

Green Teacher

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A photograph of four people in kayaks on a river. They are wearing life jackets and waders. The background is a dense forest of evergreen trees. The water is calm and reflects the surrounding greenery.

Learning through a Forest Lens

PLUS

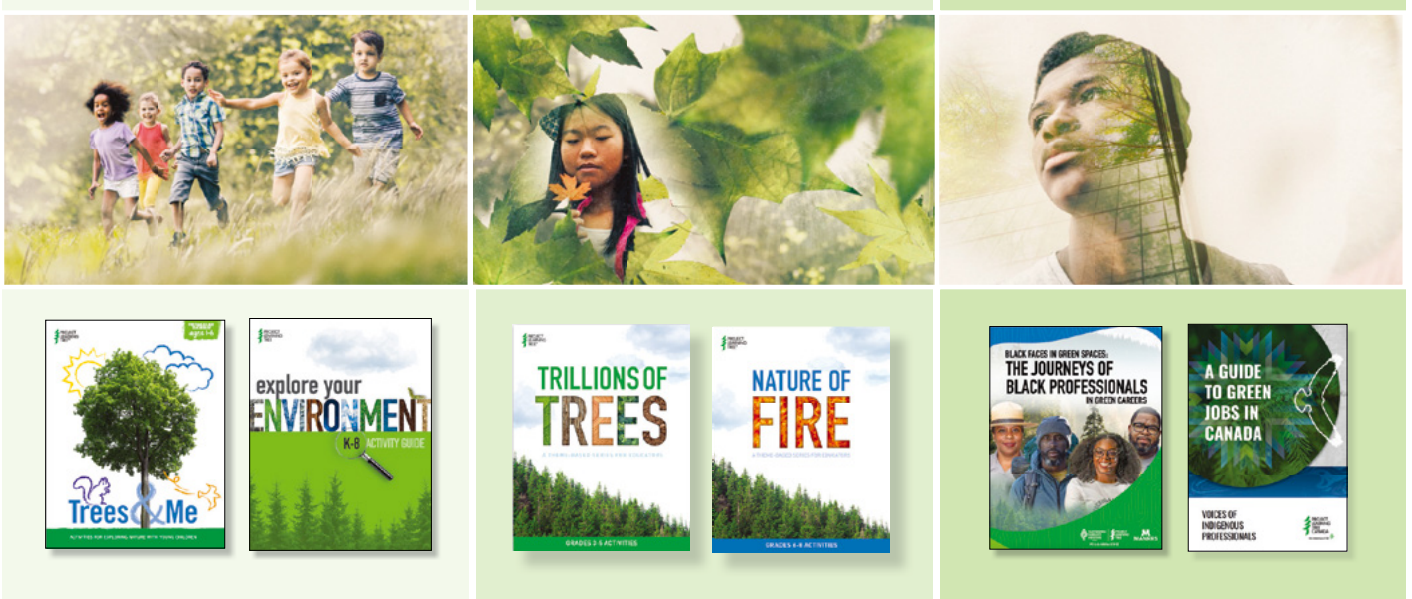
Our Responsibility to Forests | What Is a Forest? | Are There Green Careers in the Forest? |
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EDITORIAL

IN THE OPENING ARTICLE of this special themed issue on learning through a forest lens, [Project Learning Tree's](#) Jess Kaknevicius notes two remarkable statistics about forests: “They are home to about 80% of land-based biodiversity and about 350 million people worldwide.” (For a bit of added context on that second figure, almost 10 times the number of people living in Tokyo — the world’s largest urban area by population — live in forests.) As such, if benevolent extraterrestrial entities were to ask about experiencing land-dwelling life on this planet, our best bet would probably be to suggest that they start by visiting the nearest forest. There’s just so very much going on in these natural communities where trees are the dominant and most readily conspicuous life forms. When the miracle of life presents in such a dizzyingly diverse array of manifestations, we can’t help but be enchanted and inspired to learn more.



Thanks in large part to the research and writings of folks like Suzanne Simard, Peter Wohlleben, and Robin Wall Kimmerer, among many others, our collective understanding of forests has rapidly expanded, especially with respect to their subterranean connections. The “wood-wide web” — once a theoretical concept requiring extensive study to address its many unanswered questions — now occupies a foundational place in the broader story about forests. Just as we have long taught about annual growth rings, stratification, and foliage density, it is now second-nature to talk of mother trees and mycorrhizal networks.

Chances are a good number of you reading this are already well-attuned to the rhythms of your local forests. Maybe you teach at a forest school or forest kindergarten. Perhaps you regularly partake in the Japanese practice of shinrin-yoku (forest bathing), benefitting from the abundant phytoncides circulating about in the air. It may also be that you are in the early stages of considering a forest as an integrating context for learning. In any case, our hope is that the four articles and five lesson outlines contained in this issue collectively serve as a sort of pedagogical toolkit for teaching in and about forests. Whether you live in a temperate, sub-arctic, or tropical zone, the wisdom contained in the following pages is applicable to your closest woody giants as well as their associated life forms and non-living elements.

We also invite you to tune in to the forthcoming podcast episode (set to drop in April) with Project Learning Tree about fostering a conservation mindset through a forest lens or check out previous episodes about [the health benefits of forests](#) and [what we can learn from trees](#).

Finally, please keep us posted about any meaningful forest-related learning you and your learners experience in the coming months. We’d love to hear stories about your local tree-filled community and the opportunities for discovery it offers to the curious and inquiring mind.



-Ian Shanahan

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Key to article symbols

You will notice in this issue a few new visual cues alongside most articles. These symbols will allow you to quickly identify some important indicators about each piece.

Age groups



Age 5–12 (Elementary)



Age 14–19 (High School)



Age 10–14 (Middle School)



All Ages



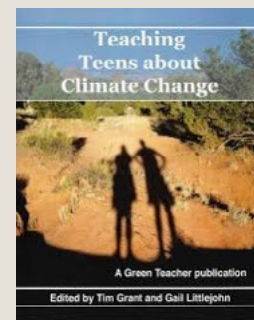
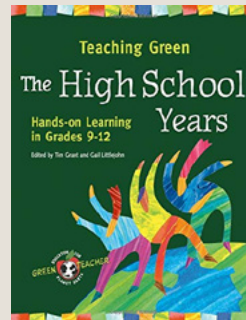
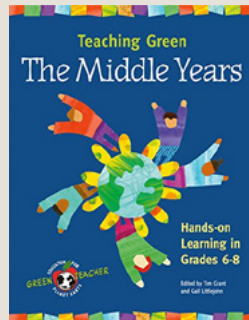
Activity/lesson plans indicates that articles include an activity/lesson plan*

*Note: Most articles include practical tips and insights even if they do not all include activity/lesson plans.

Green Teacher

Our books feature a curation of the best **ideas, lessons and activities** for engaging students in environmental education, in and beyond the classroom.

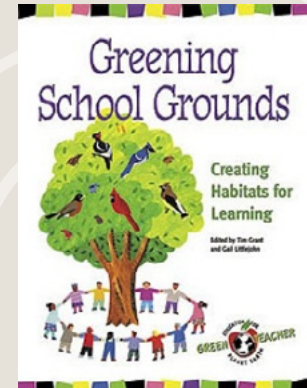
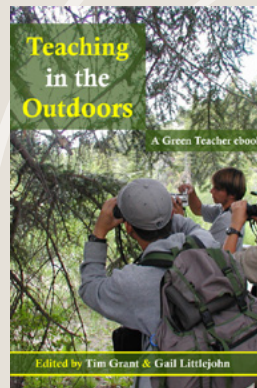
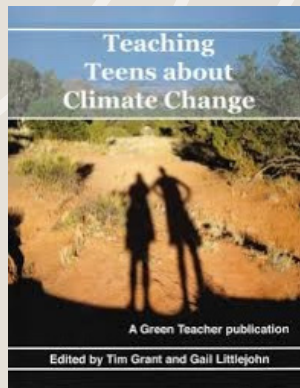
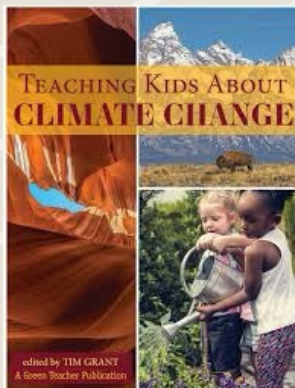
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Our Responsibility to Forests

Instilling a love of forests in students means a brighter future for our planet



All photos provided by Project Learning Tree


By **Jess Kaknevicus**

WHAT IS OUR RESPONSIBILITY to forests? There are so many ways to answer this question, but I think most of us would agree that we share a responsibility to ensure forests are sustainable and there for future generations to benefit from.

If we accept this starting point — that forests deserve our support — then observing, understanding, and experiencing forests first-hand is a great way to start figuring out how you can actively promote forest sustainability. Think of it as beginning a personal relationship with a forest near you. Closer to home, people can support community forests and even the trees in their own yards. People can also support forests by choosing wood, paper, and other forest products that are sourced sustainably.

In the face of today's sustainability challenges, forests are too important to ignore

So, why should we support forests? Forests cover 31% of the world's land.¹ They are home to about 80% of land-based biodiversity² and about 350 million people worldwide.³ Forests produce oxygen, replenish and filter groundwater, secure soil, and regulate air temperature. Forests offer a place to educate and inspire future generations to connect to nature and become stewards of the natural environment.



All these facts, along with myriad inspiring ways to support forests, are part of the Project Learning Tree Forest Literacy Framework: a Guide to Teaching and Learning About Forests (plt.org/forestliteracy). Project Learning Tree is committed to advancing environmental education, forest literacy, and green career pathways, using trees and forests as windows on the world. PLT's award-winning resources offer a lifetime of learning, from early childhood through adulthood, and our wide and diverse network provides professional development for educators and opportunities for young adults to explore forests and green careers. PLT is an initiative of the Sustainable Forestry Initiative (forests.org). SFI is a non-profit charitable organization with the mission of advancing sustainability through forest-focused collaboration.

At PLT we know that forests offer some of the greatest solutions to big global sustainability challenges like biodiversity loss and climate change. We think it's essential for everyone to be engaged and educated on some level to ensure that forests can fulfill this critical role.

A closer look at the role forests play in mitigating climate change shows just how important it is that we all show our support for forests. According to the International Union for Conservation of Nature (IUCN), the world's largest and most diverse environmental network, forests are one of the most important nature based solutions to addressing the effects of climate change. About 2.6 billion metric tons of

carbon dioxide, one-third of all the CO₂ released around the world from burning fossil fuels, is absorbed by forests every year.⁴ So, we're not overstating things when we say forests are essential to mitigating climate change.

SFI is an IUCN member, and over 370 million acres of forestland are certified to the SFI Forest Management Standard in the US and Canada. In total, these SFI certified forestlands store about 250,000 million metric tons of CO₂ equivalents,⁵ an amount roughly equivalent to the total emissions of all the world's cars over 38 years.

Helping people see their personal connections to forests helps them understand how their actions affect forests

Learning to take action to support forests gives students pathways to be environmental stewards today and tomorrow. At PLT, we believe forests and students benefit when everyone has the opportunity to identify and explore their personal relationship with trees and forests. For example, how we treat hiking trails, campgrounds, and campfires says a lot about how we can help or harm forests.

We also need students to understand that even the choices they make when they're not in the woods can have a big impact on forests. We all need to understand that the resources that we use and consume every day are connected to forests. Once this connection is made, students can see how choosing responsible wood products — with certification labels showing that they are from well managed forests — supports forest sustainability.

Once students understand that forests are part of their daily lives, they are more likely to grow up to become stewards of the forest.⁶ Helping students at all levels understand objectives for and perspectives on forest management at local, national, and global levels will help them be better able to engage in conversations and actions supporting sustainable forest management and sustainable supply chains. Once they become adults, students can take action by becoming informed and active voters, attending public meetings, and participating in lifelong environmental learning.

Asking the right questions: the right way to get students to support forests

Of course, technical arguments and complex facts aren't the best way to engage K–12 students. That's why PLT takes my

original question: "What is our responsibility to forests?" and asks it in all kinds of age-appropriate ways to engage students. Consider these kinds of questions from the PLT Forest Literacy Framework:

- Grades K–2: What can we do to help forests?
- Grades 3–5: What can people do to take care of our forests?
- Grades 6–8: What can individuals do to ensure the well-being of our forests?
- Grades 9–12: What career opportunities are available in the forest and conservation sector?

Grades K–2: What can we do to help forests?

The PLT Forest Literacy Framework has direct connections to Next Generation Science Standards (NGSS) in the United States for grades K–2. Under the NGSS science topic "human impacts on Earth systems," the PLT framework presents the core idea that people do things that can affect the world around them. Some of the sample PLT forest literacy activities include the following:

- Read *Welcome to the Neighborhood* by Shawn Sheehy or another book that introduces children to forests and forest organisms.
- Gather students by a tree and invite them to act out the different stages of a tree's life.
- Challenge students to look closely at a tree and find as many different plants and animals as they can (including people) that live in and around it.
- Count the number of objects in the classroom that are made from trees and tree products.
- Help students plan and conduct an investigation of what plants need to thrive.

- Work with students to carry out a tree planting project.

- Read *A Walk in the Forest* by Maria Dek, which encourages children to discover the forest as a place for imaginative play and contemplation.

Grades 3–5: "What can people do to take care of our forests?"

The PLT Forest Literacy Framework also has direct connections to Next Generation Science Standards in the United States for grades 3–5.



Under the NGSS science topic “human impacts on Earth systems,” the PLT framework presents the central idea that people and the communities they belong to are doing things to help protect the environment and natural resources. Some ideas for PLT forest literacy activities include the following:

- Challenge students to identify the names of trees in the schoolyard, in a park, or along a street.
- Lead an investigation of biotic (living) and abiotic (non-living) components of ecosystems through a plot study comparing shady and sunny locations in the schoolyard or a nearby park.
- Create a model of a forest food web by having students choose a forest animal, draw a picture of it on an index card, then research and write on the card what that animal eats and what eats it.
- Inspire students to go on an outdoor scavenger hunt for tree products.
- Ask students to brainstorm different jobs that might be necessary to care for forests and to provide the things we need and want from them.
- Conduct a modeling simulation using math cubes or poker chips to explore what happens when trees compete for limited resources such as water, sunlight, carbon, and nutrients.
- Invite students to sit under a tree and use their senses to generate group lists of words the tree evokes.
- Encourage students to investigate their school site, inventory natural habitats, trees, and wildlife present on the site and find out how the grounds are maintained.

Grades 6–8: “What can individuals do to ensure the well-being of our forests?”

Middle school students understand that problems have multiple solutions and are able to see different perspectives on an issue. Forests can become a meaningful context for middle schoolers to design and conduct investigations and to use evidence to analyze results. They should also be able to back personal opinions with evidence and to distinguish between opinion and fact. These forest literacy concepts are an ideal foundation for middle-school activities:

- What social, economic, and environmental benefits do forests provide?
- How do we sustain forests and preserve the benefits they provide?
- What can individuals do to ensure the well-being of our forests?
- What green career opportunities are out there?

Grades 9–12: “What career opportunities are available in the forest and conservation sector?”

In high school, forests can become the focus of more sophisticated research. Forests provide a meaningful context for high school students to examine the implications of issues on a variety of levels, locally and globally. Students can also explore their forest-related green career options. Consider using some of these PLT forest literacy activities:

- Lead students on a tree survey of the school grounds; identify the genus of each tree; and measure the diameter at breast height and the height of each tree.
- Study the process of succession, first by reading about the re-establishment of ecological communities following the eruption of Mount St. Helens in 1980.
- Challenge students to explore the connection between forests and water through a soil filtration experiment using two-liter plastic bottles or other simple materials.
- Show videos depicting real-life people in different forestry jobs using PLT Canada Day in the Life YouTube videos.
- Using the US Forest Service’s Climate Change Atlas, have students analyze data on how climate change is affecting forests in the Eastern United States.
- Explore the role of prescribed burns in managing fire-prone forest ecosystems.
- Examine the US statistics for the UN Sustainable Development Goals.
- Invite students to carry out a project to deepen their connection with forests.
- Help students take a leadership role in the community by planning and presenting a Forest Day with a nearby elementary school classroom.

Forest literacy shows that nature is a great teacher

Forest literacy is a truly interdisciplinary endeavor, with connections to science, social studies, mathematics, health, business, and many other subjects. Learning about forests charts a pathway to understanding the importance of forests as a sustainability solution. The more students are prepared to be forest stewards, the better off we all are.

Jess Kaknevicus is Vice President of Education at the Sustainable Forestry Initiative. She engages young people on the values and benefits of sustainably managed forests and on green careers in the sector through Project Learning Tree, SFI’s leading education and career pathway initiative.

Endnotes:

1. *The State of the World’s Forests 2020*, Food and Agriculture Organization of the United Nations, <https://www.fao.org/3/ca8642en/ca8642en.pdf#page=18>.
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What Is a Forest?

Home to more than just trees, forests are key to biodiversity.



All photos provided by Project Learning Tree

By **Darren Sleep**

WHAT IS A FOREST? It's so much more than a bunch of trees: forests are critical ecosystems. If we think of forests as ecosystems, it's easier to see how trees and forests influence their environment and how the environment influences trees and forests.

Students learn in school that everything is connected, from birds, insects, fish, dirt, and trees to our pets, our food, and ourselves. But to really understand how absolutely interconnected all life forms in an ecosystem are, it helps to experience those webs of life first-hand, inside and outside the classroom.

That's why a forest is a great place for students to continue learning about ecosystems and how we are all part of larger nature-based systems. Many students live within easy reach of forests, especially if we consider urban forests in our communities.

Using forests to understand concepts like nature-based systems helps boost fundamental comprehension of the relationship between forests and humans, and how forests make a difference in our lives. If we can help students make these important connections, they are more likely to form per-

sonal connections with nature and become stewards of the natural environment.¹ Because we all know that people only value what they understand, and it starts with students.

As a scientist who supports educators, I know how important it is to understand basic ecological principles and concepts like ecosystems and how they apply to forests. I was excited to help the Project Learning Tree Canada (PLT Canada) team produce the *Forest Literacy Framework: A Guide to Teaching and Learning About Forests* (plt.org/forestliteracy). It's a great resource for educators who want to help students answer the question: What is a forest?

Defining what makes up a forest is the first step in connecting with forests

Forests are ecosystems characterized by a higher density tree cover and may include a wide range of different species, structures, or ages of trees. They also include myriad other plants, a range of wildlife, and commonly include waterbodies like streams, rivers, ponds, and lakes. Forests may be classified by the dominant tree species or combination of tree species present. Forests range in size from under an acre to thousands of acres. (See sidebar: Plant types explained)

The nature of a forest is affected by living (biotic) things such as plants, animals, humans, and their interactions. For-



Plant types explained

Broadleaf trees are slower growing and their tree rings are closer together, which makes their wood denser, harder, and stronger. Most broadleaf trees are called hardwoods.

Conifer trees grow quickly, and their tree rings are wider apart, which makes their wood lighter, less dense, and softer. Most conifers are called softwoods. Conifers are unique among vascular plants (ferns, horsetails, et al excepted) in that they are non-flowering (gymnosperms).

Woody plants are trees and shrubs with shoots that last for years. There are two types of woody plants: deciduous and evergreen. Deciduous plants drop their leaves every fall. Evergreens keep their leaves (needles) all year.

Vascular plants have specialized supporting and water-conducting tissue, called xylem, and food-conducting tissue, called phloem. Trees and shrubs are vascular plants. The exceptions are mosses, liverworts, algae, and lichens, which are considered non-vascular plants.

Herbaceous plants are vascular, often flowering, plants without wood tissues. They usually have flexible green stems. They also die back for the winter.

ests are also subject to non-living (abiotic) factors, including, for example, soils, nutrients, moisture, sunlight, and climate. Forest health is affected by many other factors, too, including natural competition and availability of space, light, water, and nutrients, as well as the frequency and intensity of natural disturbance, human interventions, pests, and disease.

Forests can be public resources or private, but the benefits of forests — like the clean air they produce or the water they purify — are almost always public and don't have boundaries. We can find forests in rural, suburban, and urban areas. An urban forest is defined as all trees within a defined urban core boundary. Forests may be sustainably managed for a particular resource like carbon or timber, managed purely for recreation or conservation, or in a few cases unmanaged. Many forests are managed for multiple values all at once.

Forests as ecosystems

Organisms within forest ecosystems play a variety of roles, such as primary producers, consumers, and decomposers. Abiotic components — things like sunlight, soil, minerals, and water — also can have a dramatic role to play in a forest ecosystem. (See sidebar: Producers, consumers, and decomposers in an ecosystem)

Forests interconnect with other terrestrial and aquatic ecosystems to form biospheres. Grasslands, rivers and lakes are common ecosystems that border on forests, and either slowly transition with forests like at a forest edge next to a field or lake, or more gradually, as tiny ephemeral streams in forests lead to larger and larger streams, rivers and lakes.

Forest ecosystems are complex and dynamic and continuously undergo natural change and adaptation. Gradual change includes succession or replacement of existing trees by newly growing ones and climate adaptation. More abrupt changes are brought on by wildfire, pests, and disease. These changes — both gradual and abrupt — are mediated by chemical and nutrient processes that involve

energy transfers and chemical cycling. In a forest there is an exchange of nutrient elements like oxygen, nitrogen, and hydrogen among the soil, plants, and animals that live there.

Sustainable forest harvesting is often adapted to mimic these natural disturbances whenever possible. As the forest is adapted over millennia to natural disturbances, adapting forest practices to mimic them reduces the long-term effects of management on forests. Natural events like wildfires, storms, ice damage, insects, disease, and volcanic activity help us understand how forests react to change, allowing us to adapt human-caused activities like forest management and road construction in a way that is compatible with natural forest dynamics.

Forests grow through natural regeneration or may be assisted through silviculture — or the science of growing and cultivating trees. In Canada and the United States, strict laws and regulations, augmented by voluntary certification standards, ensure that harvested trees must be replanted.

Appreciating the trees that make up a forest

Of course, most students understand that the key defining characteristic of any forest is the trees within it. But to really advance how students learn about and perceive forests, appreciating the uniqueness of tree species and comprehending how individual trees function and interact in a forest ecosystem can go a long way. (See sidebar: Plant types explained)

A tree is a woody perennial plant usually 12 feet or greater in height at maturity, often with a single main stem, and a distinct crown of leaves, needles, or scales. Trees can be identified by these distinct features and others like their seeds, leaves, flowers, bark, and shape. They can be classified into family, genus, and species groups. Trees are broadly classified into two botanical groups: conifer and broadleaf. Trees within each group are then divided again into deciduous and evergreen depending on their leaves.

Deciduous trees have leaves or needles that die and drop after one growing season. Coniferous trees retain their green leaves, needles, or scales for two or more growing seasons.

Trees experience primary and secondary growth. Primary growth results in an increase in root length and tree height. Secondary growth results in the increasing diameter of roots, branches, and stems. Like all plants, trees have life stages that include germination, growth, maturity, reproduction, decline, and death.

Trees play various important roles as part of the forest ecosystem. These roles include supplying oxygen, producing food, providing habitat for wildlife, stabilizing soil, moderating temperature, capturing and storing carbon, and cycling water and nutrients. After their death, trees often provide habitat for other creatures to live on or in and provide nutrients and soil as they decay.

Classifying and differentiating forests

Classifying and differentiating forests into biomes and types helps people understand the forests in their community, in their country, and around the world. Different forest biomes exist around the world. Examples include tropical forests, temperate forests, and boreal forests. In North America, major forest biomes include boreal, temperate deciduous, tropical deciduous, temperate coniferous, and temperate rainforest.

Many different forest types exist within a biome, typically distinguished by their dominant tree species. For example, there are oak-hickory forests, spruce-fir forests, and many others. Forest types can be further broken down into more distinct natural communities that recur on the landscape, characterized by finer-scale descriptions of vegetation, including shrubs and ground cover. (See sidebar: Natural communities)

Around the world, forests live in places with considerable variation in soil types, elevation, temperature, wind, and precipitation patterns. These variations create the different forest types and associated plants and animals (flora and fauna) that, together with disturbance history and patterns, contribute to a region's biodiversity.

Humans are part of the forest ecosystem. They depend on and influence forest ecosystems and are also influenced by them.

Helping students to answer the question: What is a forest?

To help students deepen their understanding of forests, consider these kinds of activities from the *Forest Literacy Framework: A Guide to Teaching and Learning About Forests*. These activities and concepts from the Forest Literacy Framework have direct connections to Next Generation Science Standards (NGSS) in the United States and to social studies standards. Many concepts also support English language arts and mathematics standards as well.

Grades K-2:

- Read *Welcome to the Neighborhood* by Shawn Sheehy or another book that introduces children to forests and forest organisms.
- Gather students by a tree and invite them to act out the different stages of a tree's life.



Producers, consumers, and decomposers in an ecosystem

The living things in an ecosystem are all producers or consumers.

Producers are any kind of green plant that uses photosynthesis.

Consumers are organisms that can't make their own food. A deer is a consumer because it relies on plants to survive.

Decomposers take dead animals (consumers) and plants (producers) and break them down and digest them. Fungus is a common decomposer.

Natural communities are groups of plants and animals found in specific places repeatedly. Examples could be a wind-exposed mountainside or muddy streamside. Natural communities have three main characteristics: the composition of plant species; vegetation structure (e.g., forest, shrubs, or bogs); and a specific combination of physical conditions (e.g., water, sunlight, and temperature).



Grades 3-5:

- Challenge students to identify the names of trees in the schoolyard, in a park, or along a street.
- Lead an investigation of biotic (living) and abiotic (non-living) components of ecosystems through a plot study comparing shady and sunny locations in the schoolyard or a nearby park.

Grades 6-8:

- Guide students to select a tree native to their region and write a research report about it.
- Lead students on a field study of three different environments, such as a lawn, a stand of trees, and a pond or creek.

Grades 9-12:

- Lead students in conducting a tree survey of the school grounds, identifying the genus of each tree and measuring the height of each tree and the diameter at chest height.
- Ask students to conduct an opinion survey to determine the community's view on forests and forest management issues.

Forest literacy helps students understand what a forest is and so much more

Helping students understand what a forest is can be a great chance to make connections between science, social studies, mathematics, health, economics, and many other subjects. Learning about forests opens the door to understanding the importance of forest ecosystems to meeting sustainability challenges today and tomorrow. Preparing students to meet these challenges can help them become better learners and help them help forests.

Project Learning Tree has many resources to help answer questions students have about forests. PLT is committed to advancing environmental education, forest literacy, and green career pathways, using trees and forests as windows on the world. PLT's award-winning resources offer a lifetime of learning, from early childhood through adulthood, and its wide and diverse network provides professional development for educators and opportunities for young adults to explore forests and green careers. PLT is an initiative of the Sustainable Forestry Initiative (forests.org). SFI is a nonprofit charitable organization with the mission of advancing sustainability through forest-focused collaboration.

Darren Sleep is Lead Scientist at the Sustainable Forestry Initiative. He ensures that SFI's work is grounded in thoughtful, science-based knowledge and communications, and that SFI standards and education programs reflect the latest in scientific understanding.

Endnote:

1. *Environmental Education Encourages Environmental Stewardship*, 2023, The National Environmental Education Foundation, <https://www.neefusa.org/education/benefits#encourages>

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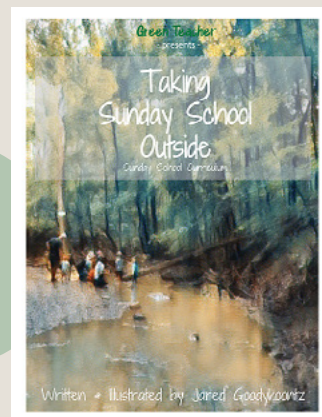
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Why Do Forests Matter?

Forests matter when it comes to climate change, biodiversity, education, and economic development




All photos provided by Project Learning Tree

By **Danika Strecko**

WHY DO FORESTS MATTER? There are three important parts to consider. Forests matter for critical environmental, social, and economic reasons. Together, these three types of reasons can show students why it's essential that we work together to ensure the sustainability of our forests if we care about the future of our planet. Sustainably managed forests and the products they produce are powerful tools to achieve shared goals like climate action, conserving biodiversity, educating future generations, and sustaining economic development.

Forests also offer a great way to help teachers engage students on many sustainability topics. Students are motivated to make positive contributions to the long-term health of people and the planet. Forests are living laboratories that can provide students with the opportunity to study ecosystems, conservation, and natural resource management.

A deeper look at these opportunities, along with myriad inspiring ways to support forests, is part of the Project Learning Tree *Forest Literacy Framework: A Guide to Teaching and Learning About Forests* (www.pltcanada.org/en/forest-literacy or plt.org/forestliteracy). Project Learning



Tree (PLT) is committed to advancing environmental education, forest literacy, and green career pathways, using trees and forests as windows on the world.

PLT's award-winning resources offer a lifetime of learning, and our wide and diverse network provides professional development for educators and opportunities for young adults to explore forests and green careers. PLT is an initiative of the Sustainable Forestry Initiative (forests.org). SFI is a non-profit charitable organization with the mission of advancing sustainability through forest-focused collaboration.

Forests matter for critical environmental reasons

Forests are one of Earth's major life-supporting systems, providing fundamental ecosystem services that are critical to life. Forests support other ecological systems too, contributing to the health of waterways, oceans, and non-forested ecosystems all over the world.

Mitigating climate change

Forests capture and store (sequester) carbon from the atmosphere and are essential to the global carbon cycle. Forest products made from wood also store carbon for that prod-

10 Reasons Why Forests Matter

1. Addressing climate change by capturing and storing carbon
2. Helping recover species at risk by providing habitat
3. Delivering additional ecosystem services like soil nutrient cycling, purifying air and water, and mitigating droughts and floods
4. Providing renewable supply chains for products we use every day such as sustainably sourced paper, cardboard, and wood
5. Sustaining communities and economies by supporting diverse career opportunities
6. Providing a place to learn and discover, to understand our connection with the natural world
7. Contributing social and cultural benefits by providing spaces for recreation and renewal
8. Lowering rates of asthma and respiratory illness
9. Lowering the temperature of urban heat islands
10. Developing new medicines and sustaining traditional medicines



uct's lifetime. Carbon storage is an important strategy for mitigating global climate change, along with reducing fossil fuel consumption. Many forest products are reusable or recyclable, and they store carbon. Wood products can have a lower environmental impact than alternatives when evaluated from a full life-cycle perspective.

Providing biodiversity habitat

Forests provide habitat for wildlife and fish. According to the National Forest Foundation, U.S. National Forests alone are home to more than 3,000 species of wildlife—including hundreds that are rare or endangered. Fish and forests go together as well. Perhaps the most iconic example is the West Coast salmon runs. Studies show that trees along the banks of rivers with salmon grow more than three times faster than trees along salmon-free rivers.

Improving air quality

Forests improve air quality by absorbing certain pollutants (e.g., ozone, carbon monoxide, nitrogen dioxide, and sulfur dioxide) and releasing life-sustaining oxygen. Research from Lancaster University shows that roadside trees reduce nearby indoor air pollution by more than 50 percent.¹

Purifying water and improving soil quality

Forests filter sediment and toxins from surface runoff and are critical to the water cycle, due to their role in evapotranspiration at a very large scale. Forests also maintain soil through the decomposition to create new soils and roots to retain soils. In turn, soils contribute to forest health.

Making cities better

Urban forests moderate temperatures by helping to reduce the urban heat-island effect. Trees reduce air temperature by altering wind speeds, creating shade, and blocking solar

radiation. In addition, trees transpire moisture into the air and cool it. Urban trees also filter water and mitigate storm-water runoff.

Forests play a key social role

Understanding how forests shape local communities and enhance our health helps people recognize the value of forests to society. People hold different values about forests and their uses, based on their personal experiences and connections with the forest.

Historical perspectives on the contributory role of forests help build our understanding and personal connections to forests. They can also guide decisions to manage forests for future generations. Forests have always been important to people who live on the land and within forest-dependent communities, including Indigenous Peoples. But forests also shape urban communities in ways people may not realize.

Sustainable products we use every day

Forests are the source of renewable and sustainable products that people use every day. Imagine life in a city without access to paper, tissue, furniture, food, clothing, and building materials. Forests are also the source of biofuels that support global sustainability.

Physical and mental health benefits

When people spend more time in forests, it can improve their physical health, including their heart health, their brain and lung function, and their capacity to fight disease. Trees reduce skin cancer risk by providing shade. Forests can contribute to improved mental health, reduce stress levels, and promote an overall sense of security and wellbeing.

Trees in urban spaces promote healthy, active lifestyles and increase the amount of time that people spend

in nature.² Having more trees in an area is associated with lower rates of asthma and respiratory illness in urban populations.³

Forests are fun

Forests provide excellent playgrounds for outdoor recreation, including hiking, fishing, canoeing, camping, and hunting.

Forests drive sustainable economic growth

Understanding the importance of wellmanaged forests for economic livelihoods for individuals, communities, and our nation helps to increase students' understanding of the overall value of forests. Students can benefit from learning how forests provide many economic benefits for people as a source of sustainable materials, jobs, and investment opportunities. Helping students understand that forests are a renewable resource can go a long way toward ensuring they understand sustainability as a concept.

Sustainable forestry supports green jobs

The forest sector generates diverse employment opportunities for foresters, scientists, harvesting professionals, truckers, factory workers, engineers, architects, wildland firefighters, carbon modelers, and many more. Linking professions like these with forestry can help students chart a green career path.

Forests drive innovation

Innovative new forest bioproducts include green chemicals, bioplastics, biofuels, wood and glass fiber, and carbon fiber made from trees. These products can be made from manu-

facturing leftovers, harvest residues, trees that were thinned from urban and forest stands, or trees that were damaged or killed by fires, insects, and disease.

Keeping forests as forests

Students can learn how providing economic gains to forest landowners is important because it provides an income that allows the landowner to maintain the land as forest, rather than selling it for non-forestland uses like building a suburb.

Showing why forests matter can make learning matter

Helping students learn why forests matter can help them make connections to almost any subject a teacher chooses. That's good news for students and teachers, and it's good news for the future of forests and our planet.

Danika Strecko is Senior Manager of Education at the Sustainable Forestry Initiative. She plays a central role in SFI's education and career pathways work. Danika leads implementing the Project Learning Tree Canada Forest Literacy Framework and expanding the reach and engagement of youth in environmental education, forest literacy and career pathways.

References:

1. https://www.researchgate.net/publication/258442913_Impact_of_Roadside_Tree_Lines_on_Indoor_Concentrations_of_Traffic-Derived_Particiulate_Matter
2. <https://arbordayblog.org/misc/trees/6-ways-urban-trees-make-you-more-active-outdoors/>
3. <https://www.mdpi.com/1660-4601/18/11/5852>

Lifecycle Assessments and the Circular Economy

Lifecycle assessments (LCA) demonstrate the advantages of wood when it comes to factors like embodied energy, air and water pollution, and carbon footprint, according to WoodWorks (woodworks.org). An LCA measures the environmental impact of things like construction materials or even an entire building over its lifetime. The process of conducting an LCA begins with tracking raw materials from extraction or harvesting through manufacturing, transportation, installation, use, maintenance, and end of life disposal or recycling. Data resulting from an LCA allows architects, builders, and owners to make better informed choices based on a product's environmental impact.

A circular economy creates systems that minimize the depletion of non-renewable resources by sustainably managing and regenerating renewable resources. Forests have the potential to play a central role in the circular economy by providing renewable raw materials.





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Are There Green Careers in the Forest?

Inspire the next generation of forestry and conservation leaders




All photos provided by Project Learning Tree

By **Jerri Taylor**

HOW MANY STUDENTS say they want to find a job to be proud of that gives them a chance to make a difference in the world? How many teachers include the idea of working in a forest-related job in their answer? My experience tells me that students ask the first question over and over again, but at the same time I'm doubtful many teachers and other educators ask students to check out forests as a career path.

Not mentioning forest- and forestry-related opportunities when discussing sustainable green career paths with students means they are missing out on some exciting opportunities. There were 9.8 million green jobs in renewable energy alone in 2016,¹ and by 2030 there will be an additional 15 million to 60 million new green jobs.²

These green jobs can offer fulfilling, career-oriented pathways for students to explore. The U.S. Bureau of Labor Statistics defines green jobs as jobs that produce goods or services that benefit the environment or conserve natural resources.³ This means putting students on a green jobs pathway not only helps secure their future, but green jobs work to help conserve the planet we share.



Green jobs are found in forests and conservation, as well as in more traditional sectors like manufacturing and construction. They can be in non-profit organizations, government, business, or education settings and can encompass areas as diverse as energy, environmental education, food, forestry, transportation, waste management, and water and watersheds.

Come work in the forest

Some of the most exciting — and perhaps greenest — green jobs involve forests. Teachers know that forests provide a huge variety of environmental benefits and services. But many teachers, especially in more urban areas, may not know that all kinds of professionals and skilled workers are needed to ensure that forests and the products they produce are managed sustainably.

Working in a green forest job means supporting forests in the vital role they play in so many of Earth's essential systems, including the carbon cycle, soil cycle, water cycle, and climate cycle. Forests clean the air we breathe, filter the water we drink, and are home to rich biodiversity.

A wide array of jobs are related to forests, offering opportunities for people with diverse backgrounds, skills, interest areas, and personal qualities. These include careers in the following:



The many faces of green forest careers

People in many different jobs work to sustain our forests. Here are a dozen jobs drawn from the myriad career pathways available to students today.

Foresters, or forest managers, oversee public or private forestlands. They develop short- and long-term plans for planting and growing, monitoring trees for healthy growth, and making sure forest practices comply with environmental regulations.

Environmental educators lead school and community groups in learning activities focusing on trees and forest ecosystems. They guide field trips where learners can experience nature firsthand.

Natural resource economists ensure the sustainability of forest resources and determine the value of assets from the forest such as timber and ecosystem services. They also work to find the most efficient ways to supply or manufacture forest products.

Wildlife biologists study wildlife and their habitats to understand what they need to thrive. They consider the relationship of birds, mammals, fish, reptiles, or amphibians to the forest and to each other. Their work helps manage wildlife habitats for the benefit of all.

GIS specialists love maps. As geography or geographic information system (GIS) specialists, they work with computers to create graphs and maps showing forest-related data, such as land use, tree cover, and environmental practices.

Loggers harvest timber from forests, which people rely on for building materials, furniture, paper, packaging, and many other products. Loggers cut the trees safely and in ways that preserve water quality and the long-term health of the forest.

Policy advisors analyze laws and programs that affect the forest and provide guidance on ways to improve them. They look at all the ways policies might impact people and the forests and find the best balance.

Forest engineers figure out how to use trees and other forest resources in the most efficient, cost-effective, and sustainable way. They may also develop and test wood products, or design and supervise the construction of a trail or bridge.

Wildland firefighters protect and maintain the health of the forest by preventing, controlling, and putting out wildfires. To prepare for fire emergencies, they maintain and test firefighting equipment, and talk to the public about ways to help prevent wildfires.

Hydrologists investigate water in forests by studying how it travels through the forest, into the soil, and eventually to a stream. In addition to learning about the water cycle, they try to solve challenges such as how streamflow affects forests or how climate change impacts watersheds.

Millwrights are industrial mechanics who maintain or construct machinery for mills, print shops, or other businesses. They must be familiar with different machines and how they work and have the analytical skills to fix problems.

Nature photographers use forests and the great outdoors as their shooting sets. They use various cameras, lenses, and tools to document elements of our natural world to share with clients. This work involves traveling to remote areas and waiting patiently to capture the perfect moment depicting wildlife and nature.

- Forest management, inventory, and planning
- Biodiversity and ecosystem functioning
- Education and research
- Wood products manufacturing
- Health and recreation
- Wood and energy production
- Social and urban development

Teaching resources to help students make green career choices

Project Learning Tree's *Green Jobs: Exploring Forest Careers* (plt.org/curriculum/green-jobs-forest-careers) is full

of resources and activities to engage middle school and high school students in the world of green careers. Project Learning Tree is committed to advancing environmental education, forest literacy, and green career pathways, using trees and forests as windows on the world.

PLT's award-winning resources offer a lifetime of learning, from early childhood through adulthood, and our wide and diverse network provides professional development for educators and opportunities for young adults to explore forests and green careers. PLT is an initiative of the Sustainable Forestry Initiative (forests.org). SFI is a non-profit charitable organization with the mission of advancing sustainability through forest-focused collaboration.

Connecting forests, curricula, students, and careers

Teaching and learning about forests and green jobs can be incorporated into diverse subject areas, including science, math, geography, English, social studies, career education, biology, environmental education, communication technologies, and vocational education.

Green Jobs: Exploring Forest Careers shows educators how to identify curriculum links in your state for your specific subject areas or content areas of interest. You can also request supporting professional development on standards alignment from your PLT State Coordinator for this PLT resource or any other. To contact your state coordinator, visit plt.org/your-state-project-learning-tree-program.

Helping students prepare for green careers

As students struggle to map out a potential career path, it's nice to know that the green economy encompasses an ever-growing array of careers and jobs. While this is definitely good news, the sheer number and variety of green jobs makes it difficult to say exactly what education or training will be needed for a given job.

The good news is that teachers can help students prepare for green jobs in general by discussing green jobs as a viable option for all learners, no matter their education pathway — especially if they are from under-represented groups in the forest sector, including women, Indigenous youth, people of color, immigrant youth, students with disabilities, and youth from low-income households.

Encouraging students to see STEM courses as a pathway to working in the woods is another key approach. Biology, environmental science, and agriculture courses will be beneficial, regardless of whether or not learners pursue careers in these specific fields.

Offering different opportunities for students to use technology to conduct research, solve problems, use models, and present their findings will come in handy in many green jobs. Even entry-level green jobs may require proficiency in basic tech skills like word processing and data entry.

Many green jobs involve leadership or people-oriented skills. Employers are looking for workers who can communicate, collaborate, and be creative leaders.

Learning about green jobs shows that forest-related work makes for a great career choice

Preparing students for a green career is a truly interdisciplinary endeavor, with connections to science, social studies, mathematics, health, business, and many other subjects. Helping your students learn about green careers will help build understanding of the importance of forests as ecosystems and sustainability solutions. The more students we can interest in working in and on behalf of forests, the better job we will all do in conserving our precious planet.

Jerri Taylor is Director of Diversity in Career Pathways at the Sustainable Forestry Initiative. She leads the career pathways work at SFI. Jerri has an extensive background in creating and implementing comprehensive school counseling programs. She specializes in opening career pathways tailored to disenfranchised communities.

Endnotes:

1. Renewable Energy and Jobs Annual Review 2017, International Renewable Energy Agency, <https://www.actu-environnement.com/media/pdf/news-29073-irena-emploi.pdf#page=3>
2. Transition to green economy could yield up to 60 million jobs, ILO says, 2012, International Labour Organization, https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_181795/lang--en/index.htm
3. Measuring Green Jobs, 2023, U.S. Bureau of Labor Statistics, <https://www.bls.gov/green/home.htm#:~:text=Green%20jobs%20are%20either%3A,or%20use%20fewer%20natural%20resources>



A Forest Framework

March 2023



All photos provided by Ian Shanahan

by **Chloe Faught** and **Gillian Petrini**

IN THE FOLLOWING PAGES you'll find five lesson outlines that you can use to help guide your students in their understanding of what it means to learn with and from forests. Part of this involves understanding our relationship to and with the Earth and, within these lessons, our specific connections to and with forests. Forests are critical to the health of our planet and the health of our species. Forests function as cohesive ecosystems, reliant on the various life forms within them to grow and thrive. This cohesion provides an interesting analogy for how we might look at education and learning with and from one another, inclusive of the natural world as a teacher. When we look at learning through and with a lens of the forest, it offers a unique framework for a pedagogical approach to learning. When learning through a forest lens, one recognizes and values interconnectedness to all things, the need for reciprocal relationships, the importance of nurturing conditions that invite opportunities for discovery and wonder, and the value of time to explore and allow for learning to emerge, naturally.



Learning through a forest lens is interconnected:

Interconnectedness

We frame our lessons using an Indigenous worldview of interconnectedness. In the local nations on Vancouver Island, British Columbia, the concept is called Nuts'a'maat (Halqu'emeylem, Lekwungen) or Tsawalk (Nuuchanulth). As taught to us by our mentor John Harris, a member of the Snuneymuxw Nation, Nuts'a'maat means 'we are all one' or 'everything is connected.' Within this teaching is the importance of relationship, both to each other as human beings and to other beings. "If you view the trees in your yard, or the salmon in your river, or the whales swimming up the channel, or the eagles flying in the sky — if you view all things as your relatives, you are less likely to do things that will impact them adversely" ([John Harris, February 4, 2022](#)). You will likely find that there are similar teachings in the Indigenous communities in your region and we encourage you to find them out. It is beneficial to engage in all learning with a foundation of understanding of where one is, whose lands one is on, and with an understanding of our

interwoven connection with place. An integral practice used to help build a sense of interconnectedness is through circle practice, which encourages sharing, communication, and coming together.

Principles of circle practice

Circles have been a form of non-hierarchical gathering for decision-making, sharing stories, and celebrating since humans have been on this Earth. Circles are a powerful means of connecting with one another to build community. If key principles are practiced, the circle can become a contained place for students to be heard as they share a depth of thoughts and feelings. This practice can bring about a sense of solidarity and a sense of interconnectedness. If guidelines are in place and clear intentions are laid out for the circle, a respectful space and a culture of trust can be established within the class. Establishing expectations for respectful behavior ensures that everyone feels they can speak openly and be heard. There are many resources available on circle practice as referred to below. Here are four principles to highlight with students prior to engaging in circle:

- **Speak from the heart** (speak your truth; be genuine and authentic; your words are your own; use “I” statements)
- **Listen from the heart** (respectful listening means listening with your whole body, ears, and eyes — giving full attention to whomever is sharing)
- **Be open-hearted** (embrace the chance to connect; be accepting of varying thoughts and ideas; be non-judgmental)
- **Get to the heart of the matter** (be succinct enough so everyone has time to share)

In addition to the two principles above, here are two other important guidelines to frame your circle practice:

- **Silence is honored** (Anyone can pass; no one is ever forced to share)



Orange Mycena (*Mycena leaiana*)

- **Confidentiality** (no one shares what was shared by others outside of the circle)
Principles Adapted from Leighton, H. (2021). Principles for the Way of Council [Unpublished manuscript].

Learning through a forest lens is reciprocal:

Reciprocity involves the engagement in exchanges that are mutually beneficial. It includes a balanced back and forth of both action and responsibility. The act of reciprocity happens in the natural world all the time. The symbiotic relationship between trees and fungi through their mycorrhizae (see Lesson 1 to learn more) is one such example. Trees benefit from the nutrients the mycorrhizae gather from the soil and, in return, trees offer to fungi glucose (sugars) produced during photosynthesis. Mutual exchange, mutual responsibility. Such exchanges and responsibilities of reciprocity between humans and the natural world have been strained with an extractivist model plaguing our interactions for so long, leading us to a climate and ecological crisis. Engaging in a reciprocal relationship with the natural world involves understanding our responsibility within this relationship and committing to a two-way exchange, one that not solely benefits humans. Examples of actions of reciprocity with nature include preservation and protection, appreciation for what is consumed, gratitude, gift giving, and acts of service (for both human and non-human communities).

Gratitude

We believe that it is crucial to ground our learning in gratitude and respect. Lessons often start or end learning in this manner with a circle of gratitude or with a guided question for continuing to practice gratitude. Educators are encouraged to use the practices of gratitude detailed in these lessons at every opportunity.

Circle prompt examples for gratitude:

As an opening, here are two examples:

“Today at this moment, I am grateful for... because...”

“One thing I love about this place, this forest, is...”

As a closing, you can consider something as simple as

“One thing that I am grateful for in our day together/this class/this experience is...”

Learning through a forest lens is emergent:

Some of the most powerful learning comes not in the perfect lesson but rather through establishing rich conditions for curiosity and wonder. Like a fertile soil that is optimal for growth, a thoughtful learning environment that centers on curiosity and student interest is ripe with opportunity for meaningful, authentic discovery guided by student interest and enthusiasm. Emergent learning — learning guided by students’ evolving thinking and understanding of the world — requires an openness to students’ leading; it requires the valuing of time in a busy school schedule and the patience to set the groundwork for opportunities to spark curiosity about the world around us. Emergent learning is slow-paced. It is the antidote to the fast pace of life. It is a chance to slow down, to savor and be deeply immersed in the moment of learning together. Moving at a slower pace allows for expanse and depth. It allows for questions to arise



American Beech (*Fagus americana*) nuts

and answers to be revealed, often leading to further questions and wonderings. A slow pace and time allowance is truly a gift, empowering students as learners and deeply seeding the way they view themselves and their relationships with and responsibility to the world around them.

How to use the lesson outlines:

In the following lesson outlines, we have provided you with some background knowledge on forests as well as the tools for helping students observe nearby forest communities and engage in dialogue and critical thinking, using pedagogies to spark imagination. The five lessons can be used in isolation or as part of a forest framework. While each lesson has listed age groups and suggested subject areas, there are information and activities for younger learners that may be tweaked for older learners. We look forward to hearing about how you and your students have used our work.

Chloe Faught is a 5th-generation settler from the Lekwungen, WSÁNEĆ, and Halq'emeylem territories (known also as Greater Victoria, British Columbia, Canada), who has a deep love for her home and is grateful every day for being able to live on these lands and learn. She is a secondary science and social studies teacher with a passion for bringing people together and connecting them to the Earth. She strives through her lessons and through her work, both within and outside of her teaching practice, to move our

institutions and communities to alter our ways of living in a way that will enable us to continue to flourish on Earth.

Gillian Petrini is the Healthy Environments for Learning Day (HELD) Project Coordinator for the Canadian Partnership for Children's Health and Environment (CPCHE). Her background includes teaching for over 15 years with a passion for promoting healthy and sustainable environments, nurturing our relationship with the land, and connecting students to place. Gillian holds a BEd and MEd from the University of Victoria with a focus on environmental sciences. She also serves on the executive of the local chapter of EEPsA, the Environmental Educator Provincial Specialist Association (based in British Columbia, Canada).

Resources:

1. The article, *Pedagogical Talking Circles: Decolonizing Education through Relational Indigenous Frameworks*, focuses on talking circles as a pedagogical practice of decolonizing education. P. Barkaskas, D. Gladwin. (2021). *Pedagogical Talking Circles: Decolonizing Education through Relational Indigenous Frameworks*. *Journal of Teaching and Learning* Vol. 15, No. 1 pp. 20-38 Retrieved from <https://files.eric.ed.gov/fulltext/EJ1303475.pdf>.
2. This is the introductory portion of the document *BC First Nations Land, Title, and Governance Teacher Resource Guide*. Within this chapter there is an overview of talking and sharing circles. First Nations Education Steering Committee. (2019). *BC First Nations Land, Title and Governance. Planning for Instruction*. Retrieved from <http://www.fnesc.ca/wp/wp-content/uploads/2019/08/1.5-Planning-for-Instruction.pdf>

All extra materials needed for the following lessons are available online through this link:

<https://greenteacher.com/gt135-lesson-supplements/>



Canopy of mixed forest

All photos provided by Ian Shanahan



Lesson 1: Who are the standing people in your neighborhood?

By Gillian Petrini

Overarching inquiry question(s):

How is a forest like a neighborhood?

Target age group: K–5

Topics: trees as beings, community, habitat and ecosystems, reciprocity, social-emotional learning

Curricular competencies (listed in brief):

- Observing in familiar contexts
- Communicating observations and simple predictions
- Demonstrating a sense of curiosity

Terminology:

Mother Trees: Term coined by BC forest researcher Suzanne Simard. Also called “legacy” or “hub” trees, these are the largest trees in the forest. They have the most connections to other organisms through fungal mycorrhizae and provide nutrients to other plants and trees.

Mycelium: Branching threads of fungi that grow from the mycorrhizae

Mycorrhizae: The fungal root (connected with the roots of many other plants)

Mycorrhizal networks: A vast network of mycorrhizal fungi linking the roots of trees and other plants

Reciprocity: A relationship that is mutually beneficial, in exchange and responsibility

Symbiotic relationship: A relationship where both species benefit (i.e., mutually beneficial)

Wood-wide web: The mycorrhizal communication network has been compared to an internet among trees and coined the ‘wood-wide web.’

Background information:

Ongoing [research](#) is continuing to reveal the complexities and intricacies of the forest: the way that forest species communicate, connect, and care for one another. While the trees and plants in a forest may look solitary and unconnected, below the earth, there is a vast web of fungal “tendrils” called mycelium, serving as a sort of “phone line.” These fungi can connect the roots of different trees (and other plants) to create what is called a mycorrhizal network. The mycelium is the mass of the fungi and is made up of tiny threads. The mycorrhiza is where a fungus and tree form a special relationship called a symbiotic relationship, meaning that it is mutually beneficial — both species benefit from it. Through photosynthesis, trees produce glucose sugars and share these with the fungus. The fungus, in turn, takes in nutrients and water from the soil and gives them back to the tree.

Underground, the mycelia form an intricate network from tree to tree, connecting one root system to another, forming the mycorrhizal network. Trees’ survival, health, growth, and even behavior can all be influenced by the connection to a mycorrhizal network. This network is often referred to as the wood-wide web: a term coined by Suzanne Simard. The wood-wide web allows for trees to nurture one another, support kin relationships, and send signals when danger is present.

Trees nurturing one another

The mycorrhizal network enables a web of communications, demonstrating clearly that trees have the ability to connect with one another. The mycelium runs from tree root to tree root and through it flows chemical signals, nutrients, and water as trees share with each other — constant acts of reciprocity among trees.

A [study](#) found that when nearby Douglas Fir trees were covered by shaded cloth to block their ability to generate nutrients from photosynthesis, it was discovered that nearby birch trees sent sugars through the mycorrhizal network to the fir in response. This

demonstrated the recognition and giving of nutrients to those nearby who are in less favorable conditions. It has also been found that trees living together in a forest (of the same species or not) tend to live longer than trees living in isolation in more urban environments.

Trees and their kin

A [study](#) looked at the relationship among the same species and found that trees recognize other trees of their own species and that they may preferentially share nutrients with them through the mycorrhizal network. This behavior has been seen as a kin relationship: a relationship between family members.

Mother trees are the old, hub trees in a forest and they typically have the most connections to the mycorrhizal network as their roots are deeply established in the soil. The mother trees are the caretakers, the nurturers of the area. They have been linked to the increased survival of young seedlings (when these seedlings are connected with a mother tree). These trees also share resources and nutrients when neighbors are in ill health.

Trees send danger signals

During times of danger, mycorrhizal networks are extremely important for the health of the associated trees. When danger is sensed — such as the presence of a predator or the growth of an invasive plant — a chemical signal can be sent through the mycorrhizal network, warning their tree neighbors about a predator or inhibiting the growth of invasive plant species. Major forest disturbances like deforestation may trigger trees to send out stress signals to other nearby trees.



Urban Forest

Summary (Learning & pedagogical outcomes; goals & activities in brief):

In this lesson students will begin to see their connectedness to forests in ways that move beyond the surface understanding of a forest and toward a kinship — a relationship with forests as well as relationships within them.

To enable students to begin fostering connections with the forest family, students will begin by thinking about the qualities of family before being guided to think of these qualities in relation to a forest. Students will collaboratively create a class definition of a forest. While above ground a forest may initially look as though it only contains trees, plants, and ground cover, there is also a complex, vibrant community that is hidden underground. Students will be invited to share in a guided inquiry that allows them to explore a forest’s connections. Students will then have an opportunity to think more deeply about the trees in their neighborhood and their relationship both with these trees and among the trees too.

Suggested materials:

The following can be shared at any point during the lesson to add further information and context to the ideas shared in this lesson.

Video/Graphic Title & Link	Suitability	Description
Video: How Trees Secretly Talk to Each Other – BBC	Grade 3–5	A short two-minute video highlighting the many ways that trees communicate with one another in an underground network
Video: The Secret Language of Trees – Camille Defrenne and Suzanne Simard	Grade 2–5	A simple animated video that describes in a whimsical way the mycorrhizal network
Video: TED Talk: How Trees Talk to Each Other – Suzanne Simard	Grade 4–5	A more intermediate-level presentation by Suzanne Simard on the intricate ways that trees communicate
Graphic: Talking Trees – National Geographic	Grade 4–5	A visual graphic with text highlighting the interconnections among trees in a forest

Opening:

If possible, begin with students sitting in a circle) using the circle method *outlined in our framework*) and offer the question, *how would you describe the word ‘neighbor’ or what does it mean to be a neighbor?* Moving around the circle or through the class, students can share a word or a few words that come to mind when they think of the term ‘neighbor.’ At this point, there is no right or wrong answer. Hopefully words and concepts like ‘near each other,’ ‘helpful,’ or ‘takes care’ emerge.



Giant Swallowtail (*Papilio cresphontes*)

You might then add in the question, *did you know that trees in the forest take care of each other too?* Then, move on to explain how forests are like neighborhoods — their denizens help each other out, take care of one another, and keep each other safe.

Activity:

Define a forest: What is a forest?

Still in circle, ask students to turn and talk for a few minutes to their neighbor and share an experience in a forest. Where did they go? What was it like? If students have not been to a forest, tell them that this is okay; they can listen to others' experiences or imagine what a forest might be like.

As a whole group, discuss the question, *what is a forest?* Try to get the class to create a definition of a forest together. This serves as a base point that you can come back to for

refining after the lesson. Have the collaboratively-created definition visible for all to see.

'Standing as a forest' guided imagery

For this part of the activity, students are going to be participating in a guided imagery exercise. Ideally, this could be done outside but inside works just fine too. Students could, by choice and if it is safe to do so, take their shoes off to connect closer to the ground. They will either stand for the duration of the activity or sit on a chair with feet planted on the ground. In preparation, ask students to find a space to stand, where they won't be distracted, and imagine that they comprise a forest. As such, they should be spread out organically.

Guided imagery

Read the following aloud to the class, adjusting as necessary to make it more suitable to your own speaking voice.

Note on how to read: Take your time. Allow for pauses to let students imagine what you have just said before you move on to the next description. You could consider repeating any key sentences twice to be sure that students understand what you have said.

Imagine that you are a tree. You are one of the standing people – a term used by many Indigenous People that acknowledges the aliveness of trees, the spirit of trees, and their interconnected relationship with us. You are strong and alive. You stand tall and feel the sun hit your branches on warm days, and the rush of rain on wet days. Sometimes snow weighs down upon you or the wind blows through your branches. Through all the days of weather and the enduring seasons, you stand. Feel that your feet are your base – your trunk and you are rooted so strongly to the ground. Feel each part of your foot planting itself – the corners of your foot, your heel, the base of your foot. Spread each of your toes so that you have lots of space to anchor here. Now send your strong roots down into the ground (through the floor, the class/space below, through the foundation of the building), past the surface layer of the earth, down, down into the soil. Imagine your roots spreading through the soil, twisting and winding as they move outwards, holding you securely to this place.

*With these roots secured, now imagine that the **mycorrhizae** have decided to come and hang out with you. The mycorrhizae are the threads of fungi. They grow and connect to others. Now feel those mycorrhizae connecting you to your buddy. You are connected together in a symbiotic relationship, which means you share back and forth. The fungi give you nutrients and water and you in return provide food. The mycorrhizae, their threads are hugging tight and wrapping around your roots, entwined. From the mycorrhizae spread the mycelium, a web of threads. Picture the mycelium growing out spreading, reaching out, traveling through the soil, connecting to all your neighbors in this forest. Imagine that connection, like a roll of wool, weaving a web to all the trees standing right here in this forest. Once you feel this connection has been woven, send a 'hello' to your neighbors through the ground. Can you sense your neighbors' replies?*

Now imagine that you receive a signal that one of your neighbors is in trouble. They are sick. Your response is, how can I help them? Perhaps send them something nourishing to help them feel better? Or a positive thought? Through this underground web, imagine sending them some of the things that they need: antibiotic chemicals and essential nutrients.

Now imagine that some of these trees around you are not only your neighbors but are family. They are related to you. You are the same species; you know them so well, How can you show them that you are thinking of them, whether they are healthy or unhealthy? Perhaps you want to send them nutrients too.

As you imagine yourself sending out nutrients to those around you, both neighbors and family, know that they are in turn sending them to you as well. Feel that you are cared for and supported by all these standing people around you. You are never alone.

In our last few moments as trees, imagine that you have sensed a danger coming. A non-native invasive species – meaning it is not from here and it grows aggressively – has traveled from a faraway place and has made its way into your forest. It has the potential to hurt those

around you – your neighbors, your family This unwanted traveler from another place – an insect of some kind, maybe a beetle – is not welcome and is going to cause problems. Knowing this, you send out a chemical signal letting others know of the danger so that they can take action to protect themselves. Imagine that you are sending that out to give them a warning to take care.

The signal has been received and responses have sent the stranger away. Danger has now passed, and all the trees are well. Imagine yourself again as part of this connected web, feeling cared for, feeling taken care of and supported. For a moment, take time to feel part of this bigger family – this neighborhood or neighborwood – to feel at home in your place with the standing people.

When you are ready, come back to this room, to being in a human body. Please find a place to sit again if you are not sitting already.

Guided imagery reflection:

Take a minute to think about how this experience was for you. What did you enjoy? Was there anything you didn't? What did you notice about how you felt? Did you know that all of this is taking place in the forest? Share with the person beside you and then when ready have the class share out as a whole group.

Redefining a forest:

When we look back at the definition of a 'forest,' is there anything that you would add to what we initially created? Have students again turn and talk before sharing out as a larger group. The conversation may touch on the community aspect, sharing, and the supportive nature of a forest.

Extensions:

Who are the standing people in your neighborwood? (See Lesson 1 Worksheet):

This lesson lends itself nicely to taking classes outside on community walks to explore more deeply the concept of trees as standing people as well as which trees are a part of the neighborwood.

Some ideas for this include getting students to find a tree in their area and do the following:

- *Say hello and introduce themselves to a tree:*

Tell the tree their name and who they are before sharing something they appreciate about the tree.

- *Gift giving:*

Create a gift (that is compostable and not harmful to the tree) and offer it to the tree in appreciation for all that it offers.

- *Sit with a tree:*

Get to know the tree by observing all of its characteristics and describing its features. This could be turned into a game where students read one another's descriptions and then find each other's trees.

- *Draw the tree:*

Find different times throughout the year to revisit the same tree and notice how it changes throughout the year. Capture this in a drawing using watercolors, pastels, or pencil crayons.

- *Measure the tree:*

Refer to the lesson *Why forests are so important as the climate changes* to find out how to measure if the tree is a hub tree or mother tree.

- *Community mapping:*

Invite students to create their own map of the neighborwood, mapping where trees are located and which species they are.

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Sugar Maple (*Acer saccharum*)

Lesson 2: Everything you love has a name: Making friends in the forest and revitalizing lost language

By **Chloe Faught**

Overarching inquiry question(s):

What do you love and why? What does it mean to be a friend and to care for something? How does knowing a name bring you a greater connection with that Being? How do we encourage people to save, protect, and give space to other beings?

Suggested materials:

- Plant and tree ID cards, books or handouts of your local area, or an app like [Plant Snap](#)
- Other guidebooks or sheets for other species (e.g., birds, insects, mammals) or a free app like Cornell Lab's [Merlin](#), which can identify birds by color or vocalization.
- Clipboards
- Camera or sketch paper & pencil
- Your sense of curiosity
- Hand lenses
- Sit pads

Target age group: K-12 (adaptations for older and younger students suggested)

Curricular competencies (listed in brief):

- Listening and observing
- Understanding and creating connections with other Beings through observation and naming
- Group discussion
- Building empathy for others
- Understanding how emotion is connected to language

Terminology:

Endangered, Extinct, and Sleeping language: Most of the Indigenous languages in North America are [endangered](#) (children no longer learn these languages as their mother tongue), extinct (no speakers left), or sleeping (the language has a documented form, but there are no **fluent** speakers).

Systems thinking: Systems thinking is a framework for understanding the world by examining the components and parts of something and how these parts are interrelated. From how we perceive the world (our lens), we build understanding and meaning about how the world works and what components are important. This framework explores how and why we make distinctions and make decisions, develop emotions, and preserve and create ideas. For a great video that helps explain the main components of systems thinking, see [Systems-thinking: A little Film About a Big Idea](#) (Cabrera Research Lab).

Background information:

We've got more than 50% of species in decline. And names, good names, well used can help us see and they help us care. We find it hard to love what we cannot give a name to. And what we do not love we will not save.
(Robert McFarlane, *The Lost Words*, 2018)

This quote encapsulates what this lesson will hopefully reveal to the teacher and the students, through the exploration of learning the names of a forest's beings.

There are two main ideas that are in the quote above that relate to how we, as humans, interact with forests and all of the other beings/species on Earth: the importance of names and the importance of love. These ideas are not separate and relate very closely

to each other: You name and give identity to the things you love AND when you love and care for something or someone, you are giving preference to a specific individual or group of individuals. You use names to give a distinction to that person or being over all the others that you do not know. Here is a bit more detail on how names and love interact through a [systems thinking](#) lens.

Names: Naming is an important part of how we relate and connect to each other. One of the first things we often ask someone we meet them is, “what’s your name?” Why? One of the reasons is that names are part of our identity and therefore, when we meet someone new, we seek to know more about that person. What distinguishes them? What makes them unique? In the last decade, we have also been learning to give or ask for pronouns. Like names, gender is a huge and very personal part of our identity. Pronouns comprise one of the verbal constructs of gender identity. When you learn the name or pronoun of someone else, you open the door to having a relationship with that person and to learning more. Robin Wall Kimmerer, in her book [Braiding Sweetgrass](#) and [in this article, argues we should do the same for plants](#). Name them or call them with a pronoun just for them. She suggests “Ki.” Without names and a relationship, a person or other Being is just like everyone else — one of billions of unidentified persons.

When you walk into a forest, especially if it is a place that you rarely or never visit, you may have very few ways to distinguish Beings. You likely have a general framework: trees, soil, birds, etc. Maybe you can name a few specific Beings: worm or deer. Can you name a specific kind of tree? Do you have a name for one or more specific trees that you meet and interact with regularly? Can you use language to describe the characteristics of those trees (the barks, leaves, needles, or scales)? If not, then what is lost in the not knowing? How and why can you learn to know them?

In addition, colonization has led to a loss of Indigenous names and languages. Renaming and learning these languages is an act of Reconciliation with Indigenous peoples. Most of the Indigenous languages in North America are [endangered](#), extinct, or sleeping. These languages have words for forests and species, and often these names and words are rooted in the specific relationship of the tree to the people. The name may give a sense of what the tree was used for, the stories told about the tree, or how the tree grows. For example, the Western Redcedar (*Thuja plicata*) is a very important tree to Indigenous people in British Columbia and the Northwestern USA (Washington & Oregon). This tree was harvested for canoes, for totem poles, and for buildings. The bark was used for baskets and clothing and many other items. Each part of the tree has/had its own name:

First Nations’ languages and vocabulary reflect the importance of this tree; most have separate terms for different parts of the tree.

The Quw’utsun’ (Hul’qum’inum’) name for cedar wood, and sometimes the tree, is [xpey?](#). The tree itself is also called [xpey?-əlp](#), adding the suffix [-əlp](#), meaning “plant” or “tree”. The inner bark is called [sláway](#), derived from the early term [law](#), or [ləfw](#), meaning “to come off (as skin or bark)”. ([Ecoforestry Institute Society, 2019](#))

If we wish to reconcile with Indigenous peoples and deepen our knowledge of the forest, then we need to name and know these plants, animals, and ecosystems. It will help us to know them better, (even if we give them names that we have come up with) because it will give them an identity. It will help us make friends with these beings, care about our forests, and therefore preserve them. Read the forest framework information on [Interconnectedness](#) and the concept of [Nuts’a’maat](#) for more information about Indigenous frameworks for relationships with other Beings.

Love: In systems thinking, love is simply the recognition that ‘the other’ (another being or thing) is real and ‘legitimate’ and lives in coexistence with you. Put simply, you recognize that this other Being lives in the world with you and has a right and purpose for being here. With this recognition comes respect for its distinction or differences from you and a sense that you are willing to protect and preserve this separate Being. This is love. Love can be for an individual person or another species. Love can be for an ecosystem, the whole Earth, or even a non-living entity. How many people might tell you that they love their car or their home? Likely, many of them really do.

As mentioned above, we give names to things we make distinct from everything else. We definitely give names to what we love. If you are in a garden tending to your vegetables, you know the differences: these are your carrots; they are different from your cabbages. Maybe your tallest sunflower has its own special name. You protect these veggies and show your respect by pulling weeds from them, by providing water. We also give names to our cars. There are names for car companies and specific car ‘species’: the Honda Accord, the Mercedes Benz. They are distinct. If you can name more car or brand ‘species’ than plants, then what does



Fuzzy Foot (*Mycena overholtsii*)

that say about what you are paying attention to? Can we reverse this learning so that we and our students can learn to pay more attention to and give more respect to our forests? Can we build a greater sense of love and care for other non-human beings? This lesson plan lays out a method for beginning this journey with your students.

Summary:

The lesson examines how humans care for those Beings whom they love and how naming and identifying of other Beings is crucial to love. Students explore these concepts through a variety of activities.

First, through discussion and a song about lost words, students will examine the connection between love and the naming of species.

In the second activity, students will explore the forest and choose one Being to get to know and share. They will spend time observing, writing, and drawing (or photographing) as well as choosing a name for their species.

In the third activity, the connection between language loss in Indigenous communities is made. Tools and activities to help classes reconnect with endangered North American languages are given.

Opening:

Begin this lesson by bringing attention to the idea that names are important and that we give names to things that we care about and love. We give names, and even nicknames, to our friends, and we learn language to help us to make these connections.

1. Start in circle if possible and give or write on a board one or more of the following prompts:

What do you love and why? OR What do you care about and why?

What does love mean to you? What does it give you?

What does it mean to be a friend and to care for something?

Do you know some of the names of the plants and animals that live in our area?

Please note: The topic of love is a sensitive one for many people. There are many definitions of love and younger students won't likely understand the systems thinking definition of love (given above). It could distress someone who is feeling lonely and without love or someone who has recently lost someone. You may wish to use 'friend' or 'care' instead in certain situations.

2. Play the **Lost Words Song** from **Folk by the Oak** and discuss what a lost word is

Use one of the [versions of the Lost Words Song](#) to listen to and discuss. You may wish to listen to the song more than once to allow students to really connect with the ideas through music.

This version shows the musicians both writing the song and serving as the author and illustrator of the [book *The Lost Words*](#).

For younger students: Give a very simple explanation about what the song is about prior to playing. (i.e., This song is about how we name and know things that we love. By learning the animal and plant names, we begin to understand and maybe even love them.) Use the Words and Image Poster to teach some of the words. You may wish to point to the words as the song plays. Play the song once or twice and allow students to share what they are feeling or thinking as they hear the song.

For older students: Hand out the lyrics to the song. It may be best to first allow students to simply listen and read along to the song. You might ask them to circle words they do not know as they go along.

Afterwards, go through the words they do not know, using the poster to show them the beings mentioned. Then ask them to discuss these two questions:

What do you think the song is about?

What does the song mean by "Enter the wild with care, my love / And speak the things you see / Let new names take root and thrive and grow"?

From the discussion that follows, you may wish to discuss further the importance of names and how that relates to what we care about and love.

Lyrics for **The Lost Words Song**

<https://www.thelostwords.org/spell-songs/>

*Enter the wild with care, my love
And speak the things you see
Let new names take and root and thrive and grow
And even as you travel far from heather, crag and river
May you like the little fisher, set the stream alight with glitter
May you enter now as otter without falter into water*

*Look to the sky with care, my love
And speak the things you see
Let new names take and root and thrive and grow
And even as you journey on past dying stars exploding
Like the gilded one in flight, leave your little gifts of light
And in the dead of night my darling, find the gleaming eye of starling
Like the little aviator, sing your heart to all dark matter*

*Walk through the world with care, my love
And sing the things you see
Let new names take and root and thrive and grow
And even as you stumble through machair sands eroding*



Sori of Common Lady Fern (*Athyrium filix-femina*)

*Let the fern unfurl your grieving, let the heron still your breathing
Let the selkie swim you deeper, oh my little silver-seeker
Even as the hour grows bleaker, be the singer and the speaker
And in city and in forest, let the larks become your chorus
And when every hope is gone, let the raven call you home*

Source: <https://lyricstranslate.com>

Activities

There are many activities you could do to help students name and learn about forest species. This lesson offers just a couple of suggestions that can help students begin to connect with trees and/or a forest. You could adapt these lessons to other ecosystems. As with many of the other lessons, the more time you spend in an ecosystem, the better it is for helping students connect with it. In addition, the more that you can encourage students to question and be curious about what they are seeing, the more interest they will have in naming and learning about a forest. This is not a name or word memorization activity. The goal is the development of students' empathy for, relationships with, and interest in the natural world and the Indigenous ways of knowing that exist in your place.

Activity 1: Name-revealing party

1. Go out into a wild area where students can be relatively free to explore. Choose an area that is not too ecologically sensitive, and give rules about where students can go. You may wish to choose a spot that has natural boundaries, or you can establish boundaries if students are younger.
2. **With the associated worksheet**, students are instructed (alone or in pairs) to find something living that they can't name but are curious about or find beautiful or interesting (best if it is a Being that won't move or move quickly). Have students sit and observe this Being. Encourage them to introduce themselves to the Being. Have them sketch (secondary biology students could do a biological drawing!) or take pictures of it. Can they describe it or identify its parts? What does it smell like? What interactions might other species (including humans) have with this Being? Then have students write one or more questions they wonder about.
3. **Have students create a name for their Being:** Once students have observed for several minutes, they should create a name that they think is suitable for their chosen Being. Encourage them to create a name that connects with something they have learned about their Being through observation.
4. **Name-reveal party:** Once all students have finished their observation and naming, the class comes together and goes to each Being as a group. Have students share the name of their Being, something about the Being, and their questions about it. Teachers and other students may wish to share what they know about each Being or a story of an experience with it. Questions can be answered if they are simple, or they can be brought back to the classroom to investigate further. Teachers may wish to share the common, Indigenous, or scientific name of the various Beings.
5. Develop a way for the class to **say farewell** to each Being before moving to the next species. It may be as quick as "Thank you [Being name]. May you live well." Have students help create what to say.
6. Once you finish your name reveal and return to the classroom, you may wish to **nurture further the relationship between the student and their Being** by completing the following:
 - **Younger students:** Help them in the class to learn more about their Beings and answer the questions they came up with. Using what they have learned, students can create a poem, chant, or rhyme about their Beings.
 - **Older students:** Have them research the connections between/among their forest Being to other Beings and humans. How are they used by Indigenous people? What ecosystems are they found in? How do they change throughout the year? What are some of their other names?
 - **Older students:** Connect and discuss the broader implications for knowing the names of species and ecosystems through the questions, *how does knowing a name bring you a greater connection with that Being? How do we encourage people to save, protect, and give space to other beings?*
 - **All students:** Encourage repeat visits back to the forest for students to check on their Beings. They can bring a water bottle to water their Being (if it is a plant). How does their Being change with the seasons? If it is an animal, are there times when you cannot find it? Why?

Activity 2: Learning the Indigenous names for your forests, wild areas, and species

This activity can be done inside (preferably after students have been outside to connect with their local lands or ecosystems) or outside. Your students will be learning about Indigenous place and species names and the meanings and worldviews behind these names.

Option 1: Invite an elder to share their knowledge: If possible in your community, invite an Indigenous elder or local Indigenous person in to share their knowledge of the land and its Beings. Not only may Indigenous elders share names in the local language,

they may also be able to share some of the worldviews their people hold surrounding ecosystem and species protection and stories related to local ecosystems and Beings.

Note: If you wish to bring in an Indigenous person to share their knowledge, check with your school administration and/or Indigenous educators for the appropriate protocols for booking and honoring knowledge sharing. Lots of school districts have specific procedures, lists of people willing to share their knowledge, and set honorariums or gifting procedures. Even if an elder is unavailable to come to your class, your district may have specific and shareable resources from the local nations about Indigenous names and language.

Option 2: Using online and print resources to learn local names and pronunciations for forest places and Beings

Students and teachers can use online resources to learn about the Indigenous place and Being names in their community. There are many ways to do this and many languages across the world to learn. Even bringing to your class one word or name a week for students to learn will allow students to build a connection with Indigenous people and to the forests and trees. Here are five tips for learning Indigenous words and languages:

- 1. Try to say it!** It is not easy to learn a new language, but if a language isn't spoken and taught, it will go extinct.
- 2. Be humble.** You will make mistakes and it may take many weeks or months to pronounce or say a word correctly. Accept pronunciation corrections, and keep trying.
- 3. Build slowly and repeat.** Start with one or two important words. Repeat and work the word regularly into your day. Add new words weekly as your class starts to understand the initial ones.
- 4. Include Indigenous place names and land names as much as possible.** Even if you aren't going to regularly speak all the words, adding in the word (and saying it!) when learning about a new place or Being develops an understanding of the language.
- 5. Uncover word meanings and stories.** Many place names and words have legends and stories behind them. For instance, an important mountain on the Saanich Peninsula, British Columbia known as [L'ÁU'WEL'NEW has a legend](#) that explains the naming of the **WSÁNEĆ** people and their connection with Arbutus trees (**KEKEYILĆ**).

Even if you cannot find the name of a specific plant or animal in an Indigenous language, you can learn some of the alphabet with your students and help them pronounce their Beings' names if you can find them through another resource.

Note: Not all words and stories are shared or should be shared. Please ask permission if you hear a story or word before you share it. It is generally accepted that Indigenous stories and words that are published have been granted permission for sharing.

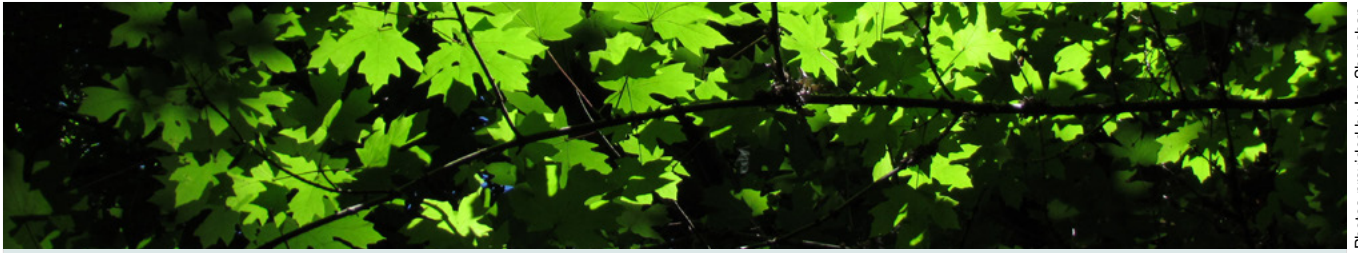
Resources:

Here are a few other resources to help you find your local languages and resources.

Website	Description
Canadian Language Museum	This is an excellent resource for language learning! It has a list of sites and resources for many languages, organized through language families. There are also many links to specific language-learning apps.
First Voices	First Voices is a national language resource. It is a database for many Indigenous languages and contains words, phrases, songs, games, and even kids portals for many of the languages.
Native Land Digital Map	This is an online mapping tool developed to “foster conversations about the history of colonialism, Indigenous ways of knowing, and settler-Indigenous relations” through an interactive map and other tools. Its scope is providing information on territories, language, and Indigenous peoples worldwide
Indigenous Peoples Atlas of Canada (Canadian Geographic)	This is a link on how to order the Canadian Geographic's Indigenous Peoples Atlas of Canada Large Floor map. It is an interesting and hands-on way for students to interact with a map.

Extensions:

- Play a board or card game that teaches about native plants or animals or Indigenous language.
- Find (or create) stories about the plants and animals in your local forest(s).
- Connect your learning throughout the year through seasonal rounds and other learning in science or social studies.
- Create posters or an educational campaign to teach others (e.g., parents, those in your school) about the names you've learned!



Bigleaf Maple (*Acer macrophyllum*)

Lesson 3: Forests as healthcare



By **Chloe Faught**

Overarching inquiry question(s): How does being in a forest help us keep healthy? How does nature help people feel good? What are scientists discovering about how our brains and bodies react when we're in nature?

Target age group: K–12 (in-depth lesson for 8–12)

Topics: science, benefits of forests on mental and physical health, chemistry, math

Curricular competencies (listed in brief):





- Emergent inquiry and learning through observation
- Understanding how forests and being outside benefit human health
- Sharing and communicating ideas and emotions
- Scientific research of healthcare benefits (secondary students)
- Listening to the perspectives of others
- Developing mindfulness in nature

Background information:

Our collective awareness and understanding of mental health issues has increased in recent years and it has become a hot topic in our world, especially as we have faced the COVID-19 pandemic and the toxic drug overdose crisis. While both of these problems are complex and multifaceted and require many changes to our societies to better support those facing mental health challenges, there is a growing body of knowledge validating that the presence of nature — forests in particular — and regular exposure to these ecosystems can have positive effects on mental and physical health. While there are a number of health benefits that are being studied in connection with time spent in forests, [the strongest evidence](#) points to the health benefits to the cardiovascular system, immune system, and mental health in the areas of stress, depression, anxiety, and negative emotions. As of 2022, physicians in Canada can prescribe time in nature as part of the [PaRx program](#). Similar programs exist in the USA and UK.

While there are many different aspects of forests that are currently being studied in terms of their impacts on human health, here are the key ones that are supported by the strongest evidence:

- 1. Phytoncides/Terpenes:** These is a set of chemicals that are produced by conifers such as spruce, pine, cedars, and even oaks (which aren't conifers!). They benefit trees as they form an antimicrobial and insecticidal barrier and can be a form of communication among plants. For humans, phytoncides, which are present in the air of forests, can increase the number of Natural Killer (NK) cells in the body. NK cells boost our immune systems and fight off pathogens. They also have an anti-inflammatory effects, reduce stress hormones, and help people relax.
- 2. Fractal patterns:** Fractal patterns are repeating patterns. In nature they are abundant — for example, the repeating pattern on a fern from its leaflets to its frond, the pattern on a pinecone or even the clouds in the sky. Our brains are wired to enjoy looking at fractals and there is evidence that looking at them [can reduce stress by up to 60%](#).
 - **Exact fractal:** A fractal that is perfect. It is completely symmetrical and often repeats itself at multiple scales (e.g., fern fronds).
 - **Statistical fractal:** A repeating pattern that isn't perfect. It may not be perfectly symmetrical or not repeat at multiple scales (e.g., clouds dotting the sky).

Examples of Perfect Fractals		Examples of Statistical Fractals (imperfect)	
			

3. Soil bacteria: While there is a lot that we do not know about soil, there is [growing evidence](#) that some of the bacteria in soil can help reduce stress. In particular, *Mycobacterium vaccae* injected into mice demonstrated evidence of increased serotonin production.

4. Color: There is [strong evidence](#) that looking at the color green reduces stress and boosts mood.

5. Sound: Gentle nature sounds and silence from other noise irritations help control our autonomic (resting and relaxing) nervous system.

6. Smells: Aromatherapy is very popular today. [There is a lot of evidence that some of the smells in forests](#), particularly from conifers, can boost metabolism and relieve pain and stress.



Horse Chestnut (*Aesculus hippocastanum*)

7. Negative ions: As water moves (in rivers, oceans, etc.), when lightning strikes, or even as plants grow, negative ions are produced. In terms of spaces, [forests have the highest concentration](#) of these ions. Negative ions can combat allergens in the air, deter viruses, and increase our hormone serotonin, which may be why there is a link between negative ions and [lower depression rates](#).

8. Connectivity and awe: When you are out in a forest, you are part of a connected ecosystem full of living Beings, which may awaken an appreciation for beauty and feelings of interconnectedness, making you less likely to feel alone.

Forest Bathing: Forest bathing, known as Shinrin-yoku in Japan where the practice originated, is becoming a more common practice in Europe and North America. It is the practice of immersing yourself in a forest for a period of time, often for either extended periods or regular intervals of 15–20 minutes in order to gain the benefits provided by the forest. Forest bathing involves slow, gentle walks and pauses to observe with all your senses and can also include moments of sitting still. There is an element of mindfulness practice that is often incorporated into forest bathing. Forest bathing, even for a few hours infrequently, has been shown to boost the immune system, lower blood pressure, and improve sleep quality.

Summary:

This lesson is based on an emergent learning approach, emphasizing student observation and providing opportunities for (self) discovery of the human health benefits of being with and in forests. By experiencing and engaging in self-reflective activities offered in a forest-bathing experience, students will hopefully awaken to many of the aforementioned benefits.

For younger students, the goal of this lesson is to observe and discover some of the pleasures and benefits of being in a forest and to open pathways to emergent learning and inquiry related to forests.

For older students, this emergent learning may lead to detailed research and discoveries related to the emerging science behind some of these felt benefits, such as the chemistry of phytoncides as well as the health benefits of fractals, soil bacteria, or nature sounds.

Suggested materials:

- Journals (or pen and paper & a clipboard)
- Sit pads
- cameras

Opening: Circle or journal practice

Begin with a student reflection or sharing circle to start exploring how forests might provide 'healthcare' to us as humans. Choose one or more of the following prompts that can either be adapted during an oral sharing circle or as part of a silent journaling:

- *What places make you feel the healthiest, happiest, and most alive?*
- *What does 'health' mean to you?*
- *How does being in a forest make you feel? Why do you think being in a forest makes you feel this way?*
- *What places make you feel the healthiest, happiest, and most alive?*
- *Write down three or more words that come to mind about how you feel right now. (Then have students repeat this activity once they are in the forest and you can compare the responses.)*

Note: Not all people have had positive experiences in nature, and some may have had so many negative experiences in life that some of these questions (such as asking to share about a positive, happy place) may stir deep emotions. Please be aware of this as you choose which question(s) to use, and be clear that anyone can pass or choose to participate through writing. Seek appropriate support for a



Dog-day Cicada (*Neotibicen canicularis*) exuvium

highly distressed individual through a school counsellor or other available means. This is also something to be aware of when you go into the forest or wild places. If someone has expressed a negative emotion toward a particular setting, you may need to talk with them further and seek help before you decide to take them there.

Once students have shared and depending on what has been shared, you may wish to explain some of the research on how forests provide humans with ‘healthcare’ as are described above. Conversely, you may wish to conduct more of an emergent experience and have students uncover some of the forest benefits as they explore and experience a forest.

Activity: Lessons in the forest

For both activities described below, it is strongly suggested that you take students to a natural area that has trees. A native forest is best, but even a planted urban forest can do if there are no wild places nearby. If you can’t access the outdoors,

you could put an image of a forest or trees on a screen, turn on forest sounds, and/or even bring in some forest smells.

Note: This lesson would work best if conducted over a few days or with repeated access to a forest. However, this is not always possible, so you are encouraged to adapt this to fit your context.

Activity 1: Emergent inquiry and appreciation through a forest bathing (*shinrin-yoku*) choice board (suitable for all ages)

The goal of this activity is to help students understand that just being in a forest provides us with many benefits to our mental and physical health. Through exploration, learners will hopefully be able to have some answer to this question: *How does a forest help us to be healthy?*

- 1. Forest bathing walk or sit spot primer.** Walk slowly and fairly quietly through the forest as a class. Forest bathing is a mindfulness activity. Encourage complete silence at pauses and draw attention to different parts of students’ senses (listening, looking, closing eyes and feeling, etc.) as you move. Allow students to find a comfortable place to do a sit spot for five minutes. Encourage them to listen to the sounds they hear. What are they and how do they make students feel? Direct them to take some deep breaths, listening, smelling, and even gently touching the forest. Older students can be encouraged after sitting for a few minutes to write their feelings and thoughts in a journal. After five or so minutes, bring students back together and do one of the other activities below.
- 2. Choose one or more observation experiences** from the choice board (attached handout and listed below). The goal is not to rush through many activities but to choose one or more to help students experience the healthcare benefits of the forest. Many of the choices will need some explanation before you can send students out to do the activities.

Find a perfect fractal on a plant that interests you and draw it. Does it have fractals at many different scales (sizes)?	Lie on your stomach and smell the dirt for 5–10 breaths or 1 minute. Write down whether you liked the smell and how it made you feel.	Do something for the forest. For example, speak to a tree or plant and thank it; remove invasive species; or pick up some trash and take it to a garbage or recycling bin.	Play a game of tag, hide-and-seek, or another common game in your school yard. Then repeat the game in the forest. How is it different? (Please be aware and choose places where this is appropriate, as some parks have ‘on-trails’ rules.
Walk through an urban area, paying attention to smells. Then go into a forest. What do you smell? Which smells did you prefer?	Find something in the forest that you find interesting or beautiful. Spend some time with that thing. If it is alive and moving, watch and observe it. Imagine what it would be like to BE that Being. Photograph, sketch, or write about what you found and why you are drawn to it.	With eyes closed or blindfolded, spend 1–2 minutes feeling and even smelling the bark of a tree, getting to know it. If you were led here by a partner, can you identify your exact tree if you are led away once you take off your blindfold?	Take off your shoes in an area that is safe to do so and do a barefoot stand or walk for a few minutes. Can you feel the mud? What else? Can you imagine the many bacteria and mycelia underneath in the soil connecting to the trees?

3. **Closing circle:** Regardless of which activity you chose, you will want to allow students to share their experiences or observations. After they share, link the learning to some of the knowledge you have about how forests provide us with healthcare. If students express negative emotions (e.g., fear, cold), make sure you address these issues when they arise and allow for students to challenge themselves through choice. For instance, when I do the blindfold tree activity, I allow students to be led blindfolded, others to close their eyes, or others to do the activity themselves by only closing their eyes when they reach the tree.

Activity 2: Fractal scavenger hunt (appropriate for older students in Grades 5+)

This activity highlights in more depth how fractals are everywhere in nature as well as the new science (see link in backgrounder on fractals) that has emerged about how looking at fractals (and especially green fractals) is both enjoyable and reduces stress.

Bring students to a natural area and show them a couple of examples of fractals, both exact and statistical. Ask them if they find them interesting to look at and explain afterwards the science behind fractals and stress reduction. Then have students go on a scavenger hunt to find fractals of their own. Tell them that the goal is not necessarily to find them all (it is not a race) but to find examples. **See linked worksheet for a printable student scavenger hunt.**

Find and draw or name a fractal that...

repeats on a least 3 different levels (sizes)	is brown	is white, pink, purple, or yellow	is exact (perfect)
is statistical (repeating but not perfect)	is alive	is larger than you	is smaller than your fingertip
is on you or another person	is on an insect, spider, or worm	is on a human-made structure	you can see from looking up at the forest canopy

Closing circle:

Convene a similar closing circle to the one described in Activity 1, which will allow students to explore and share what they have discovered.

Extensions:

- **Research forest health benefits (high school):** To deepen their understanding of healthcare benefits, have student choose one of the healthcare benefits listed in the introduction and do some research into the science behind how and why forests provide these benefits to people as well as which benefits are for the forest (e.g., why do forests emit phytoncides or create fractals if not for us?).
- **Art and math with fractals:** After the fractal activity, engage students in an art lesson that involves creating their own fractal image. Or, if you are teaching math, delve more into the mathematical parameters for measuring the complexity of fractals (Fractal Dimension (D)).
- **Mental health and wellness:** Have students make up a plan that involves incorporating outside time into their lives and/or explore other mindfulness activities (e.g., meditation or yoga).
- **Careers:** Have a forest-bathing practitioner, scientist studying the effects of forests on healthcare, or a nature-based counsellor share their experience and knowledge.



Yellow Trout-lily (*Erythronium americanum*)



Early-stage leaf-out

Lesson 4: Why are forests so important as the climate changes?



By Chloe Faught

Overarching inquiry question(s):

Why are forests and trees so important as our climate changes? How healthy are our forests and trees? How might we protect and improve the forests in our area?

Target age group: K–12

Curricular competencies (listed in brief):

- Appreciating and understanding how trees and forests influence the climate (e.g., through shade and cooling, carbon sequestration, flood mitigation and soil stability, etc.)
- Making observations and making inferences and questions about how and why trees are important
- Understanding which local trees and forests contribute the most to carbon sequestration
- Measuring and calculating the age of trees in your area
- Evaluating whether the trees and forests in your area are well protected and healthy or need further protection

Terminology:

Carbon sequestration: The amount of carbon that can be absorbed by a plant and turned into a biological molecule that is stored within the plant as it grows and lives. Trees are effective at sequestering carbon, as they hold it in their trunks for a long time — and even longer as dead trees or logs. Carbon sequestration rates vary, but generally larger, older deciduous trees sequester the most. Measurements are usually expressed as an annual rate (e.g., 10 kg of carbon/year).

Ecosystem services: Something that an ecosystem provides that is beneficial to people (and other organisms or the Earth). Examples include purifying the air, providing soil stability, decomposing waste, pollinating flowers, and sequestration of carbon from the atmosphere while providing oxygen!

Microclimates: Microclimates are what they sound like — the climate of a smaller area. Often when we talk about the climate of a place, we are usually talking about large geographic regions (a state, a province, or a biome like “tropical rainforest”). A microclimate is more specific — a particular part of a town, like a city center. At those scales, vegetation like forest cover can have a huge effect on temperatures and even moisture levels as trees absorb sunlight, cover and shade areas, and absorb and release moisture.

Mother trees: A term coined by British Columbia forest researcher Suzanne Simard. Also called “legacy” or “hub” trees, these are the largest trees in the forest. They have the most connections to other organisms through fungal mycorrhizae and provide nutrients to other trees and plants. They are also the ones that typically sequester the most carbon per day and have likely sequestered the most in total.

Background information:

Why are trees important as the climate changes?

There are many benefits that trees and forests provide that go beyond their value as wood when we cut them down, sell them, and make them into something else. This list below includes only a few of the many ways that trees provide ‘ecosystem services’ or benefits while they are living as part of a forest ecosystem.

1. Shade and cover: Trees provide cover and shade, and they contribute to the creation of cooler microclimates.
2. Soil stability and water filtration: Trees hold banks in place so that they don’t erode (fewer landslides!), and they filter the water that passes through them. They also slow down water filtration through the soil, which can reduce flooding.
3. Nurturing other species: Forests are full of many species that are adapted to living together. The trees themselves are crucial for other plants as well as animals, fungi, and bacteria that live with them.
4. Carbon sequestration: With climate warming and carbon dioxide emissions increasing, trees and plants have the incredible ability of naturally sequestering carbon from the atmosphere and storing it.

Trees and carbon sequestration. Which forests and trees are preferred?

This question is complex, given the wide variety of ecosystems, trees, and forests that exist in Canada, North America, and the world. Each tree has a different sequestration rate, and this rate usually increases as a tree ages. There are many other factors as well. Here are a few key guidelines to consider when you discuss this topic with students:

1. Mother trees are the oldest and largest trees in a forest. These trees have the greatest connectivity and thus capacity for helping other trees and plants in the forest survive. They also have the greatest carbon sequestration rates as a [tree's carbon absorption rate accelerates as it ages](#).

2. Larger patches of natural forests have better sequestration rates than smaller ones:

Due to the connectivity between trees and other species, their ability to share resources, and their ability to create microclimates, large forests have trees with better carbon sequestration rates than individual trees that are not connected.

3. Preferred tree species: Deciduous trees (mostly comprised of hardwood, broad-leaved species) are the best at absorbing carbon dioxide on a carbon-per-centimeter-diameter basis. Particularly long-lived trees include the Sugar Maple (*Acer saccharum*), oaks (*Quercus spp.*), Black Walnut (*Juglans nigra*), and hickories (*Carya spp.*). Honorable mentions on this list include Horse Chestnut (*Aesculus hippocastanum*), Ponderosa Pine (*Pinus ponderosa*), Eastern White Pine (*Pinus strobus*), and Douglas Fir (*Pseudotsuga menziesii*). However, native trees in a natural habitat, no matter the tree type, are typically preferred over non-native species outside a forest.

4. Old growth: Preserving existing older and/or large patches of natural forest is important as these are currently sequestering a lot of carbon and can continue to store it for a long time.

5. Increasing global numbers of trees overall: Adding trees and forest patches to our urban environment in any form will help with carbon sequestration, shading, and the creation of cool microclimates. We have lost a lot of forest over the last few hundred years and some scientific studies estimate that [Earth can support at least another 900 million acres of forest. If we planted it all we could reduce atmospheric carbon by 25%](#).

Summary:

Students will explore and discover how important trees and forests are. This investigation begins with emergent learning on a forest walk or with brainstorming and watching impactful videos to promote discussion.

Students will learn about the importance of large "Mother" trees in a forest and measure and estimate the age and size of trees in a local forest or urban area. They can use their data (and optional data on forests and natural areas) to decide whether or not they think they have a sufficient number of healthy trees and forests in their region.

There are several suggested extensions, including community education and engagement surrounding the protection of old trees, forests, and natural areas.

Opening: Exploring 'Why are forests important as the climate changes?'

There are two ways to approach the opening, wherein students are encouraged to access their prior knowledge about trees and the importance of trees to both the climate and Earth.

Option 1: Observation walk: If possible, allow the students to discover and think about the inquiry question and answer it by observing and examining trees in a forest or urban landscape. Give students the prompt, *why are trees important as the climate changes?*

Note: For younger students, this lesson may need to be prefaced by some information about climate change or altered to involve a more general question such as 'What do trees and forests provide?'

1. Put students into buddy groups of 2-3 for the walk and have them bring a notepad and a pen so that they can think and note their thoughts and questions as they go.
2. Begin by letting students work together without any additional guidance questions. Encourage them to write both what they think about why trees are important and any questions they have. After a short walk with pauses or some time where student groups can break out and visit a tree, reconvene the circle and have everyone share what they've discovered. During this check-in, use students' questions to help them explore the main question and decide how much more guidance they might need in uncovering more of the many possible responses. If guidance is needed, consider some of



Adult male Rose-breasted Grosbeak (*Pheucticus ludovicianus*)

the following prompts or discussion questions that might draw out some of the main ways trees are important:

- How does a tree get energy? What does a tree need to make that energy? Which element is its body mostly made up of?
- Did you notice any differences in temperature or moisture as you went from outside a forest to inside it?
- Which trees do you think are bringing in the most carbon dioxide and thus need to 'breathe' (respire) the most?
- What happens to the carbon if a tree dies and falls in the forest vs. if we cut it down and remove it and/or all of the surrounding trees?
- What is happening underground? How are the trees able to get water? Do they share it?
- How could a tree be helping other species live?



Ostrich Fern (*Matteuccia struthiopteris*) fiddleheads unfurling in early spring

3. Return to the classroom. Have students create a drawing or image of the tree they studied most, depicting or listing the features that are important to climate change. Or have students make a mind map.

Option 2: Classroom brainstorm and video discussion (suitable for older students who can read/write well)

If you do not have a forest or trees nearby or you don't have time to walk, you can have students brainstorm a list of ways that trees are important as the climate changes. After students brainstorm, have them share their answers as a class. Then use one of the videos below to deepen that initial understanding about trees and their importance as Beings that can **sequester** carbon, provide shade and cooling, filter water, and play a vital role in enhancing the health and happiness of people in urban areas.

Video Title & Link	Suitability	Description
Greta Thunberg and George Monbiot make short film on the climate crisis	Grades 7–12	Greta and George make an impactful short video on the importance of trees and the restoration of forests for reducing atmospheric carbon.
What if there were 1 trillion more trees?	Grades 9–12	This is a good TEDx video that outlines the research behind how much carbon sequestration would happen if we planted more trees as well as some of the considerations and limitations to this as a solution for climate change.

Activity: Mapping the mother trees and mapping natural areas

In this activity students are going to go out into their community, preferably to a forest, to measure trees to estimate their age and carbon sequestration rates. Are there any mother trees that need preserving? How are they being protected?

Before you head out

1. Why are mother trees important? This short video from CBC about the work of The Mother Tree Project, organized by Suzanne Simard, highlights some of the reasons why mother trees are important. You should either watch and discuss this video with students or use it to highlight some reasons why big old trees are important.

Video: [Why mother trees are crucial for fighting climate change](#)

2. Learn and teach students about the dominant native tree species in the region. You do not need to know ALL of the species in your area, just a few. Pick one or two that you will focus on for this study. Then copy the data table (see attached) for student groups. Record which species you will be looking at and the growth factor for each one.

Outside Activity: Finding the growth factor for the tree species(s) you have chosen

You are now ready to go outside to your neighborhood or forest and measure and age your trees. Can you find any 'mother' or old-growth trees? How old are the trees where you are? You can find out by measuring the circumference (the measurement around the tree trunk at breast height or 1.3m) and using the tree's Growth Factor (GF) to get an estimate! See below.

The Growth Factor (GF) for your tree is the average amount in diameter that your tree will grow per year. Faster-growing species will have a larger GF. By knowing the GF, students can measure the circumference of the tree and figure out the age of the tree by using an online calculator (<https://www.omnicalculator.com/biology/tree-age>) or this formula:

$$AGE = GF \text{ (growth factor)} * DBH \text{ (Diameter at breast height in inches)}$$

How to age and describe your trees:

For younger students (K–4): Spend time together on a nature walk learning tree species; meeting, hugging, or encircling trees; and guessing how old a tree is. As Suzanne Simard says in one of the last lines of her book *Finding the Mother Tree*, “Go find a tree — *your tree*. Imagine linking into her network, connecting to other trees nearby.”

Create a tape or string that has some calculated diameters that correspond with the age calculation above for your dominant tree species (see example below). That way, when you are out in the forest, you can have students guess trees’ ages before they measure them and see an estimate for themselves. Conversely, if you just have a measuring tape, measure a tree’s circumference and then [use the tree calculator](#) to find out its approximate age. It might help students better understand the age of the tree by relating its age to that of a family member (e.g., parent, grandparent, great grandparent, etc.)

EXAMPLE: How to make a Tree Age String so that you can estimate age instantly

This example is for a Garry Oak (*Quercus garryana*). This tree species has a growth factor of 3.53. I can determine circumference measurements for different ages by making calculations.

Age of Tree (years)	Finding Diameter of Tree (DBH in inches). $DBH = \text{Age} / GF$	Circumference (inches)
300	$300 / 3.53 = 85$ inches	267 inches
200	$200 / 3.53 = 56$ inches	178 inches
100	$100 / 3.53 = 28$ inches	89 inches
50	$50 / 3.53 = 14$ inches	44.5 inches

Note: Measurements are in inches, as the growth factors are created using the imperial measurement system.

For older students (Grades 5–12): Have students go into a forest and measure the circumference at breast height (approximately 4.5ft / 1.3m from ground) of several trees and fill in the data sheet provided ([see the worksheet “How old are the trees? Tree Age Calculation Chart”](#)). Students can calculate the age of the trees in groups. It would be best if they made the calculations in-situ as they go, in case they find an old tree (>100 years old) or a tree that might be a mother tree that they want to temporarily flag (marking with flagging tape or something easily removable but easy to see works best).

After groups have measured and calculated a few trees, the class can regroup and any significant findings can be shared. Students may wish to go on a tour to see any of the significant or interesting trees that have been measured or observed. It may be helpful to map or write down GPS points of significant trees in case the class wishes to return to the trees for an extension activity.

Either in the forest or back in the classroom, have students complete and discuss the questions at the bottom of the worksheet so that the links among age, carbon sequestration, and forest connections are clear to students.

Extensions: Forest and tree protection

- **Make an awareness campaign for your important trees:** Share your knowledge about large trees with others in your community. Can you make a newsletter, posters, or a map that can be shared to show important forests or trees in your community? Alternatively, create a poster or use the Respect & Protect template to tell the community about how old the trees are where you live ([see example of a poster in the worksheets package](#)).
- **Research tree and forest protection bylaws:** Does your municipality or region have tree protection bylaws or habitat protection for natural forests? Have older students research local municipal laws that might protect trees. Compare them with other municipalities in your area, province/state, or country. Do students think that the laws are sufficient to protect these trees? If not, what sorts of actions could be taken? Write to a municipal government, attend a council or parks meeting, or explore whichever other ideas your students can think up!



Cucumber Tree (*Magnolia acuminata*)

Lesson 5: Why we need urban forests as the climate changes



By **Chloe Faught**

Overarching inquiry question(s): Why are plants and forests important in urban environments? Do we have enough urban forests in our neighborhoods? What can we do to protect and increase forest cover in our communities?

Target age group: Grades 7–12

Curricular competencies (listed in brief):

- Understanding how deforestation has played a role in human history for hundreds of years as well as the main causes (farming, unsustainable resource use, and urbanization)
- Learning the importance of protecting and replanting urban forests
- Analyzing the tree canopy cover and green space of a few blocks in your neighborhood
- Comparing the extent of tree cover to both averages in various cities as well as Toronto’s goal of 40% urban forest
- *Extension: Taking action to help improve the urban forest in your community*

Terminology:

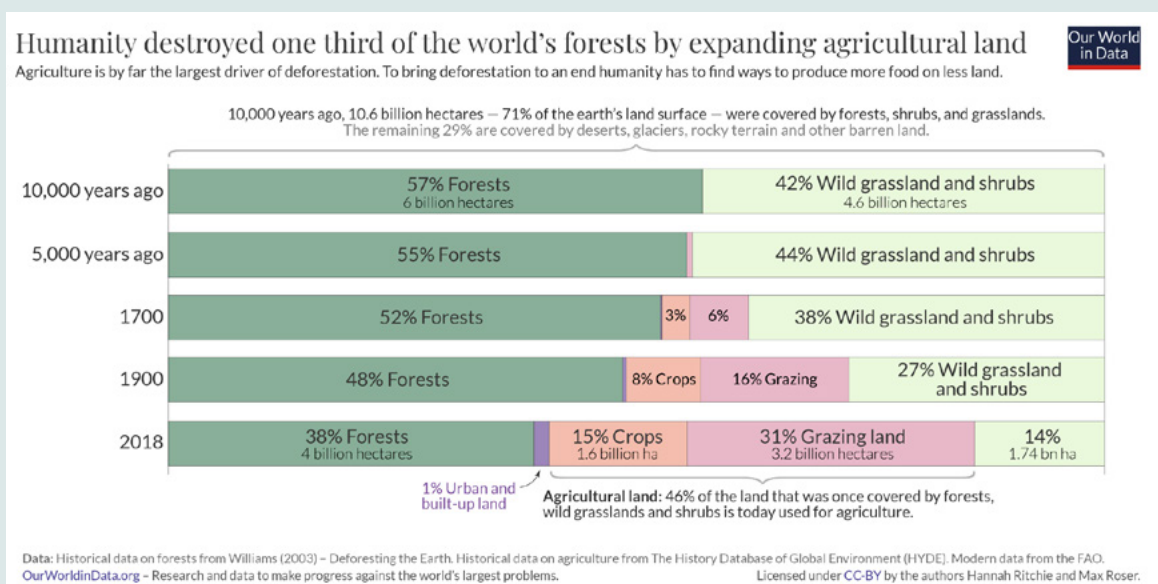
Urban forest: Urban forests include natural areas as well as planted areas that are parks, boulevards, and private yards. They are not necessarily connected as a natural forest would be and they include both native ecosystems as well as planted, landscaped places. Urban forests provide many of the same benefits as natural forests. In addition to their unique benefits due to the proximity to people.

Recommended materials:

- Clipboards
- Tree identification guides
- String or measuring tape
- Satellite images of your neighborhood

Background information:

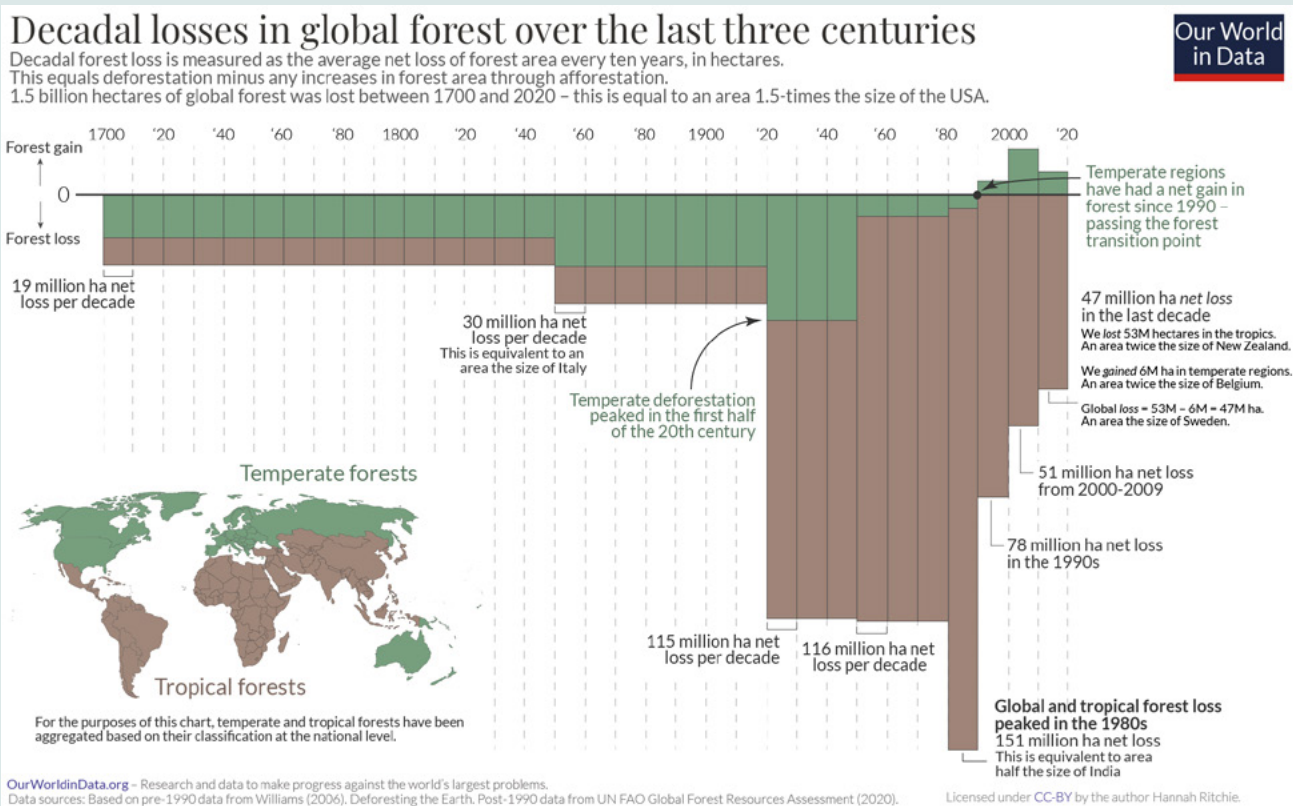
Deforestation — the permanent removal of trees and forests on a large scale without replanting new trees— is a centuries-old practice. While tree removal has been part of humans’ and trees’ entwined life histories, larger-scale deforestation really began in the 1700s as forests were increasingly converted to agriculture (see Graph 1). Today, this trend has shifted as agricultural land is now shrinking and commercial forestry and urbanization exert pressures on our forest coverage. However, in Canada¹ and the U.S.,² strong reforestation laws mean deforestation is virtually nonexistent.



Graph 1: Forest and wild grassland coverage changes over time (According to this graph and informed estimates, we have lost 2 billion trees since the end of last ice age (~10,000 years ago). This is largely due to agricultural practices.)

Overall, for the last 30 years, deforestation rates have been declining worldwide from their peak of 151 million hectares in the 1980s. In temperate forests (notably in North America, Europe, and Australia) reforestation has outpaced deforestation (see Figure 2). This is a small piece of good news; however, the reality is that globally we are still deforesting at a huge rate in tropical forests, and billions of hectares of forest have been lost in the last few hundred years.

Earlier lessons have focused on the myriad of benefits that forests and trees provide to us, especially in the face of a warming climate with increased carbon dioxide in our atmosphere. Together, there is a very strong case to support reforesting our landscape where it is feasible and improving the quality of our urban forests. Urban forests include natural areas as well as planted areas that are parks, boulevards, and private yards. This lesson is focused on encouraging students to evaluate our urban forests to see if they are sufficient or if there are places that can be enhanced. 2021–2030 is the [UN Decade on Ecosystem Restoration](#).



Graph 2: Decadal losses in global forest over the last three centuries. This graph demonstrates the history of deforestation on Earth and the scale of the loss.

Overall, there has been a decline in tree canopy cover in urban areas in Canada. For instance, as discussed in [Vancouver's Urban Forest Strategy](#), the current coverage declines every year and overall it is estimated to be at 18%. Some urban cities, like [Toronto, ON](#), have pledged to reverse those trends and aim for 40% coverage.

Urban forests are particularly important as the climate warms, as they can provide shade. Continuous canopies in an urban neighborhood create a cooling effect or cooler microclimate while also reducing stormwater flooding, since tree coverage slows water's flow into the ground as trees absorb water through their roots.

Summary (Learning & pedagogical outcomes; goals & activities in brief):

Students will begin by exploring how important trees are for creating microclimates and how they play a role in the design of sustainable communities now and in the future (Extension: Exploring legislation to protect and enhance tree cover in cities).

Then, students will undertake one or both of the following activities, each of which involves exploring whether their neighborhoods have sufficient tree cover and forests from the perspective of supporting a healthy community.

Opening:

Open by asking the question, *are trees and forests necessary in cities or urban areas?* This will hopefully prompt some lively discussion and potentially some arguments or differences in opinion. Brainstorm as a class before having students watch the following video. Use this as a discussion opener. Then ask students to re-evaluate and see if there is anything that needs to be adjusted about their understanding.

What happens if you cut down all of a city's trees? by Stefan Al	Grades 7–12	This is an engaging animated TEDx video showing how trees and forests are important in urban areas for a wide variety of reasons.
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Map practice exercise: Which neighborhood map has the preferred urban forest?

Next, use the three satellite images of different urban neighborhoods in Toronto to discuss and set some general criteria for what would be a preferred amount of forest and natural (green) space as well as street and neighborhood tree cover.

Activities:

For both of these activities the class needs to know which exact geographic region where you will be conducting the tree and urban forest analyses. Consider exploring a block or two around the school. Secondary students could break into groups, with each assigned a block, OR groups could each do the analysis for the same block and then compare results. Use Google Maps to help you decide which area would be best for your class.

1. Is there enough shade & tree habitat? Counting trees and the squirrel leap test

This activity is one that is commonly done in community urban planning, and you can find similar examples of it in the [Citizens Coolkit on Climate Change & Urban Forestry](#) and the [BC Climate Action Toolkit](#).

Counting trees: With the block or blocks or area you have picked, students will be counting the number of street trees and the number of trees on the street boulevards as well as the number of trees in front yards or other areas. Students will walk one to two blocks on both sides of the street, counting the trees and giving estimates on their respective ages according to the following categories: seedlings, saplings, mature, old-growth, decayed/dead

Squirrel leap test: Can a squirrel leap* from tree to tree all along the street(s) that you are walking? Can it cross the street through the canopy at least twice per block? Then the canopy (tree coverage) is considered continuous and will provide benefits in terms of lowering the microclimate, providing shade and habitat and reducing stormwater flooding.

**An Eastern Gray Squirrel (Sciurus carolinensis) can jump a maximum of two meters.*

Use the worksheet provided to allow students to complete the two activities above before sharing the worksheet.

2. Habitat and tree coverage mapping

This second activity extends the first activity and allows students to map the forest canopy and other coverage “habitats” using any satellite photo of their neighborhood/block.

Instructions: (This activity is adapted from a similar one from the [Climate Coolkit](#).)

- Print out a Google Map (or a digital mark-up if doing this activity on a computer) of a block or region that students will explore. If they have completed Activity 1, then use the same location where they counted trees.
- Using the map, students mark and color different areas to show different habitats. Have them then use the colored images to estimate the percentage (%) of coverage of each type of habitat (see provided worksheet and example). Habitats include the following:
 - » “Squirrel Habitat” – Trees and Canopy
 - » “Worm Habitat” – Lawns & Soil
 - » “Car Habitat” – Pavement
 - » “Pigeon Habitat” – Buildings and Roofs

How to estimate % coverage:

1. Eyeball method: This method involves a rough estimate, which is perfectly fine for this type of study. First, in your head (or with tick marks on the map), mark the halfway point and each 25% of the map. Then, starting with one of your habitats, try to ‘fill up’ one side of the image by imagining pieces of the colored portions all squished together on the left side. Can you get to 10% of the way across? 25%? 50%?

2. Grid method: This method is more precise. You can create a grid across squares. A 5cm x 5cm grid would allow you to look at each square and get a better estimate of the % in each one. Then, tally all the estimates and divide by the total number of squares. This will give you an overall estimate of the average percentage of coverage.

$$\% \text{ in each square/number of squares} = \text{Average \% of coverage}$$

Note: Do not worry if some of the areas overlap. This is likely to happen. If there is lots of “squirrel habitat,” then the trees will overlap and your overall coverage will be >100%.

If you prefer to use a digital tool like Google Earth or i-Tree, see the [Climate Coolkit](#) for a quick primer on these tools (pages 50–54).

- Discuss and compare your results among different groups and compare your results to those of your street tree survey. Are they similar?

Extension: Helping your community with its urban forest renewal project:

After you have completed these lessons, you might feel compelled to do something. Here are some suggestions:

- Are there grants or ways you can get your school involved in generating native trees or natural areas to your schoolyard or community?
- Can you use your knowledge to educate neighbors and inspire them to plant more native trees, native plants, and natural areas in their yards? Perhaps you could create a pollinator garden.
- Have students create a map or drawing or have them upload a photo of their own yard or living space. Then, have them alter the space to allow for increased trees and greenspace. Perhaps they can share their map with their family or the property owner of their building (if a rental) to prompt discussions.

Endnotes:

1. The State of Canada’s Forests Annual Report 2022, Natural Resources Canada, https://natural-resources.canada.ca/sites/nrcan/files/forest/sof2022/SoF_Annual2022_EN_access.pdf#page=33
2. <https://www.fs.usda.gov/speeches/state-forests-and-forestry-united-states-1#:~:text=The%20United%20States%20has%20the,third%20of%20our%20land%20area.>



Tamarack (*Larix laricina*) cones

Ian Shanahan

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is now a
registered charity in Canada

...and we have big plans!

1

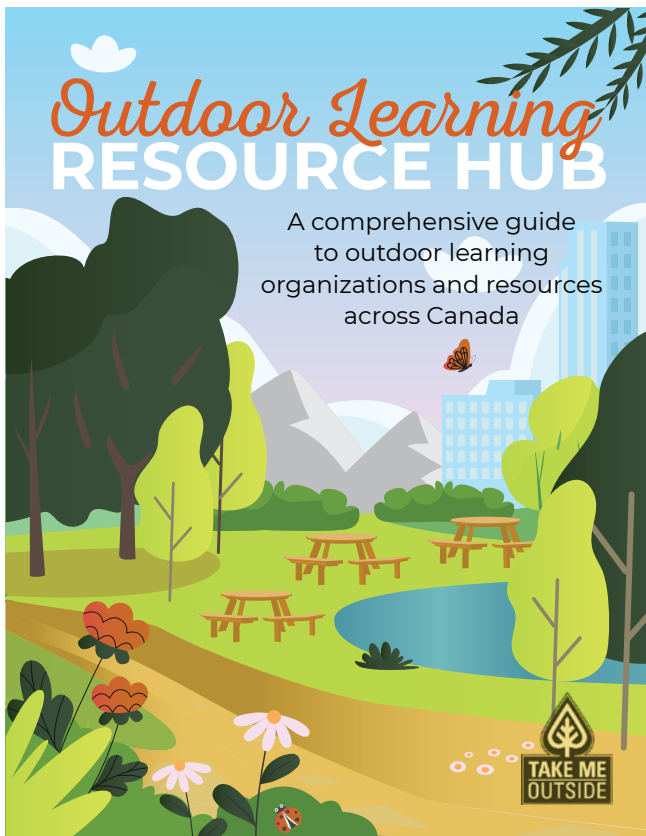
Partnerships —
Becoming a go-to
collaborator for
high-impact
partnerships

2

**Cutting-edge
content** —
Increasing our
capacity for
creating resources

3

More Accessibility
— Engaging
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Indigenous,
remote,
francophone, and
Spanish
communities



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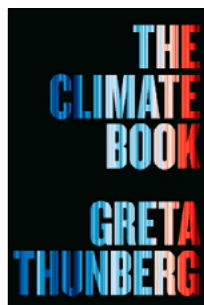
Alliance for New Jersey Environmental Education



RESOURCES

Reviewers: Ian Shanahan, Annelly So, William Straits, Julie Travaglini, Sofia Vargas Nessi, Kim Zumach, and Stacey Widenhofer.

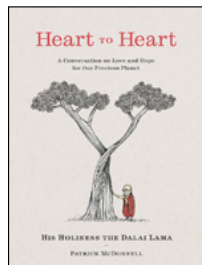
The Climate Book



If you've ever longed to attend a conference featuring some 100 or so of the most prominent minds in the climate space, you can now do so without even having to leave your home. Greta Thunberg's in-depth book starts with key metrics and figures about climate change before guiding readers through five sections respectively devoted to how climate works, how our planet is changing, how it affects us, what we've done about it, and what we must do now. Woven among the short and engaging pieces from experts like Naomi Oreskes, Katharine Hayhoe, Dave Goulson, Bill McKibben, Kate Raworth, Per Espen Stoknes, George Monbiot, Michael E. Mann, and Robin Wall Kimmerer, among many others, are 18 hard-hitting essays from Ms. Thunberg, written in urgent language that may put off some while galvanizing others. The need for rapid action to decarbonize our energy system and re-establish a more reciprocal relationship with nature is a theme that underscores much of the book. There are also frequent reminders of the injustices of climate change and how many countries' emissions-reduction statistics don't always tell the whole story. As intended, this book represents a stirring call to action as well as a common forum through which we can further explore the inspiring work of those actively working toward solutions. – (IS)

Random House Canada, 2023; ISBN 978-0-593-49230-7 (hb); 464 pp.; CDN\$41.00 from penguin-randomhouse.ca

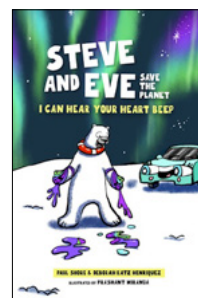
Heart to Heart



In this beautifully illustrated book, subtitled a conversation on love and hope for our precious planet, the Dalai Lama guides us in a meditative reflection on the health of the planet, an exercise which he believes can serve as a hopeful journey. The Dalai Lama, together with illustrator Patrick McDonnell, invites people to share his compassion and sense of responsibility toward the Earth. He shares his belief that we are all connected through a “oneness” and that we can together achieve a better common good. The touching illustrations depict a sad panda leading the Dalai Lama on a wander through the forest while discussing the drastic changes to nature brought on by human greed and carelessness. This touching little book could be read in 20 minutes, but it stays with you for much longer than that. It can be enjoyed and treasured by people of all ages. – (SVN)

Harper One, 2023; ISBN: 978-0-0632-1698-3; (hb) 144pp; US\$24.99 from harperone.com

Steve and Eve Save the Planet



A vibrant and funny graphic novel about the climate emergency that inspires kids to become more involved in saving the planet, Steve and Eve Save the Planet: I can hear your heart beep is geared to 6–12 year-olds, but can also be enjoyed and appreciated by the young-at-heart. Early on, Eve, an electric vehicle, is looking for her peers but ends up in the Arctic and meets Steve, a polar bear with funky paws. In this page-turner, the characters take us on an engaging ride

where they teach us about kindness, teamwork, and climate change using smart, witty language delivered in an entertaining and educational way. The colorful illustrations by Prashant Miranda deftly capture the amazing Arctic landscapes, and co-author Paul Shore and Deborah Katz Henriquez's messaging leaves you with an uplifting and hopeful sense that we can work together for a better future. – (SVN)

Planet Hero Kids, 2023; ISBN: 978-0981347455 (pb); 215pp; US\$23.95 from savetheplanetbook.com

Lyme Disease, Ticks, and You



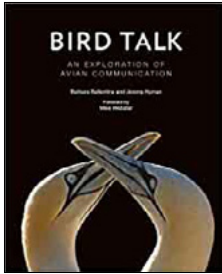
Dr Shelley Ball, author and freshwater insect ecologist, is a long-term sufferer of Lyme disease and other tick-borne diseases. After years of experience navigating the medical system,

treatments, misdiagnosis, and self-education, she has written this guide to the complicated science of Lyme disease, prevention of tick bites, recognizing Lyme and other tick-borne diseases, resources for self-education, and advice for seeking medical professionals who are educated on the disease and its potential treatments. There are many useful photos and diagrams to support the core information. The author clarifies that this book is not a substitute for professional medical advice; rather it offers information to bring awareness to issues around Lyme and to assist people in their decisions regarding diagnosis and treatment. – (AS)

Firefly Books, 2021, ISBN 978-0-22810-320-2 (pb), 160 pp, CDN\$19.95 from fireflybooks.com

Bird Talk

Birds sing, call, or flash color as signals for communication. Across seven chapters, this book covers communication channels, male-female communication, territoriality and dominance,

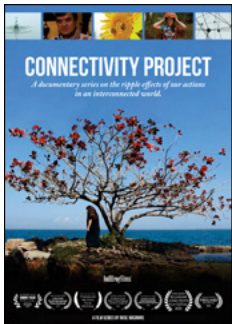


parent-offspring communication, warning signals, group life, and communication in a noisy world. Scientific but easy to read,

this book also contains a treasury of gorgeous bird photos showing birds in action as they communicate through feather-based facial ‘expressions’ and gestures. This would be a nice coffee table book or a complement to a naturalist or birder’s collection. Subtitled an exploration of avian communication. – (AS)

Comstock Publishing Associates, 2021, ISBN-978-1-5017-5342-8(hb), 192pp., US\$29.95 from cornellpress.cornell.edu

Connectivity Project



This film series has three 15-minute episodes respectively titled Interconnectivity, Plants Have Wings, and Speaking Out. The project emphasizes

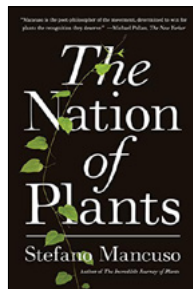
how we are all interconnected across the world, through time, culture, and traditions. In fact, all creatures are connected and thus depend on a vast network to stay alive. For example, some 85% of all plants need pollinators; air has no geographical boundaries. Since we are so interdependent, the role of the individual matters. One action can cause a ripple effect, so to create positive change, one decision does make a difference. This project suggests that change can start anywhere and that you can begin at home to help improve the planet. Recommended for those in middle school and higher. – (AS)

Bullfrog Films, 2021, DVD, ISBN: 1-948745-58-5, 45 mins, US\$350 DSL bullfrogfilms.com

The Nation of Plants

The Nation of Plants offers an entirely unique perspective about the consequences of climate change and mass

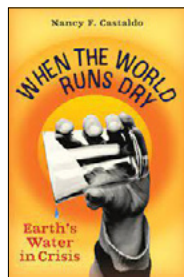
extinction by giving plants back their rightful power in what humans see as “our” world. If we reimagined the constitution as though it were written by plants, what lessons on resilience and community would humans learn? If some of the Earth’s most numerous inhabitants (plants) gained the ability to speak and write, what would they say? What would be in their Universal Declaration of Rights of Living Beings? I will say that this book takes a fairly negative tone toward human beings, painting us as nothing more



than a pimple on the back of the Earth. Other than that, as a fairly short and easy read, this book really makes you think about how we take plants for granted. Written by Stefano Mancuso. – (JT)

Other Press LLC, 2021, ISBN 978-1-6354-2099-0 (hb), 176 pp., US\$21.99 from otherpress.com

When the World Runs Dry



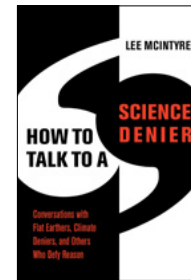
Water. It is essential to life and most of us in North America take it for granted. In her 186-page book, *When the World Runs Dry*, Nancy Castaldo writes about the problems that are facing our

watery planet. Written with young readers in mind, this book presents a detailed account of many complex water problems. To begin, the reader is taken into a deep dive about water pollution — ranging from lead water pipes, industrial pollution from plastics, and fracking to coal, agricultural run-off, and accidental contamination of water from flushed pharmaceuticals. Castaldo includes real “case studies” throughout each chapter so that the reader can get a first-person perspective of what it is like to live where the water is so polluted that it can cause life-altering health problems. While this book is written for young readers, it is not recommended for students

younger than about 11/12 (~Grade 6), as some of the stories about unsafe water are quite unsettling. The final chapter encourages the reader to take positive action to conserve water and offers ways in which the reader can become an advocate for clean water around the world. This book would make a welcome addition to a middle school library. – (KZ)

Algonquin Young Readers, 2022, ISBN: 978-1-61620-971-1 (hb); 208pp; \$15.95 US from algonquinyoungreaders.com

How to Talk to a Science Denier



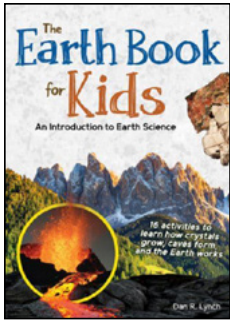
“What evidence, if it existed, would it take to convince you that you were wrong?” This is the question that author Lee McIntyre decides to ask science deniers. In his 264-page, hard-

cover book, *How to Talk to a Science Denier*, McIntyre quickly concludes that convincing deniers by flooding them with evidence-backed facts is not enough to convince them of their misconceptions. Instead, he argues for using a “technique rebuttal,” which is focused on countering the commonly held script for virtually all science deniers. Based on current research, McIntyre summarizes that nearly all science deniers use cherry-picking of evidence, reliance on conspiracy theories, use of fake experts, illogical reasoning, and reliance on impossible standards to support their beliefs. The author urges the reader to counter any of these with the aforementioned technique if you don’t already have an expert level of knowledge on the topic in question. Furthermore, he contends that building relationships, listening with empathy, and fostering a connection are the best tools in our toolkit during difficult conversations. McIntyre has applied this approach in conversations with flat-Earthers, anti-vaxxers, climate science deniers, and others who embrace fringe beliefs. While he is not always successful in his attempts to bring those he is talking to back to trusting science, McIntyre does a good job of asking

uncomfortable questions in a non-threatening manner. This book could have relevance in a high school course on philosophy, language arts, or environmental studies. It is well written and an engaging read, suitable for readers in Grade 10 or above. – (KZ)

Mit Press, 2022; ISBN: 978-0-262-04610-7 (hb); 280pp; US \$18.95 from mitpress.mit.edu

Earth Book for Kids

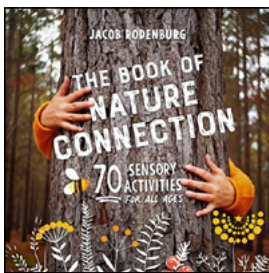


Have a budding geologist in your life? You know the ones — those with pockets full of rocks and important collections everywhere! If you do, introduce them to

The Earth Book for Kids: An introduction to earth science, to help ignite more of their curiosity. This book by Dan R. Lynch uses enticing color photos and illustrations and discusses the surface of the Earth, the water cycle, what the Earth is made of, and how rocks and crystals are formed. Also included are 16 experiments for you to do at home or in your classroom — from tectonics, energy, and faulting to soil, strata, and fossils, there is something in there for everyone! This is an easy pocket-sized guide that any young Earth scientist (ages 6 and up) would benefit from having in their library. – (SW)

Adventure Publications, 2022; ISBN: 978-1-64755-283-1 (pb); 176 pp; \$12.95 from shop.adventure-withkeen.com

The Book of Nature Connection



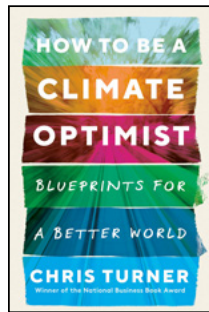
Did you know that you can hear the “heartbeat” of a tree by holding a stethoscope to its trunk when sap is running in

the spring? Have you ever tried “earthing” to benefit from direct contact with the serotonin-boosting *Mycobac-*

terium vaccae found in healthy soil? These are just two of the 70+ sensory activities described by author and nature sommelier Jacob Rodenburg in *The Book of Nature Connection*. In the introduction, Rodenburg ponders “how we might cultivate a sensefulness, a full-bodied connection to the world around us” before giving us the tools to do so across five chapters spanning our primary senses. Each chapter begins with a brief overview of the sense in question accompanied by a detailed illustration of the inner workings of the associated body part(s). In the back matter, there are suggestions for sensory walks as well as notes on additional senses such as proprioception. This practical guidebook is a terrific companion for outdoor environmental educators working with learners of any age. – (IS)

New Society Publishers, 2022; ISBN 978-0-86571-971-2 (pb); 128 pp.; CDNS\$24.99 from newsociety.ca

How to Be a Climate Optimist



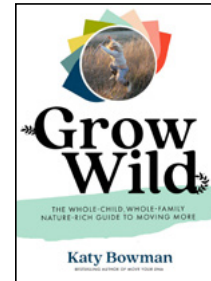
The scientific consensus is that the worst-case scenarios of global warming are now essentially off the table, but are the Paris targets of 2°C or, better yet, 1.5°C still within reach?

As the title of climate journalist Chris Turner’s eminently readable book suggests, the answer is a tentative “yes.” From where does this cautious optimism spring? By taking readers on an international tour of promising developments in our collective transition from fossil fuels to clean energy, Turner lays out blueprints for a better world (the book’s subtitle), reminding us along the way that “the pace and promise of this global energy transition have been underestimated every step of the way so far.” Indeed, it is hard not to feel at least somewhat encouraged by the fact that “wind and solar power are already the cheapest source of new power for two-thirds of the planet.” We’re certainly not out of the woods yet — and Turner acknowl-

edges early on that ecological crises like the decline of coral reefs are alarming stories best suited for others to tell — but if we continue focusing on “much better” instead of “less bad,” we just might kick the fossil fuel habit while making life richer in myriad other ways. – (IS)

Random House Canada, 2022; ISBN 978-0-7352-8197-4 (pb); 296 pp.; CDNS\$23.00 from penguin-randomhouse.ca

Grow Wild



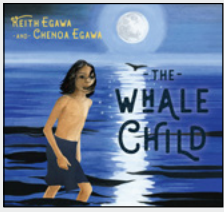
I first discovered the work of author Katy Bowman in my search for barefoot-shaped shoes after years of wearing foot-altering footwear such as climbing

shoes and ballet slippers. From there I came to know about her work on biomechanics and human movement. As a kinesiologist by training now working as an outdoor educator, I jumped at the chance to read *Grow Wild*. This resource compares children and trees, as they both grow in relationship to the mechanical environments around them. Rather than simply being a collection of exercises for kids, the book features discussions on how the dominant modern lifestyle has removed many movements from everyday life. There are also suggestions for how to create space for nutritious movement among children, which can be done by “stacking” life’s activities (i.e., doing things that fulfill many needs at once). With wild berry-picking, for example, a family could spend time together, be outside, gather food, walk, carry loads, reach, bend, and move at different angles. Also included are sections on clothing and footwear that encourage ease of movement, how to approach cooking, how the home and learning spaces can be designed for movement, and much more. There are many photographs and personal stories of parents, educators, and therapists who work to encourage movement in children. This is a must-read for anyone interested in creating a nature-rich movement culture. – (AS)

Chelsea Green Publishing, 2021, ISBN-978-1-943370-16-0 (pb), 402 pp., US \$31.95 from priometricspress.com

CHILDREN'S BOOKS

The Whale Child



Imagine seeing some of the biggest threats facing Mother Earth through a child's eyes. With their chapter book for 7–12 year-olds, co-authors Keith Egawa and Chenoa Egawa succeed in reaching their ambitious goal of being truthful about such concerns as plastic

waste, water pollution, and climate change, while telling a hopeful story of friendship and discovery. Young Coast Salish girl Alex is led on a journey throughout her local patch of Turtle Island's Pacific Northwest by Shiny, the titular whale child. Frequently joining them is Bufflehead (a small diving duck), further awakening Alex to the necessity of viewing other lifeforms as kin and taking an holistic view of stewardship. The gently rendered watercolor illustrations are largely representational with a touch of whimsy, making them fitting complements to the text. The back matter features student and teacher resources, including discussion questions and background information about Coast Salish traditions. – (IS)

North Atlantic Books, 2020; ISBN 978-1-62317-486-6 (pb); 136 pp.; US\$19.95
from northatlanticbooks.com

Hear more from co-authors Keith Egawa and Chenoa Egawa on our Talking with Green Teachers podcast, [Episode 50: Navigating ecological threats with storytelling](#)



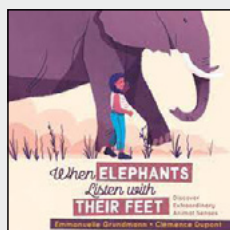
The Wonders That I Find



Geneva goes on a hike with her parents who want to share the mountaintop view. They rush and they prod her to come along so she doesn't miss it all. Meanwhile, Geneva is noticing and wondering about the small things around her such as the

ants, ferns, cliffs, rivers, and even the sunlight. The climb is worth it and the view is spectacular. Geneva's hope is that her parents stop and notice all of the wonders she has seen on the way back down. Written in rhyme and complemented by sweet, adorable illustrations, this is a perfect story to read to young adventurers. – (AS)

RMB, 2021; ISBN: 978-1-771604444 (pb); 44pp.; CAN \$20.00 from rbmbooks.com



When Elephants Listen With Their Feet

Animal senses galore! Most spiders have eight eyes, one for each leg. Pigs have twice as many taste buds as humans. Foxes use

the Earth's magnetic field to track the distance of prey. Cats can tell how far they are from the ground with their whiskers. And of course, as the title suggests, elephants listen with their feet. Learn more about animals and their unique senses in this illustrated non-fiction picture book laid out in standalone sections so that you can read it from cover to cover or in small highlights one at a time. There is an index of animals and facts in the back matter. Accessible to young animal lovers, this resource can also educate kids and adults alike. – (AS)

Pajama Press, 2021; ISBN: 978-1-77278-123-6 (hb); 40 pp; CAN \$23.95 from pajamapress.ca

A Cabin Christmas

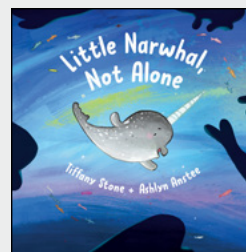


Written by Glynnis Hood and vibrantly illustrated by Ardis Cheng, *A Cabin Christmas* shows 4–8 year-olds the importance of generosity. In this adorable book, a little girl and her family live deep in the woods where the girl makes friends with the critters of the forest, warmly greeting them every

chance she gets. One day, when the family goes to town for supplies, a terrible storm burns down their house, abolishing all hope of celebrating Christmas. Once they go to town again to seek refuge, the little girl's furry and feathery forest friends work in unison to reciprocate the tenderness the little girl has shown them — just in time for Christmas. This story captures the beauty of the woods and the skills of our many forest friends. – (SVN)

Rocky Mountain Books, 2022; ISBN: 978-1-7716-0584-7 (pb); 40pp; CDN\$15.00 from rbmbooks.com

Little Narwhal, Not Alone



Based on a remarkable and unlikely true story (as described in the back matter), *Little Narwhal, Not Alone* is sure to entertain 4–8 year-olds. When a young male Narwhal swims off from its home waters, he finds himself disoriented and even in danger until he happens upon

a roving pod of Belugas. This little Narwhal fits right in with its new comrades, even though they don't look the same, eat the same foods, or speak the same language. This rhyming book, lovingly written by Tiffany Stone and sweetly illustrated by Ashlyn Anstee, shows children that we don't have to be the same (or look the same) to get along and find common ground — messages that are perfect for those in this age bracket as they start school and seek to make new friends. – (SVN)

Greystone Kids, 2021; ISBN: 978-1-7716-4620-8 (pb); 44pp; CDN\$22.95 from greystonebooks.com

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