FORESTS, WOOD & CLIMATE CHANGE

British Columbia's Proactive Response

British Columbia's (B.C.) and Canada's forests and forest products play an important role in helping mitigate climate change. Growing forests reduce greenhouse gas emissions by absorbing carbon dioxide and continuing to store carbon when converted to forest products.

B.C. practises innovation in reforestation to ensure forests are adapted to changing climates while maintaining a reliable supply of quality forest products.

BRITISH COLUMBIA FORESTS MITIGATE CLIMATE CHANGE

"Sustainably managed Canadian forests and products made from trees can contribute to the critically important objective of reducing global warming."

Dr. Stephen Colombo, Canadian Climate Forum[1]

Younger forests are more efficient in their uptake of carbon than older forests where carbon storage plateaus and can be slowly released as trees decay. Photos above: Brudder

Impacts on B.C.'s Forests

Climate change is arguably one of the most important environmental issues facing the planet. It is caused largely by the release of carbon dioxide and other gases into the atmosphere during the burning of fossil fuels.[2] The layer of greenhouse gases thickens causing a "greenhouse effect" that warms the atmosphere. Weather patterns change, leading to extreme events like flooding and drought.

B.C. forests can provide overall net carbon storage, however forest management challenges could result in forests acting as a net carbon source. Healthy growing trees capture more carbon than they release, acting as a "carbon sink". Until 2002, B.C.'s forests stored more carbon annually than they released. However, in recent years, they have been a carbon source as a result of escalating forest fires and die-offs due to the unprecedented mountain pine beetle infestation which resulted in an increase in salvage logging.

FIRE

Forest fires release massive amounts of carbon dioxide. The resulting debris left on the landscape then decomposes, releasing even more carbon dioxide into the atmosphere.

INSECTS AND DISEASES

Insect outbreaks are expected to increase as B.C.'s climate warms. Insects, as seen with the mountain pine beetle (which has impacted over 18 million hectares of B.C.'s forests), could expand their historic ranges and cause extensive tree damage or mortality. Changes in temperature and rainfall could reduce the growth rates and vigour of individual trees, putting them at greater risk of insect and disease damage.

CHANGING CLIMATE

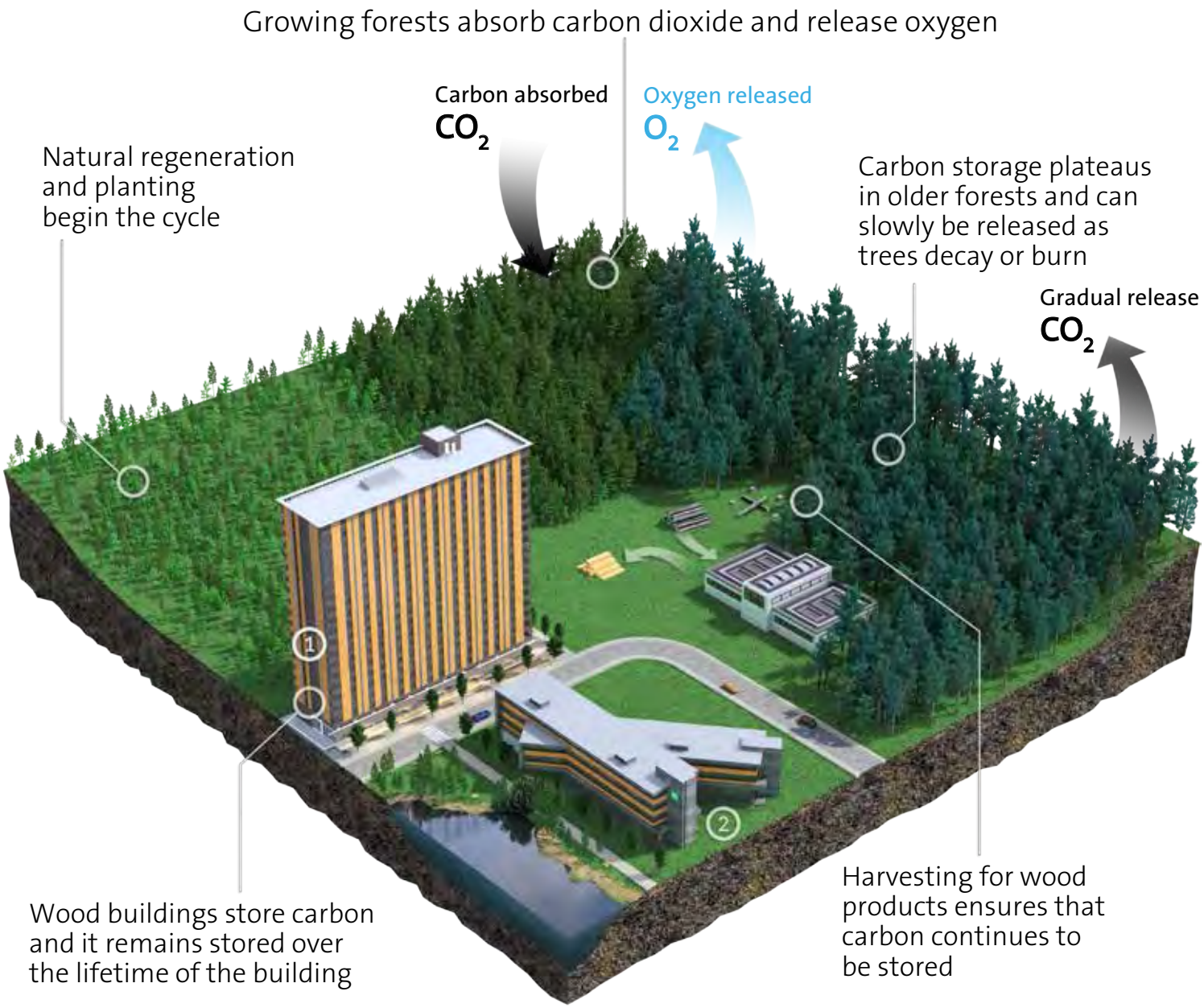
The climate in B.C.'s forests is shifting northward and to higher elevations at a rate that exceeds the ability of many tree species to naturally adjust. Long-term field trials suggest that the changing climate will lead to them being 'maladapted', or less resilient to stress and less healthy and productive.[3]

"In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre or energy from the forest, will generate the largest sustained mitigation benefit."

Intergovernmental Panel on Climate Change[4]

TACKLE CLIMATE CHANGE BY USING WOOD

Carbon Cycle: Sustainable Forest Management and Wood Products



① **Brock Commons Tallwood House at the University of British Columbia is an 18-storey wood building completed in 2017.**
Carbon stored and avoided greenhouse gas emissions: 2,432 metric tons of CO_2.[5] Equivalent to 511 cars off the road for a year.[6]

② **Mountain Equipment Co-op Headquarters in Vancouver, British Columbia was completed in 2014.**
Carbon stored and avoided greenhouse gas emissions: 2,940 metric tons of CO_2.[5] Equivalent to 618 cars off the road for a year.[6]

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Low Embodied Energy of Wood Products

In addition to wood's carbon storing properties, it is also important to consider the energy required to manufacture it into usable forest products. The energy required to manufacture wood products is generally about half as much as contained in them.[7] The low energy consumption required in wood product manufacturing results in much lower greenhouse gas emissions than from the production of other building materials.[8]

Increasing the use of wood as a building material in government, health care, education and commercial buildings would maximize carbon stored in buildings and minimize emissions from the manufacture of other building products.

While managing operating energy efficiency tends to be the primary focus of sustainable building, as building designs become more energy-efficient, the impact of building material choice will play a larger role in mitigating the impact of building construction on climate change.

Carbon Cycle: Sustainable Forestry & Wood Products

B.C.'s sustainably managed forests filter the air throughout their growth cycle. Growing trees absorb carbon dioxide from the air and convert it to oxygen, which is then released and stored as carbon in their branches, leaves or needles, trunk, roots and surrounding soil.

At the landscape level, carbon density is often greater in older forests, but this tells only part of the story. As trees age, carbon storage plateaus and carbon can be released as trees decay or are burned in a wildfire. The slowing of growth marks the best time to harvest mature trees, which absorb less carbon as they age.

Newly planted and growing forests on the other hand, begin carbon uptake as soon as they are planted and continue to do so until they reach a mature age for harvest. B.C.'s forest management laws mandate reforestation to regenerate the forest. The newly planted forest begins absorbing carbon dioxide immediately, increasing the pool of stored carbon.

When forest products are used in construction, they continue to store carbon for the life of the structure and beyond when wood fibre is recycled or reclaimed.[9]

Every year in B.C., approximately 17 million tonnes of carbon dioxide equivalents are transferred from the province's sustainably managed forests to wood products and stored indefinitely in consumer goods, buildings and other uses[10]. That's equivalent to taking 3.6 million cars off the road for a year[11].

MOUNTAIN EQUIPMENT CO-OP

Mountain Equipment Co-op's (MEC) new headquarters is an example of how using wood can help meet all code and safety requirements while also providing an environmental advantage.[12] Glue laminated timber beams and columns, joined and braced with steel fittings, make up the building structure and the floor assemblies are made of prefabricated nail-laminated timber panels.

The success of this project has demonstrated that solid wood systems and mass timber products can be used as structural components of non-residential and commercial buildings.

Top: Mountain Equipment Co-op's Vancouver headquarters uses wood as a building material to support its commitment to sustainability. Photo: KK Law

BROCK COMMONS TALLWOOD HOUSE

Brock Commons Tallwood House is an innovative tall wood student residence at the University of British Columbia (UBC). It is the tallest contemporary mass timber hybrid structure of its kind in the world standing at 18 storeys in height.

UBC's building requirements reflect the university's commitment to sustainability. Wood, a renewable material, was chosen in part to reflect this commitment, and the building was also designed to meet Leadership in Energy and Environmental Design Gold certification.

Above: Completed in 2017, Brock Commons Tallwood House is an 18 storey student residence building at the University of British Columbia. Photo: Brudder

Adapting B.C.'s Forests to a Changing Climate

B.C. is recognized as a global leader in sustainable forest management, meeting the environmental, social and economic needs of current and future generations from provincial forests.

To maintain this leadership, the province is adapting forest management policies and practices to address a changing climate and ensure sustainable, high-value forests.

PLANTING FOR THE FUTURE

Climate change predictions suggest that the suitability of some B.C. tree species for reforestation could be impacted by the expected changes in climate. A key strategy for sustaining productive forests is through assisted migration – the planned movement of a species to mimic natural population or range expansion. To enable this, B.C.'s Chief Forester has modified the existing standards for seed use to reflect the extension to higher elevations for most tree species. For example, western larch can now be planted north of its traditional range.

B.C. reforestation practices involve the planting of seedlings in areas where future climate conditions are expected to be optimal for species growth. These practices will also work to maintain healthy ecosystems which retian biodiversity and are vital to our well-being.

APPLYING RESEARCH FOR FUTURE FORESTS

The Province of B.C.'s Ministry of Forests, Lands and Natural Resource Operations invests in research to study the potential impacts of climate change to B.C. forests. By making information available to provincial forestry professionals, climate change adaptation can be advanced. Provincially funded resources include:

- ClimateBC – A computer modeling tool which utilizes historical weather station data and general circulation models to predict future seasonal and annual climate variables in B.C.
- Tree Species Selection Tool – An online database which identifies the most suitable tree species to plant in each region of B.C. considering conditions in a changing climate.

Forestry professionals can better manage for future natural disturbances, regeneration and growth changes by using these tools to create a scenario of what is expected to happen to B.C. forests.

Left: The carbon storage cycle of a forest continues following harvesting and reforestation. Harvesting trees at the optimal time in their growth cycle and regenerating the landscape with seedlings. Photo: Michael Bednar

Right: Assisted migration: B.C. forestry professionals plant seedlings in areas best suited to the species in anticipation of a changing climate. Photo: Michael Bednar

TSESHAHT TRIBAL MULTIPLEX AND HEALTH CENTRE

The Tseshaht Tribal Multiplex and Health Centre is located at the north end of the Alberni Inlet on the west coast of Vancouver Island. Situated within the highest risk seismic zone, the site is subjected to considerable tidal fluctuations. The structure utilizes a combination of open-framed post and beam in-filled with glazing and a limited number of strategically placed shear walls. A multitude of the engineered wood and lumber products were harvested and milled from the Tseshaht Nation's own forest reserves.

Completed October 2007, the Tseshaht Tribal Multiplex and Health Centre has a gross area of 140 m² (1520 ft²). Photo: Lubor Trubka Architects

ESTIMATED ENVIRONMENTAL IMPACT OF WOOD USE IN TSEHAHT BUILDING

Volume of wood products used: 1051 cubic meters (37119 cubic ft) of lumber and sheathing

U.S. and Canadian forests grow this much wood in: 3 minutes

Carbon stored in the wood: 809 metric tons of carbon dioxide

Avoided greenhouse gas emissions: 1436 metric tons of carbon dioxide

Total potential carbon benefit: 2245 metric tons of carbon dioxide

EQUIVALENT TO:

429 cars off the road for a year

Energy to operate 191 homes for a year

Post construction calculation[9]

The facility will help demonstrate the technology for multi-storey, multi-residential accommodation specially designed for the elderly population.

BEICHUAN QIANG MAPLE LEAF SENIORS HOME

The Beichuan Qiang Maple Leaf Seniors Home was built in the reconstruction of the earthquake devastated Sichuan Province region to showcase the advantages of wood-frame construction for seismic resistance and energy efficiency. These attributes of wood-frame construction are of particular importance in a country like China with climate extremes, and where more than 60 percent of the population live in areas with seismic activity.

ESTIMATED ENVIRONMENTAL IMPACT OF BEICHUAN QIANG MAPLE LEAF SENIORS HOME

Volume of wood products used: 1140 cubic meters (40273 cubic ft) of lumber and sheathing

U.S. and Canadian forests grow this much wood in: 3 minutes

Carbon stored in the wood: 881 metric tons of carbon dioxide

Avoided greenhouse gas emissions: 1872 metric tons of carbon dioxide

Post construction calculation[13]

Total potential carbon benefit: 2752 metric tons of carbon dioxide

EQUIVALENT TO:

526 cars off the road for a year

Energy to operate 234 homes for a year.

The building incorporates standard dimension framing lumber and oriented strand board sheathing, with western red cedar cladding used on the exterior.

FOR MORE INFORMATION

GOVERNMENT OF BRITISH COLUMBIA http://www.gov.bc.ca
Climate Action Secretariat

MINISTRY OF FORESTS, LANDS & NATURAL RESOURCE OPERATIONS https://www.for.gov.bc.ca
Climate Change, Strategic Wildfire Prevention and Tree Species Selection Tool

About 50% of wood products exported from Canada come from British Columbia's sustainably managed forests. This publication is part of the 'Forest Facts' series, published by Forestry Innovation Investment, the Government of British Columbia's market development agency for forest products.

To learn more about B.C. forests and products, visit:

naturallywood.com

Cover photo: Sail at the University of British Columbia is a two-phase residential project. The buildings are both six-storey wood-frame construction over two levels of underground parking. Photo: Raef Grohne
The wood grain featured at the top of this factsheet is yellow cedar.

Endnotes: [1]Canadian Climate Forum www.climateforum.ca, Forest Products Association of Canada news release, November 19, 2015 [2]Intergovernmental Panel on Climate Change https://www.ipcc.ch [3]Assisted Migration Adaptation Trial https://www.for.gov.bc.ca [4]Intergovernmental Panel on Climate Change Fourth Assessment Report 2007 www.ipcc.ch [5]Estimated by the Wood Carbon Calculator for Buildings (WoodWorks US http://woodworks.org), based on research by Sathre, R. and J. O'Connor, 2010, A Synthesis of Research on Wood Products and Greenhouse Gas Impacts, FPInnovations. Note: C02 on this chart refers to C02 equivalent. Figures calculated May 2016. [6]US Environmental Protection Agency Equivalencies Calculator https://www.epa.gov/energy/ghg-equivalencies-calculator-calculations-and-references#vehicles [7]Dovetail Partners, Inc. Building With Wood Report. http://www.dovetailinc.org [8]Intergovernmental Panel on Climate Change Fourth Assessment Report 2007 www.ipcc.ch [9]Dovetail Partners, Inc. Building With Wood Report. http://www.dovetailinc.org [10]Data derived from http://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/forest-industry-economics/fibre-mill-information [11]Calculated from the latest EPA factor of 4.73 tonnes CO2e/vehicle/year from US Environmental Protection Agency Equivalencies Calculator https://www.epa.gov/energy/ghg-equivalencies-calculator-calculations-and-references#vehicles [12]MEC Case Study http://wood-works.ca [13]Estimated by the Wood Carbon Calculator for Buildings (WoodWorks US http://woodworks.org), based on research by Sathre, R. and J. O'Connor, 2010, A Synthesis of Research on Wood Products and Greenhouse Gas Impacts, FPInnovations. Note: C02 on this chart refers to C02 equivalent. US Environmental Protection Agency Equivalencies Calculator https://www.epa.gov/energy/ghg-equivalencies-calculator-calculations-and-references#vehicles