Forest is facing a series of threats from industrial development and global warming. While reducing emissions from fossil fuels is critical, scientists now recognize that conserving large, carbon-rich forests is also necessary to mitigate global warming. Boreal conservation efforts will help prevent carbon from being released into the atmosphere, reduce the negative impacts to Boreal Aboriginal communities, and minimize the risk of extinction of wildlife species due to global warming.

The Boreal is the World's Largest Terrestrial Storehouse of Carbon


Soil Organic Carbon in Canada's Boreal Forest
Details Inside

The Global Boreal Forest encircles the planet just below the Arctic region in Canada, Alaska, Russia, and Scandinavia, and houses approximately 50 percent of the world's remaining original forests.[2] The Boreal Forest is the world's largest land reservoir of carbon. This "carbon bank" stores 22 percent of the total carbon stored on the earth's land surface, and almost twice as much carbon per unit area as tropical forests.[3] This is largely because in Boreal climates, low temperatures slow decomposition, building deep, carbon-rich, organic soils over centuries.

The Canadian Boreal Forest stores an estimated 186 billion tons of carbon in forest and peat ecosystems.[4] This is equivalent to 27 years' worth of the world's carbon emissions in 2003 from the burning of fossil fuels.[5]

Changes to the natural systems of Canada's Boreal Forest may alter its ability to store carbon. Fire is a natural and critical part of a healthy Boreal ecosystem, but global warming appears to be causing more damaging fires with unnatural frequency, increasing greenhouse gas emissions. Additionally, the frequency, duration, and extent of insect outbreaks are predicted to increase with global warming, accelerating decomposition and the release of carbon dioxide into the atmosphere.[6] Maintaining intact, healthy areas in the Boreal improves the ecosystem's resilience and resistance to these increased disturbances. Industrial activity also increases emissions by removing the protective forest cover, changing hydrology (which can speed up decomposition of soil and peat), and physically damaging soils. While carbon emitted by natural processes varies from year to year, we must limit emissions resulting from human activity.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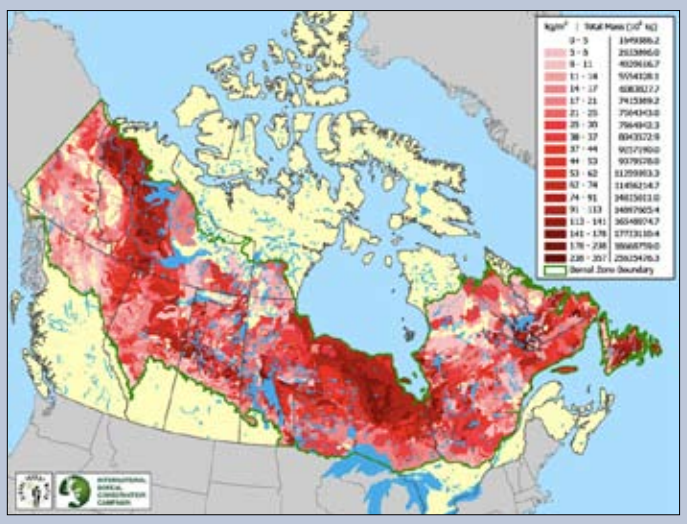
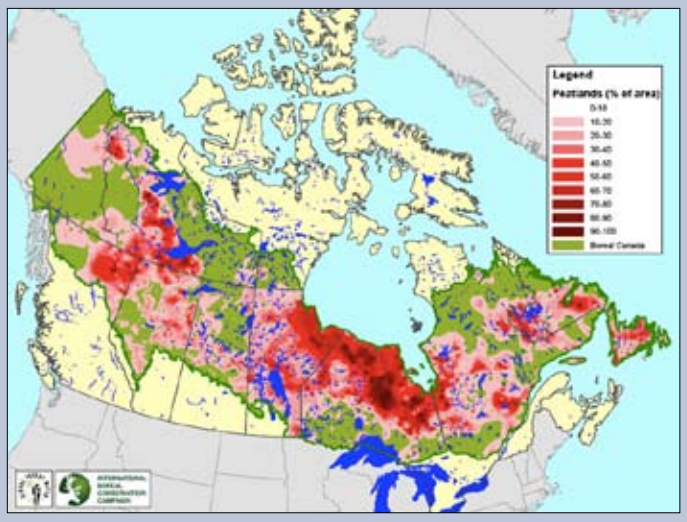
Boreal Soil – Canada's Carbon Bank



Globally, nearly 30 percent of the soil organic carbon is locked in tundra and Boreal ecosystems. Since approximately 75 percent of Canada is comprised of these ecosystems, a significant portion of the world's soil carbon is stored in Canadian territory. Most (88 percent) of the organic carbon bound in Canadian soils, including some in peatlands and permafrost, occurs at middle and high latitudes (northward from the southern limit of the Boreal Forest).[7]

To view full-size maps in PDF format, visit www.interboreal.org/globalwarming/

Peatlands in Canada's Boreal



Peatlands are recognized worldwide as highly important for carbon storage. Although they cover only three percent of the world's land area, peatlands contain almost 30 percent of all terrestrial carbon.[8] Peat is formed when decaying plant matter from mosses, sedges, grasses, shrubs, or trees accumulates in permanently waterlogged conditions. When left undisturbed, peatlands can effectively store the carbon sequestered in these plants for thousands of years.

Canada has the largest peatlands in the world, encompassing 12 percent of the nation's land area. Canada's peatlands stretch from Newfoundland to the Northwest Territories, with especially high concentrations found in northern Ontario and Manitoba.[9] These peatlands are essential to the global environment because they retain, purify, and deliver fresh water; store carbon; absorb pollutants; and support numerous species of unique plants and wildlife.

Permafrost in Canada's Boreal

Permafrost is permanently frozen soil, sediment, or rock that remains at or below zero degrees Celsius (32 degrees Fahrenheit) for at least two years. Nearly 25 percent of the earth's land surface is covered by permafrost, including about 50 percent of Canada's land area. Carbon is stored under the frozen ground through a slow freeze-thaw process that progressively moves organic matter deeper into the ground where it is sealed off from decomposition by the low temperature.

As indicated by the map, northern portions of Canada's Boreal Forest, particularly the western Boreal, are occupied by vast areas of carbon-rich permafrost. Although often overlooked in global carbon accounting, permafrost regions worldwide store an estimated 400 billion metric tons of carbon. This is equivalent to 20 percent of the total carbon stored in terrestrial plants and soils.[10] The thawing of permafrost can dramatically increase the decomposition of organic matter contained in it, with a resultant release of carbon into the atmosphere.[11]

Industrial Development Threatens Canada's Carbon Stores and Boreal Ecosystems

Logging in Canada releases approximately 16 percent of Canada's total greenhouse gas emissions.[12] Logging is a major industry in Canada with nearly one-third of the 1.4 billion acre Canadian Boreal Forest allocated to forestry companies. Most logging in Canada occurs within natural forests. Additionally, the conversion of natural forests to managed forests results in an average loss of 12 percent of carbon from these ecosystems.[13]

Oil and gas activities and peat extraction release significant amounts of stored carbon into the atmosphere. For example, Alberta's Boreal Forest and wetlands hold the world's largest reserve of unconventional oil in the form of tar sands deposits, an area approximately 142,000km^2 (35 million acres) in size.[14] Projected future tar sands extraction will strip mine over 3,000 km^2 (three-fourths of a million acres) and leave a spider's web of wells, pipelines, and roads over the rest of the region.[15] Tar sands oil production not only deforests land, disturbs peat and wetlands, and changes local hydrology by draining wetlands, it also generates almost three times as much greenhouse gas per barrel as conventional oil production. Greenhouse gas emissions from tar sands production are projected to increase by approximately 500 percent by the year 2016.[16]

Peat extraction in Canada emitted 7.74 million tons of carbon between 1990 and 2000, mostly due to the decomposition of extracted peat after being removed from this secure carbon pool.[17] Large-scale drainage and flooding of peatlands for mining or hydroelectric development can also result in substantial emissions from this otherwise long-lived carbon pool.[18]

Alberta Tar Sands

Oil Wells

Logging

Aboriginal Communities and Wildlife are at Risk

John Charles MacDonald, Trapper

The Boreal Forest is home to Aboriginal communities that depend on this ecosystem for their livelihoods. Aboriginal communities are already directly experiencing the impacts of global warming which may ruin their way of life. For example, in British Columbia, Canada, a decade of warm winters has provided conditions for the mountain pine beetle to vastly expand its range. More than 100 Aboriginal communities, now surrounded by decaying pine forests, are at risk of devastating fires.

Some of the planet's largest remaining populations of wolves, grizzly bears, and woodland caribou roam the Boreal Forest's vast, intact landscape. Billions of migratory birds nest in its trees and wetlands. Extinction rates increase as the number of stresses for wildlife increases. We are entering a period when climate change, which is occurring most rapidly in Boreal latitudes, is adding to the additional stresses of habitat loss and pollution. Conserving intact ecosystems will help species, systems, and local communities adapt by enhancing ecosystem resistance to global warming, by stabilizing microclimates, by slowing changes in forest type, and by facilitating species migrations in response to changing conditions.[19] As Boreal species deal with ecosystem changes caused by global warming, they will have a better chance of avoiding extinction if they don't also face habitat loss and fragmentation. Scientists recognize that if we ensure large, connected, natural habitats in the Boreal Forest, we may help limit extinctions.

Solutions Are at Hand

Scientists predict global warming will be one of the most important factors affecting biodiversity over the next 100 years.[20] More than 1500 respected scientists, scores of United States and Canadian conservation groups, 25 Canadian First Nations, and more than 100 major businesses are calling for conservation of large, intact portions of the Canadian Boreal.[21] They endorse the Boreal Forest Conservation Framework which is the only proposal that ensures a large portion of these ecosystems and the carbon stored within them is protected.

Actions necessary to reduce the effects of global warming in the Boreal include:

1 Completing land-use planning in the Boreal with governments, Aboriginal communities, and other stakeholders prior to approving major new development in the Boreal Forest.

2 Protecting large, interconnected areas of intact Boreal Forest in accordance with the principles of the Boreal Forest Conservation Framework. The Framework calls for conservation of at least 50 percent of the region in a network of large, interconnected, protected areas and the support of sustainable communities, world-leading ecosystem-based resource management practices, and state-of-the-art stewardship practices across the remaining landscape. Protections for carbon-rich peatlands and critical habitat for birds and other wildlife should be prioritized in order to successfully mitigate climate change.

3 Reducing carbon emissions by reducing dependency on fossil fuels and protecting the carbon-rich areas of the Boreal. This includes reducing emissions from Alberta's Tar Sands. We must also ensure that development that does proceed after land-use planning meets the highest sustainable development standards, including Forest Stewardship Council Certification and other best management practices to minimize the release of carbon into the atmosphere.

4 Promoting national and international global warming regulations that recognize ecosystem conservation as a critical means of reducing emissions and that help ecosystems adapt to climate change. Boreal Forest countries must be called on to account for and reduce emissions resulting from the degradation of natural forests and peatlands under international climate change agreements.

More Information

Additional Resources

International Boreal Conservation Campaign, *www.interboreal.org*
Canadian Boreal Initiative, *www.borealcanada.ca*
ForestEthics, *www.forestethics.org*
Boreal Songbird Initiative, *www.borealbirds.org*
Canadian Parks and Wilderness Society, *www.cpaws.org*
Natural Resources Defense Council, *www.nrdc.org*

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[2] 51 percent of the world's remaining frontier forests are located in Canada and Russia, the vast majority of which occur in the Boreal region. Frontier forests are large, relatively intact forest ecosystems that are likely to survive indefinitely without human assistance. Source: D. Bryant, D. Nielsen, and L. Tangley. 1997. The Last Frontier Forests: Ecosystems and Economies on the Edge. World Resources Institute, Washington, DC.
[3] Globally, Boreal forests store an estimated 559 of the 2477 billion tonnes of carbon stored in terrestrial ecosystems. Boreal forests store 41 billion tonnes of carbon per million km2, compared to 24 billion tonnrs of carbon per million km2 in tropical forests. Source: R.T. Watson, I.R. Noble, B. Bolin, N.H. Ravindranath, D.J. Verardo, and D.J. Dokken. 2000. Intergovernmental Panel on Climate Change Special Report. Summary for Policymakers: Land Use, Land-Use Change, and Forestry. IPCC Plenary XVI, Montreal, Canada. WMO & UNEP, Geneva
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[5] In 2003, global CO2 emissions from consumption of fossil fuels were 25.028 billion tonnes. This equals 6.8 billion tonnes of carbon. (Source: Energy Information Administration. International Energy Outlook 2006. U.S. Department of Energy. Available online: http://www.eia. doe.gov/oiaf/ieo/index.html) Therefore, Boreal carbon storage (186 billion tonnes of carbon) is equal to 27 years of the world's CO2 emissions from the consumption of fossil fuels.
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[10] An estimated 2000 billion metric tons of carbon is stored in all terrestrial plants and soils. Source: Global Carbon Storage in Above-and Below-Ground Live Vegetation and Soils. Earthtrends, World Resources Institute at earthtrends.wri.org
[11] Atlas of the Crysphere Data Sources, The National Snow and Ice Data Center, University of Colorado, Boulder, CO (Available at: http://nsidc.org/data/atlas/crysphere_atlas_north_info.html)
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INTERNATIONAL BOREAL CONSERVATION CAMPAIGN

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