

SCIENCE
RENDEZVOUS'

MILLION
TREE
PROJECT





How to Use This Guide

The first half of this guide explores all the ways trees benefit our environment, economy, and health. The second half explains how to participate in The Million Tree Project by planting or conserving trees in your own community.

Want to learn more? Check the resource lists in this guide, or view expanded lists online at sciencerendezvous.ca. You can also visit our website for the latest updates on the Million Tree Project and other exciting STEM (science, technology, engineering, and math) initiatives happening near you!

DID YOU KNOW?

Keep an eye out for fun factoids throughout the book – there are 34 of them (not including this one). There will be a quiz on this later. Maybe.



Table of Contents

Introduction 04

Why Trees Matter

A First Nations Perspective 06

Trees and the Environment

Carbon and Climate 08

Biodiversity 10

Air, Water, and Soil 12

Trees and the Economy

Sustainable Forestry in Canada 14

Forestry and Forest Products 16

Map

Canada’s Trees and Forests 18

The Million Tree Project

Conserving Canada’s Forests 20

Tree Planting: Getting Started 22

Tree Planting: Picking the Perfect Species 24

Tree Planting: Where and How to Plant That Tree 26

Tree Planting: How to Care for, Maintain, and Register Your Tree 28

Resources

For Kids and Teens 30

For Adults 32

Credits 34

Introduction

About Science Rendezvous

Science Rendezvous is a free, Canada-wide festival that brings science out of the lab and into the streets. Professional scientists invite members of the public to learn, ask questions, and get their hands on real science. Activities include presentations, demonstrations, and chances for kids—and their grown-ups!—to participate in exciting, interactive STEM experiences. Science Rendezvous demonstrates that science is not a noun, but a verb: an active, engaging process that involves curiosity, exploration, and experimentation.

Science Rendezvous began in 2008, at four Canadian universities. By 2019, the event had grown to 25 sites across the country, and from 15,000 participants to more than 215,000. Connecting “regular” people to researchers working at the forefront of scientific discovery, Science Rendezvous demonstrates that innovation is about collaboration... and that it’s also really fun!

Partnered with the Natural Sciences and Engineering Research Council of Canada (NSERC), Science Rendezvous acts as the kick-off festival for NSERC’s annual science and technology celebration, Science Odyssey. Science Rendezvous happens the day before Mother’s Day and is a fun-filled voyage of discovery for the whole family.

The Canada Wide Experiment

Science Rendezvous began its first Canada Wide Experiment (CWE) in 2013. In partnership with scientists from the University of Regina and First Nations University of Canada, Indigenous leaders and Science Rendezvous’s Northern Program, the CWE launched more than 35 high-altitude balloons. The second CWE ran from 2017 to 2019. Student participants performed water quality assessments on 12 watersheds across Canada, including some in remote northern communities.

The CWEs integrate Traditional Indigenous Knowledge with chemistry and atmospheric sciences surrounding land, air, and water quality, as well as the health of aquatic ecosystems. Visit sciencerendezvous.ca to explore the results!



The Million Tree Project

On May 8, 2021, Science Rendezvous will launch its third Canada Wide Experiment: The Million Tree Project! Why trees? So many reasons! Trees and forests:

- Capture carbon dioxide and mitigate climate change
- Help clean our water and prevent floods
- Provide habitat for plants and animals
- Cast shade and cool down cities
- Support human health, recreation, education, and spirituality
- Provide lumber, paper, and many other traditional and emerging forest products

The Million Tree Project encourages Canadians to join in planting, caring for, and conserving one million trees by 2030. Read on to learn more about the importance of trees and how you can get involved!

DID YOU KNOW?

Natural Resources Canada defines a tree as a woody, perennial plant that grows at least 4.5 m tall.

Truth and Reconciliation

What is reconciliation? According to Justice Murray Sinclair, “Reconciliation is about forging and maintaining respectful relationships.”

These relationships must be built between Indigenous and non-Indigenous peoples, but also between people and the natural world. One important aspect of reconciliation involves upholding Indigenous peoples’ Treaty and Constitutional Rights, preserving their access to the natural resources that are essential to their cultures and ways of life.

Why Trees Matter: A First Nations Perspective

Many people feel protected and at peace in the presence of trees. For Charlie Nelson, an Elder of Bigaawinashkoziibiing, the Roseau River Anishinaabe First Nation, trees are more than comforting: they are essential. Trees give fruit and shade and shelter. They offer habitat for animals, and arrows so that people can hunt. Trees share medicines for illnesses, and provide teachings and spiritual guidance. “We need people to understand how important access to these things is to everyday life,” Charlie says. “We get wellness from knowing these things.”

Anishinaabe knowledge of trees and their gifts comes from generations of experience. “I have been learning this way of life from my grandpas and great-grandpas,” Charlie says. “Some things happen over and over again, and that gives us knowledge.”

Some Elders know how to make medicines from trees; others know how to make wooden snowshoes or canoes out of birch bark. Traditional Knowledge can be shared in teaching lodges built from tamarack poles. It

is also shared while on the land.

“One old guy showed us the medicine,” Charlie says. “He said that if you are going to take the medicine, you have to give tobacco as an offering. The trees are ready to give us help if we ask them. It’s a feeling you get when you share with the trees. It feels as if they are listening to you.”

The connection between Anishinaabe people and trees begins at birth. “The tree loves the children,” Charlie says. “From the tree we make the cradle board.” Trees also care for the elderly. “We teach the people that there are two trees that are waiting for you when you get old and need something to lean on,” Charlie says: those trees are canes. “We are one with the tree, partners with the tree, companions with the tree,” he adds. “No matter what issues people deal with, there is love in nature waiting for you.”

Like trees, people are a part of nature: if people destroy nature, we risk destroying ourselves. That’s why Charlie says it’s important to harvest trees with



respect, and never to take more than needed. Charlie's son, Kirby Nelson, agrees. "These are living plants," Kirby says. "You want to tell them why you are taking their life and asking them for their help."

The Nelsons worry that this wisdom is being lost, and that taking every tree in one place threatens not just the forest, but the animals that depend on it. "We go hunting for deer and wild chickens and rabbits," Kirby says, "and their home is being destroyed." Charlie adds, "The forest is also the moose's habitat. The moose are giving to us, so we should be concerned about taking what they need."

For Charlie's family, losing trees would mean losing their way of life. "We dream about these things," Charlie says. "That is how close the Nature is. To see something in our dreams and say, 'That is the medicine.' We have to look after things, so that our grandkids might have something.

"We need to do Truth and Reconciliation with Nature."

DID YOU KNOW?

Inuit peoples have lived on Canada's Arctic tundra — where trees do not grow — for thousands of years. In the past, some got wood for houses, kayaks, sleds, tools, and toys by traveling south to the treeline. Others collected driftwood that was carried north by river and ocean currents.

Further Reading for Kids

Rose, Simon (2020) *First Nations, Métis, and Inuit Governance*. Collingwood: Beech Street Books.

Smith, Monique Gray (2020) *Every Child Matters: Reconciliation Through Education*. National Centre for Truth and Reconciliation: <https://bit.ly/34UtDeE>

Smith, Monique Gray (2017) *Speaking Our Truth: A Journey of Reconciliation*. Victoria: Orca Book Publishers.

Webstad, Phyllis (2018) *The Orange Shirt Story: The True Story of Orange Shirt Day*. Victoria: Medicine Wheel Education.

Further Reading for Adults

Digital Lesson Plans and Resources on TRC and Indigenous Education
teachingaboriginaleducation.weebly.com/lesson-plans.html
guides.library.utoronto.ca/indigenouseducation/lessonplans

Honoring the Truth, Reconciling for the Future: Summary of the Final Report of the Truth and Reconciliation Commission of Canada (2015)
nctr.ca/reports2.php

Interactive Online Map of Indigenous Languages and Treaty Lands:
native-land.ca

National Centre for Truth and Reconciliation.
nctr.ca/map.php

Trees and the Environment: Carbon and Climate

Carbon is found in plants and animals, in soil and rocks, in rivers, lakes, and oceans, and as carbon dioxide (CO₂) and other greenhouse gases in the atmosphere. The movement of carbon between the earth, the air, and living things is called the carbon cycle. Trees play an essential role in this process.

Photosynthesis

During photosynthesis, trees make sugar out of water from the soil, CO₂ from the air, and energy from sunlight. This sugar provides chemical energy that trees need to live and grow. It's also the building block for biomass: the organic carbon compounds which make up trees' living roots, trunks, and leaves.

Primary Production

Photosynthesis is sometimes called primary production, because biomass is the base of most food webs.

Herbivores

From itty-bitty beetles to great big bison, herbivores get their energy from eating plants like trees.

Carnivores

Be they warblers or wolves, carnivores get their energy from eating other animals!

Carbon Storage

Carbon makes up about half the dry weight of a living tree. Carbon is also stored in dropped leaves or fallen twigs, in dead logs or stumps, and as partly-decomposed peat or humus within the soil. In Canada's forests, soil carbon may stay locked away for hundreds or even thousands of years.



Carbon Release

As part of the carbon cycle, organic carbon is converted back to CO₂ and released to the atmosphere in three ways.

Combustion

Wildfires transform trees, leaf litter, and soil carbon back into CO₂. The same thing happens when we burn fossil fuels, which are the remnants of ancient living things.

Respiration

In the cells of animals, sugar from food combines with oxygen from breath, releasing the energy that fuels life. This reaction, called respiration, produces waste CO₂ that re-enters the atmosphere when animals exhale. Plants also respire, using sugar made during photosynthesis. Unlike animals, which can't photosynthesize, plants and trees capture more CO₂ than they release during respiration.

Decomposition

After plants and animals die, their bodies break down. Forest insects, earthworms, and mushrooms and other fungi assist this process of decomposition, which converts organic carbon back into CO₂.

DID YOU KNOW?

It takes about 500 full-grown trees to absorb a year's worth of CO₂ emissions from a single car.

The Climate Connection

Because of their role in the carbon cycle, trees and other plants reduce the concentration of greenhouse gases in the atmosphere, slowing the pace of global climate change.

Over the last 40 years, Earth's forests have absorbed about 25 percent of the carbon emissions produced by human activity. Forests that remove more CO₂ from the air than they emit are called carbon sinks.

In some years, however, insect outbreaks or large fires alter the balance of the carbon cycle, turning forests into net sources of atmospheric CO₂. That's a concern, because the "extra" CO₂ drives further climate change.



Trees and the Environment: Biodiversity

Canada is home to about 180 native tree species. From A (Alaska paper birch) to almost-Z (yellow-cedar), they provide food and habitat for thousands of species of plants and animals. In other words, Canada's forests both contribute to, and protect, our planet's biodiversity: the wild and wonderful variety of lifeforms that exist on Earth.

Trees Provide Food

With their bark and wood, sap and leaves, fruits and nuts and seeds, trees feed amazing animals like: insects and spiders, crossbills and chickadees, snowshoe hares and moose and bears, wolves and wolverines, and humans, too!

DID YOU KNOW?

One red squirrel can harvest up to 16,000 spruce cones per year!

Trees Create Habitat

From root to stem to twiggy tip, trees provide habitat for a wide range of living things:

- Soil-dwelling fungi that help trees absorb nutrients through their roots
- Lichens, moss, and mushrooms that grow on bark
- Trunk cavities where pine martens and porcupines sleep
- Fallen leaves that shelter wood frogs and salamanders
- Nurse logs where ferns and seedlings first take root

Trees also modify surrounding habitats. For example, trees shade streams, cooling the water for migratory salmon!

DID YOU KNOW?

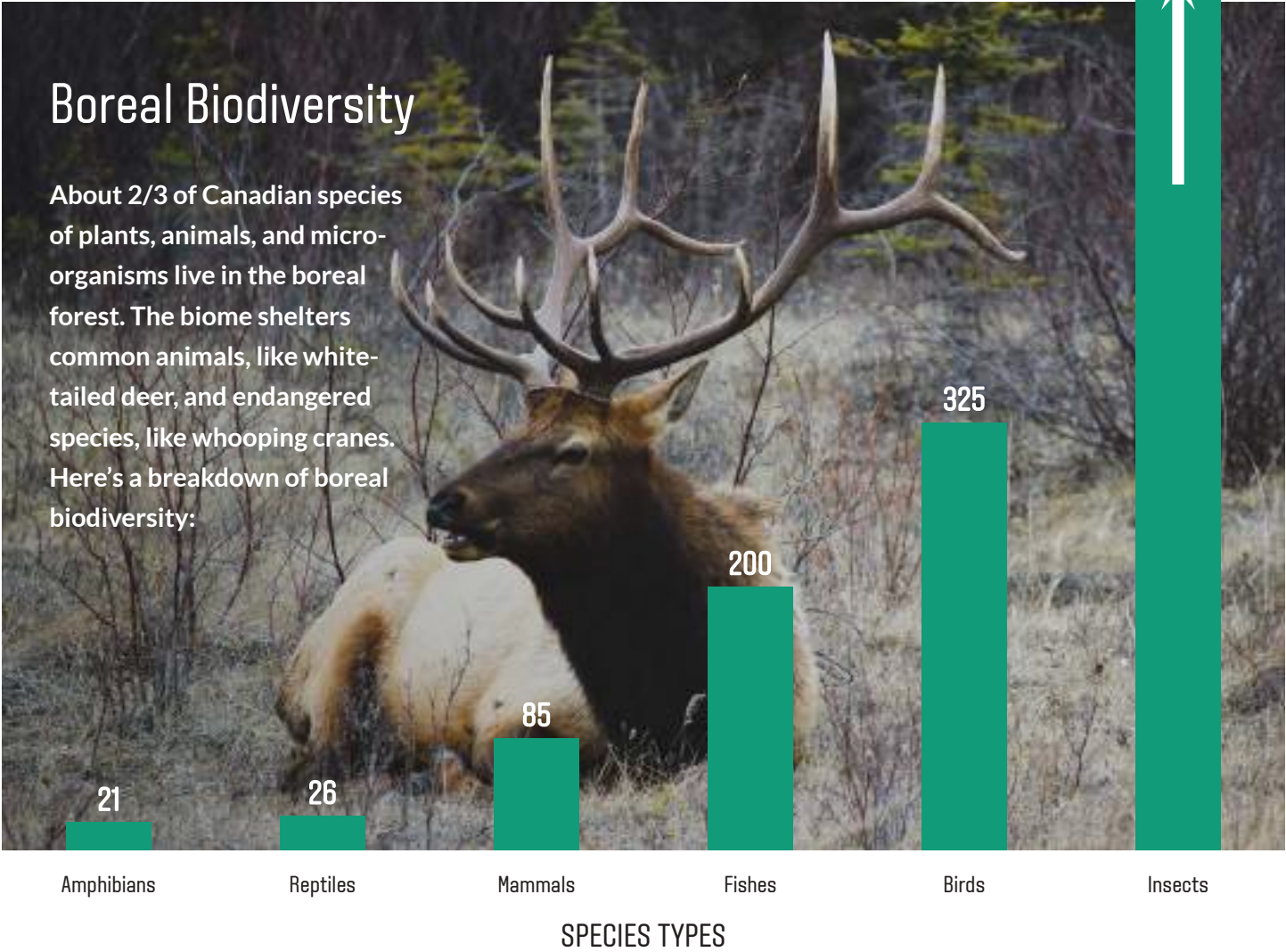
Boreal owls often nest in tree cavities made by pileated woodpeckers.



Boreal Biodiversity

About 2/3 of Canadian species of plants, animals, and micro-organisms live in the boreal forest. The biome shelters common animals, like white-tailed deer, and endangered species, like whooping cranes. Here's a breakdown of boreal biodiversity:

OF SPECIES IN THAT TYPE



SPECIES TYPES

Urban Wildlife

Urban forests provide islands of habitat for many wild species. In towns and cities, trees offer food, shelter, and nesting sites for blue jays and bats, chipmunks and squirrels, raccoons and foxes, not to mention spiders and insects. Trees also provide protection from urban predators like domestic cats and dogs.

Even dead trees matter! Sometimes called “habitat trees,” dead trunks, snags, and stumps offer plants and animals important resources like cracks and cavities, bark pockets and trunk rot.

DID YOU KNOW?

Beavers use trees to build their own habitats: lodges! Flooding caused by beaver dams also creates lake and wetland habitat for ducks, herons, fish, and frogs.

DID YOU KNOW?

Insects are the most diverse animals in the boreal forest, with an estimated 32,000 species!



Trees and the Environment: Air, Water, and Soil

Need more reasons to love trees? Here are some of the critical contributions they make to the abiotic, or non-living, components of Earth's wild and urban ecosystems.

Air

One large tree produces enough oxygen for up to four people—every single day! Trees also improve air quality by:

- Capturing solid pollutants, such as dust and ash, on their leaves
- Reducing concentrations of dangerous gases like ground-level ozone, the major ingredient in smog

In other words, trees make it a whole lot easier for humans (and other animals) to breathe!

Water

About 25 percent of the “land” in Canada's boreal forest is actually water: lakes, rivers, and wetlands. Boreal wetlands filter and purify millions of litres of fresh water every day, an ecosystem service that's worth billions of dollars per year.

Trees also catch rain and snow on their branches and leaves, so that water trickles down instead of splatting. This helps rainfall soak into the ground, rather than running off. Tree roots also pull water out of soggy soils. In these ways, trees dramatically reduce the risk of flooding.

Soil

Trees alter the temperature, moisture, and oxygen content of soils, modifying habitat for other plants and soil-dwelling critters. In autumn, fallen leaves return nutrients to the soil as nature's own fertilizer. This protective leaf litter also helps reduce soil erosion during rainstorms.

And those snaky, burrowing tree roots? They help stabilize hillsides and streambanks, preventing landslides and preserving water quality.



DID YOU KNOW?

In urban areas, trees act as sound barriers, reducing noise pollution from traffic and other human activities. The shade they cast also helps to cool “heat islands” that form in large cities.

DID YOU KNOW?

One lodgepole pine drinks up to 44 L of water each day. One adult human needs just 2 L!

DID YOU KNOW?

Up to 400 cm of snow falls on the boreal forests of Newfoundland every year!

DID YOU KNOW?

The roots of deciduous trees dig deep, while conifer roots tend to be shallow... making conifers more likely to topple during a windstorm.



DID YOU KNOW?

Canada belongs to the Montréal Process, a group of 12 countries committed to sustainable forest management.

Trees and the Economy: Sustainable Forestry in Canada

Canada's commercial forestry began during the 1600s, with the harvesting of Newfoundland pines for shipbuilding. Today, 164 million hectares of Canadian forest have received third-party certification for sustainable forest management. That's 47 percent: more than any other country in the world.

Climate change is affecting both the health of forest ecosystems and the future of the forest industry in Canada. That's why modern forest management focuses on reducing sources of greenhouse gas emissions, while maximizing our forests' abilities to act as carbon sinks. The Canadian Forest Service monitors the carbon balance of Canada's forests using the best available scientific data.

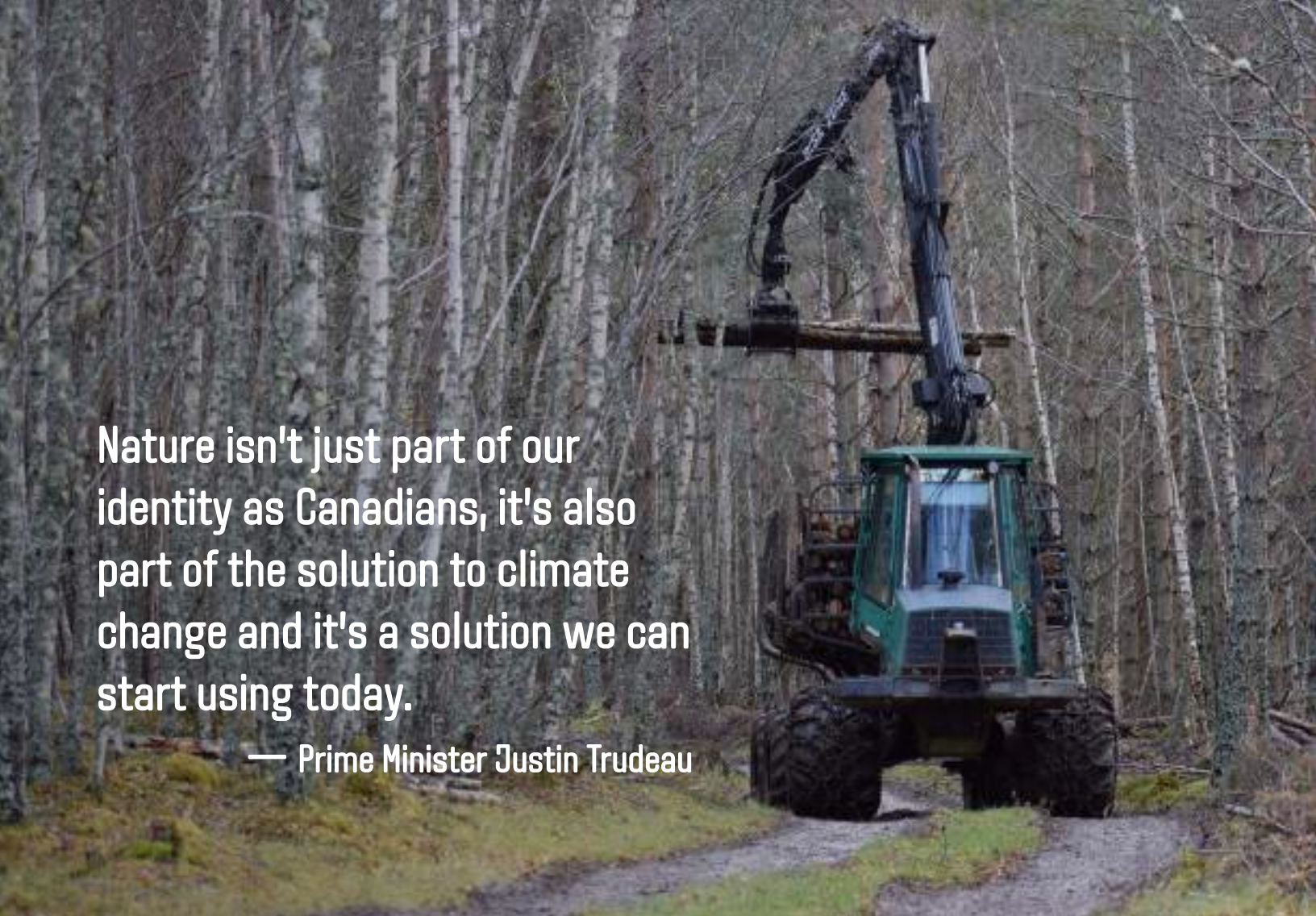
Reducing Greenhouse Gas Emissions

Canada's forest industry has reduced its greenhouse gas emissions by 38 percent since 2006. This is partly because the industry has reduced its reliance on fossil fuels. In fact, more than 50 percent of the energy used by the sector is now renewable. It's produced using wood chips and other waste biomass generated during timber harvesting or wood processing.



DID YOU KNOW?

A patch of land has only been deforested if the trees will never grow back. Canada's annual deforestation rate (0.01 percent of total forest area) is one of the lowest in the world. Most deforestation is caused by mining, oil, and gas (37 percent) or agriculture (35 percent).



Nature isn't just part of our identity as Canadians, it's also part of the solution to climate change and it's a solution we can start using today.

— Prime Minister Justin Trudeau

Sustainable Harvesting

One aspect of sustainable forestry involves harvesting a relatively small number of trees, infrequently enough that the forest can regenerate. Provincial and territorial regulations keep annual harvests well below sustainable levels: in 2017, only about 0.3 percent of available wood was taken. Forest patches are allowed to grow for at least 60 years between harvests.

Sustainable forestry also uses harvesting methods that mimic the effects of natural disturbances like forest fires and insect outbreaks. In 2019, an average forest fire in Canada burned about 470 hectares: logging cuts are much smaller than that. Finally, forest managers are working to harvest trees in ways that help maintain the forest's biodiversity, and to salvage wood from trees killed by natural causes.

Restoration and Regeneration

Canadian forestry occurs almost entirely on public land. Public forests must be reforested after harvesting: it's the law.

About 44 percent of harvested areas regenerate naturally. The other 56 percent are seeded or planted. In 2017, 572 million seedlings were planted on public lands across the country, most in harvested areas.

Others were used to help restore forests affected by fire and insects. These reforestation efforts help sustain the environment, Canadian communities, and the forest industry.

In 2019, the Federal Government announced its plans to plant an incremental two billion trees by 2030. This initiative will help Canada achieve its goal of net-zero carbon emissions by 2050.



Trees and the Economy: Forestry and Forest Products

From Newfoundland to the Yukon, Canada's forest sector employs more than 210,000 foresters, scientists, engineers, computer technologists, and tradespeople. About 2 percent of all Canadians live in the 300 communities where most jobs are in the forest sector.

Altogether, the forest industry and forest products contribute 28 billion dollars to Canada's economy each year. But forest products are not just good for business—they can be good for the environment, too.

DID YOU KNOW?

In 1811, John McIntosh found an apple tree growing near his Dundela, Ontario farm. That tree was the mother of the McIntosh apple, now the most popular variety in both Canada and the northeastern USA.

Wood Construction

From ancient temples to modern houses, humans have built with wood for thousands of years. Wood construction is environmentally-friendly because:

- Trees capture carbon during their lifespans
- Lumber stores carbon for the lifespan of the building
- It takes 6 to 12 times more fossil fuels to make a steel beam than a wooden one

Despite this, skyscrapers and other large buildings tend to rely on the strength of steel and emissions-heavy concrete. Thanks to innovative new wood products, that's starting to change. In 2017, the University of British Columbia completed construction on Brock Commons Tallwood House. Eighteen stories high, it houses 400 students and is one of the tallest wood buildings in the world. Built from cross-laminated timber (CLT) and glued laminated timber (glulam), the structure stores 1753 tonnes of CO₂ and avoided 679 tonnes of emissions that would have come from making conventional building materials. That's equal to the annual emissions of 511 cars.



From Sap to Sugar

About 76 percent of the world's maple syrup comes from Canadian trees!

First Nations peoples taught early settlers how to make it, and it was North America's standard sweetener until cane sugar arrived in 1875.

It takes 40 L of maple sap to make 1 L of maple syrup. To protect the health of their trees, Canadian producers take no more than 1.5 L of sap from each stem in the sugar bush.

DID YOU KNOW?

Do you own a rayon shirt, a smart phone, or a 3D printer? Those clothing fibres, touch screens, and printing polymers probably started out as trees!

Breakthroughs in Bioproducts

Globally, more than 280 million tonnes of plastic are produced each year, almost entirely from fossil fuels. But 90 percent of plastics could be made from renewable, plant-based polymers instead... including those from trees. Packaging is only one example: Henry Ford build a car from soybean plastic in 1941!

Bioplastics and biocomposites can store carbon and reduce emissions, especially if they are made with waste biomass left over from pulp and paper production. And they can be good for your health, as well as for the environment. Human bodies are less likely to reject medical devices made from bioproducts than from petrochemical (fossil-fuel-based) products. Bioproducts may even contribute to the fight against COVID-19: researchers at the University of British Columbia have developed a biodegradable, N95 medical mask made entirely from wood fibres.













Canada's Trees and Forests

There are eight forest regions in Canada. The boreal forest is biggest, while the tiny Carolinian, or deciduous, forest is most diverse. To learn about typical tree species in each region, visit Natural Resources Canada's Forest Classification page online at bit.ly/30mxGxJ

DID YOU KNOW?

Canada's tallest tree is a 96 m Sitka spruce growing on Vancouver Island.

Legend

-  Boreal – Forest
-  Boreal – Forest / Barren
-  Boreal – Forest / Grasslands
-  Great Lakes—St. Lawrence Forest
-  Acadian Forest
-  Carolinian / Deciduous Forest
-  Subalpine Forest
-  Columbian Forest
-  Montane Forest
-  Coastal Forest
-  Grasslands
-  Tundra



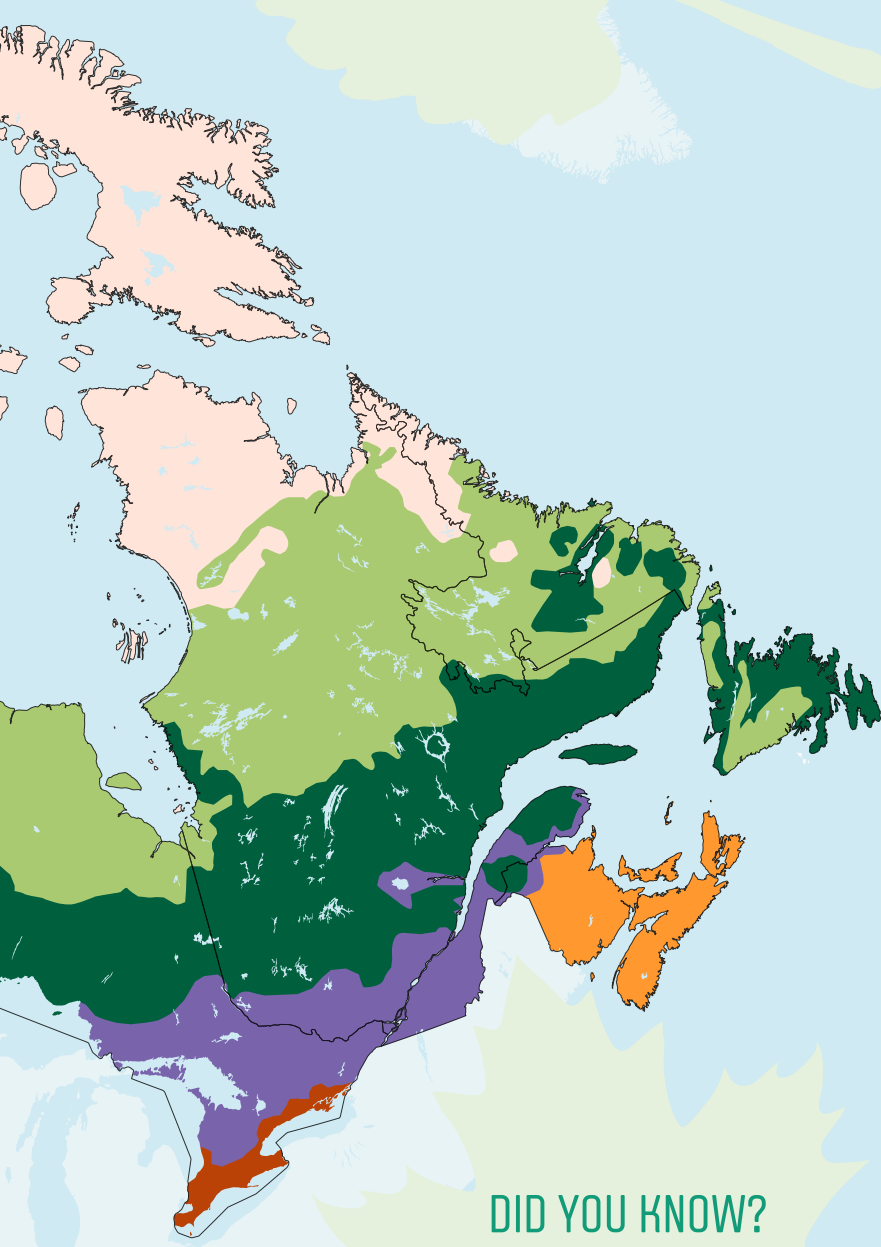
DID YOU KNOW?

Canada's oldest tree was an 1835-year-old yellow-cedar found in the Caren Range of the Sunshine Coast. Canada's oldest living tree may be an eastern white-cedar, on the Niagara Escarpment, that sprouted in 688 AD.

Canada's Arboreal Emblems

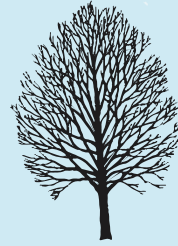
DID YOU KNOW?

The "Golden Spruce," a unique yellow-needled "evergreen" considered sacred by the Haida First Nation, was cut down in 1997 under mysterious circumstances.



DID YOU KNOW?

More than 13 percent of Christmas trees in North America are balsam firs.



CANADA
Maple



BRITISH COLUMBIA
Western Redcedar



ALBERTA
Lodgepole Pine



SASKATCHEWAN
White Birch



MANITOBA
White Spruce



ONTARIO
Eastern White Pine



QUEBEC
Yellow Birch



NEW BRUNSWICK
Balsam Fir



NOVA SCOTIA
Red Spruce



PRINCE EDWARD ISLAND
Northern Red Oak



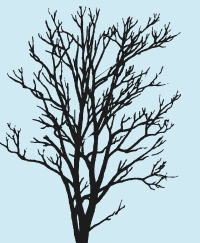
NEWFOUNDLAND & LABRADOR
Black Spruce



YUKON TERRITORY
Subalpine Fir



NORTHWEST TERRITORIES
Tamarack



*NUNAVUT
Willow (Proposed)



The Million Tree Project: Conserving Canada's Forests

Canada's forests face serious threats. If we want to preserve our wild spaces, and the amazing diversity of plants and animals that live there, we must take action.

Climate Change

Unless we dramatically reduce our greenhouse gas emissions, and do it quickly, Earth's average temperature could be 4°C higher by 2100. Global temperatures are already about 0.8°C warmer than they were in 1948, but Canada is warming faster. Our average temperature has increased by 1.7°C during the same timeframe.

Patterns of rain and snowfall are changing too: Eastern Canada is getting wetter, but the West is drying out. This has real consequences for trees. For example, the severe drought of 2001-2002 killed more than 45 million tonnes of trembling aspen in the parkland fringing Canada's prairies. That's more than twice the annual hardwood harvest by the forest sector.

Take Action:

All efforts to reduce our carbon footprints—including reducing our use of fossil fuel as well as conserving and planting trees—will help mitigate potentially catastrophic climate change.

Forest Fires

Forest fires are caused by two things: lightning strikes and people. While fire is an important source of renewal in the boreal forest, it can also threaten human health, homes, and businesses.

The warmer, drier conditions associated with climate change have lengthened Canada's fire season. Total area burned each year is also increasing. The Canadian Forest Service predicts that annual burnt area will continue to increase, doubling by the end of this century.

Take Action:

Smokey the Bear was right—it's up to us to prevent human-caused forest fires. Never throw a match or cigarette out a car window. And always make sure that campfires are completely cold before walking away.



DID YOU KNOW?

Global warming of just 1.5 to 2.5°C increases the extinction risk for 20 to 30 percent of the Earth's plants and animals, including those in Canada's forests.

Invasive Species

In the past, mountain pine beetles were found mostly in southern British Columbia. Due in part to warmer winter weather, these insects have become invasive, spreading north and east through Canada's boreal forest.

Climate change is one way that invasive species can colonize new habitats. Most invasives, however, are spread by humans: in our wood products or packaging, with ornamental trees and shrubs, or through infected firewood.

Take Action:

To avoid further spread of invasive species like Dutch elm disease or emerald ash borers, always follow regulations surrounding the import and transport of wood. Visit the Canadian Food Inspection Agency at bit.ly/3oGRiHk for details.

DID YOU KNOW?

Recycling 1 tonne of paper saves about 19 trees.

Can't Plant a Tree? Protect One, Instead

One way to participate in the Million Tree Project is by conserving Canada's existing trees. Make a plan, and tell us about it! Visit bit.ly/3mzNxlM and click the "Register Your Commitment" button to share your conservation goals.

Here are some simple ideas to get you started:

- Reduce, reuse, and most definitely recycle!
- Restore used wooden furniture instead of buying new
- Buy new wood products from sustainably managed forests: look for Forest Stewardship Council, Canadian Standards Association, or Sustainable Forestry Initiative certification
- Use less paper by buying recycled paper products; printing fewer, double-sided pages; buying ebooks and digital subscriptions to newspapers and magazines; choosing reusable bags, plates, napkins, and towels

Encouraging manufacturers to adopt renewable practices, and encouraging governments to implement stronger environmental policies, are also ways to ensure a greener future for Canadians, and Canada's trees.

DID YOU KNOW?

About 12 percent of Canada's forests are in National Parks or other protected areas. Canada has committed to protect 30 percent of its land and sea by 2030, to fight both extinction and climate change.



Tree Planting: Getting Started

DID YOU KNOW?

Some tree species produce seeds every year. Others, like black ash, seed once every 5 to 7 years.

Forest conservation and stewardship are important, but don't go far enough. That's why The Million Tree Project is mostly about—you guessed it!—planting trees.

An average Canadian produces 19.7 tonnes of CO₂ emissions each year. Each year, an average Canadian tree absorbs about 10.3 kg of CO₂. But don't let that discourage you: planting even a single tree will make a difference.

Science Rendezvous is hosting registered planting opportunities across the country, and events in your area can be arranged on request. Interested in volunteering to join or lead an event? Visit us on Facebook or our website (bit.ly/3mzNxIm) for a list of scheduled plantings, or email us at info@sciencerezvous.org

Ongoing COVID-19 restrictions may limit group planting opportunities. Not to worry! There are lots of ways to plant trees on your own. First, decide whether you'd like to plant on your own property or on public land. Many towns and provinces offer incentives for tree planting on public property.

Next, decide whether you want to purchase your tree(s) from a local greenhouse, garden centre, or nursery. If not, no problem. There are free and inexpensive sources of seeds, seedlings, and saplings, too. Let us know your plans: we can assist or provide more information.

Collect Your Own Tree Seeds

One free way to plant a tree is by collecting your own seeds. Picking tree seeds off of the ground is quick and easy, but it might not lead to a successful planting. That's because fallen seeds have often been munched on by insects or fungi... or are simply too old to sprout. A better way to collect seeds is to get shaking!

1. Pick a strong, healthy looking tree and wait until autumn, when seeds are ripe.
2. Use a rake to clear the ground under the tree, or spread out a blanket or tarp. This makes the seeds easier to find.

3. Grasp the trunk or low hanging branches and shake, shake, shake! Not too hard – you want to loosen the seeds without damaging the tree. For higher branches, try using a stick or pruning pole.
4. Check the seeds for quality. Whole, plump seeds are most likely to sprout.
5. Plant your seeds before the ground freezes. If you have to wait for spring, find out whether your seeds require stratification—a process that mimics the winter conditions tree seeds experience in nature. Visit Agriculture and Agri-Food Canada at bit.ly/2JimTit to learn more.

Tree Planting: It's Good for Your Health

More than 81 percent of Canadians live in urban areas. A growing body of research suggests that a city's trees are essential to its people's health. Urban forests have been linked to:

- Improved blood pressure and cardiovascular health
- Reduced rates of asthma and lung cancer
- Reduced anxiety, depression, and stress
- Improved mood, focus, and cognitive function
- Increased physical activity, including walking, cycling, and outdoor play

DID YOU KNOW?

90 percent of the seeds in a jack pine cone stay sealed up inside until the heat of a forest fire naturally opens the cone.

DID YOU KNOW?

Forests Ontario offers financial assistance for tree planters through their 50 Million Tree Program. To learn more, visit bit.ly/2EWQdta

DID YOU KNOW?

Many tree-planting organizations accept donations. If you can't plant a tree yourself, consider making a charitable contribution instead.

Keep on Shaking

Become a seed collector to support planting efforts throughout your community! Contact Science Rendezvous to learn about our community seed collection events. And remember to register the seeds you collect on our website, at bit.ly/3mzNxlM



Tree Planting: Picking the Perfect Species

You've decided to plant a tree: that's great! For help choosing the right species for your situation, contact local experts, like arborists or staff at garden centres and nurseries. Here are some general tips to get you started.

Location, Location, Location

The healthiest tree in the world will die if planted in the wrong habitat. Make sure to choose a tree that is adapted to the climate zone, soil type, and drainage conditions at your planting site.

Maps of Canada's climate zones are available online, as are lists of trees that grow under local conditions. Soil type and drainage are factors you can measure yourself. To test your soil, grab a handful and rub it between your fingers. Does it feel gritty? It's high in sand. Silky or floury? High in silt. Now wet the soil and squeeze it into a clump. Can you feed it out between your thumb and fingers, forming a long dirt ribbon? If so, your soil is high in clay, and probably won't drain well.

A poorly-drained soil will be moist all year round, especially under the surface. Sandy, well-drained soils are probably only wet in the spring or right after a big rainstorm. Bear in mind that a shallow water table can affect drainage. So can permafrost, so if you live in Canada's North, pick a tamarack or black spruce for best results!

Consider Your Goals

Are you planting the tree on your own property? If so, are you hoping for summer shade or relief from cold winter winds? Looking to attract birds or other wildlife? Would fruit or nuts be a bonus or a hassle? Think about how the tree will alter the habitat in your yard—for you, other animals, and your neighbours!



DID YOU KNOW?

Developed by Natural Resources Canada, the free MyTree app provides a list of tree species suitable for your climate zone. Results can be filtered by preferred habitat, adult size, and autumn leaf colour!



DID YOU KNOW?

One row of eastern white pines can reduce windspeed against your house by 60 percent!



Opt for Native Species

About 58 percent of non-native plant species in Canada were deliberately introduced. Many of those are ornamental trees and shrubs that are popular with urban landscapers.

Many non-native plants thrive in Canada, without becoming invasive. However, a native tree, from parent stock in your area, is adapted to local conditions and will probably grow the best. As a bonus, native trees support native wildlife species, including pollinators.

And don't worry—you won't be stuck with pines and poplars. Use the MyTree app or visit Tree Canada at bit.ly/2GoA0xu to explore the full range of native tree species!

Don't Feed the Tree Killers

Invasive insects and diseases kill trees across the country. But Canada is home to native pest insects, too: spruce budworm and forest tent caterpillars are two notorious examples.

To avoid losing your tree to insects or disease, find out which threats are common in your area. Choose a tree species accordingly. Remember that some pests are always present, but others are cyclical, coming and going from year to year.

DID YOU KNOW?

Boreal chickadees prefer balsam fir trees, while magnolia warblers like white birch.

DID YOU KNOW?

In 1975, a spruce budworm outbreak defoliated 71 million hectares of forest in Eastern Canada!

A young tree with green leaves is planted in a grey nursery pot, which is placed on a field of green grass and yellow wildflowers. The background shows a blurred landscape with more trees and a path.

Call Before You Dig

Underground power and gas lines can be quite close to the surface—close enough to hit with a garden shovel. For safety, and to avoid expensive accidents, call for a free locate at least five days before you plant your tree.

A white callout box shaped like a leaf with a stem, containing text.

DID YOU KNOW?

Properties with trees are worth more on the real estate market.

Tree Planting: Where and How to Plant That Tree

You've picked your tree and you're ready to dig! Well, not just yet. First, find out whether your community has bylaws that govern tree planting near property lines, or in public spaces like city parks. If you're going to plant on your own property, consider the full lifespan—and mature size!—of your tree. Is the spot you've chosen far enough away from foundations, fences, and overhead powerlines? If so, you're ready to go!



DID YOU KNOW?

Ontario's HydroOne recommends planting trees at least 8 m away from overhead powerlines and poles.

How to Plant a Tree

Different trees need different habitats... and sometimes, different planting procedures. In most cases, following the steps below will work just fine. If you'd like specific advice for your tree species, check online or with your local nursery.

1. Check the weather. Deciduous trees can be planted as soon as the frost leaves the soil in spring; you can plant conifers until four weeks after deciduous trees leaf out. Both types of tree can be planted in autumn, right until freeze up.
2. Dig that hole. You'll need a hole two to three times wider than your tree seed or root ball, and about the same depth. Roughen up the edges of the hole so it's easier for tree roots to wiggle through. If your soil contains a lot of sand or clay, now's a good time to mix in a little compost.
3. Green side up! Point your seed—or sapling's leaves—straight towards the sky.
4. Fill the hole about 2/3 full of soil, and gently pack it down to remove air pockets.
5. Give your tree a drink! Fill the hole with water and wait for it to drain.
6. Top up the soil, forming a mound around the tree's roots.
7. Unless you're planting a tall tree, or in a very windy area, you can probably skip the stake.
8. Planting more than one tree? Leave plenty of space between them to avoid crowding as they grow.

Helpful Tips

- Trees are perishable! Protect your tree during transport and plant it right away. If you have to delay, keep your tree in a shady area so the roots stay moist.
- In dry climates, mulch will help the soil retain water. Avoid root rot by keeping mulch at least 5 cm away from your tree's trunk.

DID YOU KNOW?

Too much fertilizer can actually stress a tree! If your soil is particularly poor in nutrients, a little bit of bone meal is OK.



Tree Planting: How to Care For, Maintain, and Register Your Tree

Like all wild babies, young trees need care to thrive. Tend to yours and watch it grow! And share the results of your planting experiment by registering your tree with the Million Tree Project.

Caring for Your Tree

- Water your tree twice a week—more often if the soil looks dry. About 3 buckets of water, or 15-20 minutes with a slow garden hose, is a good guideline.
- In the first year, use only high phosphorus (P) fertilizer. You can add a little extra nitrogen (N) as your tree matures.
- If your tree is staked, make sure the fastener isn't too tight—your tree trunk needs room to grow.
- Try not to prune within three years of planting. If you need to remove dead or damaged branches, wait until late fall or early spring, when the tree is dormant.

DID YOU KNOW?

Not all insects are harmful to trees—many are just in their natural habitat, doing their thing. You don't need to kill the insects unless your tree is getting sick.

Keep a Field Notebook

Scientists use field notebooks to track their experiments and observations about the natural world. You can use yours to track the growth and development of your tree! Here are just some of the things you could include in your notes:

- How fast does your tree grow? Measure its height and/or width at planting, and measure again on the same day each year. To estimate rate of growth, divide the change in height or width by the number of months between measurements. You can even plot a graph of your tree's progress over time!
- Do the leaves look healthy? Are they brown, curled, or falling off when it's not autumn?
- Do other plants, moss, or lichens grow on or near your tree?
- What animals visit your tree? What insects, spiders, birds, and mammals do you see, and what are they doing? Include photos or drawings in your notebook.

Field Notebook



Initial Notes

Growth Statistics

	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
Height (in cm)						
Width (in cm)						
Rate of Growth						
Leaf Condition						
Nearby Plants/ Moss/Lichens						
Animal Visitors						

Notes

MILLION TREE PROJECT



Register Your Tree

Make sure your tree gets counted in this Canada Wide Experiment! Visit the Million Tree Project online at bit.ly/3mzNxlM and click "Register Trees" to report your plantings. Alternatively, you can fill out this form and mail it to:

Million Tree Project
c/o Science Rendezvous
Suite 331, 60 George St.
Toronto ON M5S 1A7

Science Rendezvous will use this data to understand where, how, and what species of tree have been planted across Canada... and the amount of carbon emissions we have collectively reduced. We will not share your name or contact information with anyone outside this project.

Name: _____

Email: _____

and Species of Trees Planted: _____

Location (City, Province): _____

Circle one or more: Seeds Seedlings Saplings

Was Your Planting Led By a Volunteer (circle one): Yes No

Resources:

Thank you to our friends at the Ottawa and Kingston Frontenac Public Libraries for assembling our lists to inspire further reading.

For Kids and Teens

Children's Books

Carmichael, LE (2020) *The Boreal Forest: A Year in the World's Largest Land Biome*. Toronto: Kids Can Press.

Brooks, Marigold (2018) *Let's Plant a Tree*. New York: Rosen.

Galat, Joan Marie (2014) *Branching Out: How Trees Are Part of Our World*. Toronto: OwlKids Books.

Green, Jen (2019) *The Magic and Mystery of Trees*. New York: DK Children.

Hickman, Pamela (2019) *Nature All Around: Trees*. Toronto: Kids Can Press.

Hodge, Deborah (2009) *Who Lives Here? Forest Animals*. Toronto: Kids Can Press.

Jose, Sarah (2019) *Trees, Leaves, Flowers & Seeds: A Visual Encyclopedia of the Plant Kingdom*. New York: DK Children.

Kleppeis, Alicia Z (2018) *24 Hours in the Taiga*. New York: Cavendish Square Publishing.

Oliver, Carmen (2019) *A Voice for the Spirit Bears*. Toronto: Kids Can Press.

Serafini, Frank (2014) *Looking Closely Through the Forest*. Toronto: Kids Can Press.

Singh, Rina (2020) *111 Trees*. Toronto: Kids Can Press.

Wohlleben, Peter (2019) *Can You Hear the Trees Talking? Discovering the Hidden Life of the Forest*. Vancouver: Greystone Books.



Kid-Friendly Websites

Boreal Forest. *Hinterland Who's Who, Canadian Wildlife Federation*.
hww.ca/en/wild-spaces/boreal-forest.html

Earth Rangers (a conservation organization for kids).
earthrangers.com

Fantastic Forests. *Time for Kids*.
timeforkids.com/k1/fantastic-forests

Forest. *Britannica Kids*.
kids.britannica.com/kids/article/forest/390614

Forests for Kids Learning Guide. *Food and Agriculture Organization of the United Nations*.
catalogue.unccd.int/1179_Forest_for_kids_learning.pdf

Temperate Forest Habitat. *National Geographic Kids*.
kids.nationalgeographic.com/explore/nature/habitats/temperate-forest

The Benefits of Trees. *Tree Canada*.
treecanada.ca/resources/benefits-of-trees

The Great Big Boreal Forest Resource List. Compiled by LE Carmichael.
lecarmichael.ca/2020/04/virtual-forest-articles-lesson-plans-other



Resources: For Adults

In The Library

Brandt JP, Flannigan MD, Maynard DG, Thompson ID, Volney WJA (2013) An Introduction to Canada's Boreal Zone: Ecosystem Processes, Health, Sustainability, and Environmental Issues. *Environmental Reviews* **21**, 207-26.

Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming. (2017) Ed. Paul Hawken. New York: Penguin.

Drengson, Alan (2009) *Wild Forestry: Practicing Nature's Wisdom.* Gabriola Island: New Society Publishers.

Farrar, John Laird (1995) *Trees in Canada.* Markham: Natural Resources Canada Canadian Forest Service and Fitzhenry and Whiteside.

Gawthrop, Daniel (1999) *Vanishing Halo: Saving the Boreal Forest.* Vancouver: Greystone Books.

Kaza, Stephanie (2019) *Conversations with Trees: An Intimate Ecology.* Boulder: Shambhala.

Lukac, Martin, and Godbold, Douglas L (2011) *Soil Ecology in Northern Forests: A Belowground View of a Changing World.* Cambridge: Cambridge University Press.

Lynch, Wayne (2001) *The Great Northern Kingdom: Life in the Boreal Forest.* Markham: Fitzhenry & Whiteside.

Rustad, Harley (2018) *Big Lonely Doug: The Story of Canada's Last Great Trees.* Toronto: House of Anansi Press.

Tudge, Colin (2007) *The Tree: A Natural History of What Trees Are, How They Live, and Why They Matter.* New York: Broadway Books.

Wolfe, Art (2018) *Trees: Between Earth and Heaven.* New York: Earth Aware Editions.



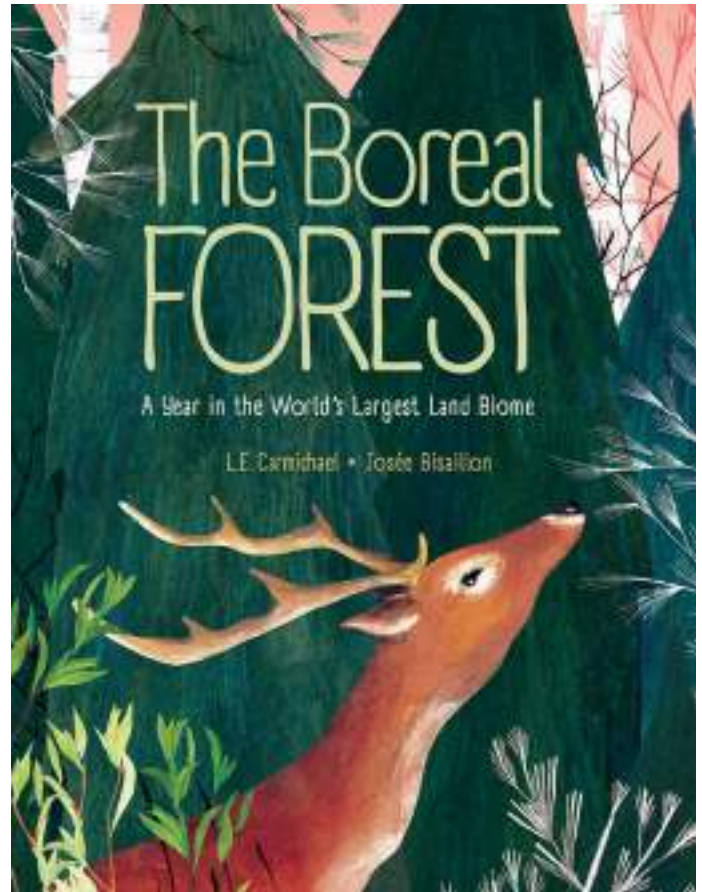
Online

- Abnett K, Jessop S (28 Sept 2020) Britain, Canada, EU Throw Weight Behind 2030 Biodiversity Protection Goal. *Financial Post*.
financialpost.com/pmnbusiness-pmn/britain-canada-eu-throw-weight-behind-2030-biodiversity-protection-goal
- Bennett J (22 Jan 2015) Iconic Driftwood House Preserved in Mackenzie Delta Permafrost. *Canadian Geographic*.
canadiangeographic.ca/article/iconic-driftwood-house-preserved-mackenzie-delta-permafrost
- Boreal Songbird Initiative.
borealbirds.org
- Canadian Food Inspection Agency. Hazards for Moving Firewood.
inspection.gc.ca/plant-health/forestry/don-t-move-firewood/firewood/eng/1330963478693/1330963579986
- Choosing the Right Tree: A Landowner's Guide to Putting Down Roots*. (2006) Ed. Ferguson Forest Centre FGCA, and the Eastern Ontario Model Forest.
fgca.net/wp-content/uploads/ChoosingTheRightTree2010FINAL2016.pdf
- Kurz WA, Shaw CH, Boisvenue C, *et al.* (2013) Carbon in Canada's Boreal Forest - A Synthesis. *Environmental Reviews* **21**, 260-92.
- Miller J. Wildlife Connections: Habitat Trees. *University of Kentucky, College of Agriculture, Food, and Environment*.
ufi.ca.uky.edu/wildlife-habitat-tree
- Natural Resources Canada. Forest Certification in Canada.
nrcan.gc.ca/our-natural-resources/forests-forestry/sustainable-forest-management/forest-certification-canada/17474
- Natural Resources Canada. Forests and Forestry.
nrcan.gc.ca/our-natural-resources/forests-forestry/13497
- Natural Resources Canada. *The State of Canada's Forests: Annual Report 2019*.
nrcan.gc.ca/our-natural-resources/forests-forestry/state-canadas-forests-report/16496
- Science Rendezvous. Million Tree Project.
sciencerezvous.ca/million-tree-project/en/
- The Incredible Seed Company. Guide Fall Tree Seeds Part 1
incredibleseeds.ca/blogs/news/the-incredible-seed-company-guide-to-fall-planting
- Tree Canada.
treecanada.ca

About the Author

At some point, every kid starts asking “Why?”. Lindsey Carmichael never stopped. Scientist and award-winning author of more than 20 STEM books for young readers, Lindsey writes to spark her readers’ curiosity and ignite their imaginations. She is a popular speaker whose school visits encourage inquiry and kindle a love of life-long learning.

Publishing under the name L. E. Carmichael, Lindsey loves beaches, platypuses, and all things fantasy. She’s fascinated by the moment when facts reveal truth. To learn more about Lindsey’s newest book, *The Boreal Forest: A Year in the World’s Largest Land Biome*, visit lecarmichael.ca or kidsnapress.com.



Additional Credits

Thank you to Charlie Nelson, Kirby Nelson, and Angeline Nelson for sharing their Traditional Knowledge and perspectives on trees in Canada. Marie-Annick Amyot, Ed Banfield, Bryson Perrin, Melissa Wheeler, Amélie Roberge, Verna Crossman, and Matthew Bock of Natural Resources Canada also reviewed this guide.

Sponsors



Copyright & Permissions

© 2020 Science Rendezvous and the Natural Sciences and Engineering Research Council of Canada (NSERC). All rights reserved. Cannot be reproduced in any form, paper or digital, without prior written consent of the copyright holders.

Science Rendezvous
Suite 331, 60 St. George St.
Toronto ON M5S 1A7
www.sciencerendezvous.ca

NSERC
350 Albert St.
Ottawa ON K1A 1H5
www.nserc-crsng.gc.ca

/// Design by Stratasfear

SCIENCE
RENDEZVOUS
MILLION
TREE
PROJECT

