



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 background 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*)