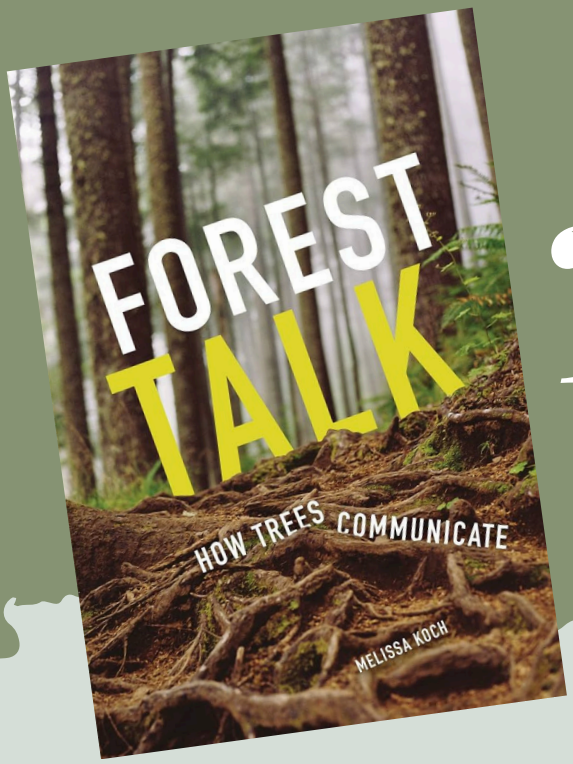


Teacher Guide

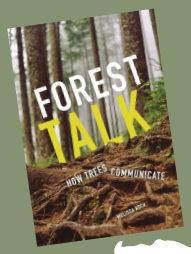
Have you done any forest bathing recently?

Have you heard what trees are saying? In *Forest Talk*, you'll learn how to listen when trees talk.

Trees communicate with us and each other everyday. We need trees and forests to help maintain the cycles that keep our air and water healthy for all life on Earth, and trees need us to protect them from destruction and degradation. The work of biologists, ecologists, foresters, and other scientists is key to this protection.

If trees are talking in the forest, on our streets, and in our own backyards, we need to listen. Scientists are listening. You can too.

- **Packed with fascinating information, inspiring stories, and a call to action, this book delivers a powerful message in an effective package. – *Kirkus Reviews***
- **Outdoorsy readers of all types will enjoy this title. A good choice for ecology units, science classes, and budding scientists as well. – *School Library Journal***
- **An intriguing volume that describes the surprising hidden lives of trees and underscores their key role in our world. – *Booklist***



GETTING STARTED

Grade Levels & Standards

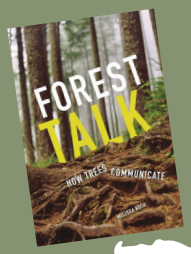
Forest Talk: How Trees Communicate is designed for a young adult (ages 12-18) reader. Teachers also use *Forest Talk* as whole class read aloud to younger students. The activities and lesson plans in this Teacher Guide can be used with grades 3-5, middle school, and high school students. The *Next Generation Science Standards* related to the activities and lessons include:

- 3-5-LS4 Biological Evolution: Unity and Diversity
- 3-5-ESS3 Earth and Human Activity

- MS-ESS3-4 Earth and Human Activity;
- MS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics;
- MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics
- MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics

- HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
- HS-LS4 Biological Evolution: Unity and Diversity
- HS-ESS3 Earth and Human Activity

Some activities also address language arts and social studies standards.



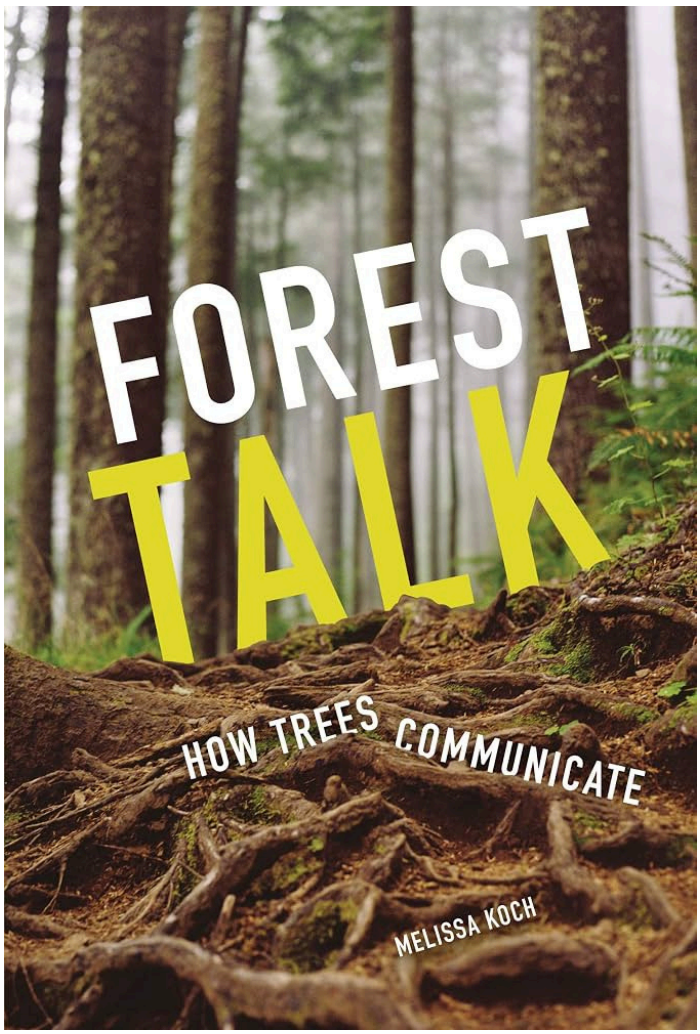
Discussion Questions

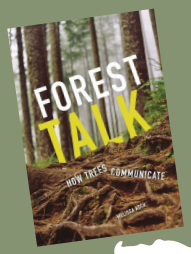
- What have scientists discovered about trees and forests, and their effect on humans' health?
- How are trees part of the water cycle?
- In what ways are trees impacted by climate change?
- How can trees help address climate change issues?
- Why are rain forests important?
- How does a mycorrhizal network work?
- What do you think of Susan Simard's choice to call mycorrhizal network hubs—trees that are older and larger that share more nutrients and resources with other trees—Mother Trees? Explain the positives and negatives of the name.
- How do scientists like geographer Paulo Arevalo Orduz and forest economist Geoffrey Donovan listen to trees and forests?
- How and why do trees move?
- Name the layers of a forest. Why is it important to study each of the layers?
- Biology professor, Nalini Nadkarni, and other scientist study the forest canopy. What tools do they use for their research and what are some things they've learned from the canopy?
- Two scientists highlighted in Forest Talk, Susan Simard and Nalini Nadkarni, both at the top of their fields, were considered silly when each proposed their seminal research.
  - Why were they dismissed?
  - Why is their research important?

Time with Trees

Outdoor Activities

We know that being among trees improves our health. The following activities can be adapted for different ages and group sizes. They work well for out-of-school as well as in-school settings.





Time with Trees

Forest Bathing

Spend some time with trees. Whether it's in your backyard, a nearby park, or in the woods. Use all your sense to take in what you see, hear, feel, smell, and taste (just the air, please) around you. Use all of your senses to absorb your tree surroundings even if it's just a few trees.

Write in a journal or just notice what your senses tell you:

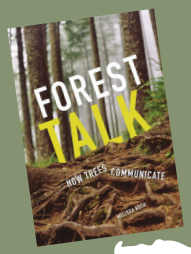
- What do you hear?
- What do you smell?
- What do you see?
- What do you feel (on your skin, with your hands your feet)?
- What does the air taste like?

Forest bathing is a quiet, slow, deep breathing connection with trees rather than a walk or hike to go somewhere. When you are among trees, you are already there.

If you are with other people, pick a location to gather after each experience to share what you (smelled, heard, etc.). Spend 5-7 minutes on each sense and 3-4 minutes sharing.

After you spend about an hour forest bathing, how you feel? More relaxed? Happier? You are not alone. Scientists have found that spending fifty minutes among trees reduces anxiety, depression, stress, and lowers blood pressure.

Yes, trees are good for you.



Time with Trees

Planting Trees

You can be good for trees too. Maybe you don't see many trees near you. You could plant a tree or . . .a forest. Some urban areas are planting tiny forests in cities. Organizations such as Natural Urban Forests and others can help you get started. If planting a forest seems daunting, connect with a local organization that plants trees. You could search online using the name of your city or town, "tree planting," and "volunteering" to find a local tree planting project.

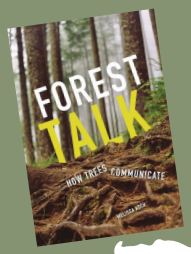
Reading Beneath Trees

Once you finish planting trees or forest bathing, find a book to read beneath a tree. Maybe you could read a book about trees, such as Forest Talk, to learn more about ways you can help trees, forests, and our Earth.

Writing Poetree

Write a poem of thanks for everything that trees give you throughout your day—from the air you breath, the water you drink, the food you eat, and many items you use throughout your day. Once you've written your poem, share it with a tree or two.

Read other published tree poems. Write another tree poem with a topic of your choice.



LESSON PLAN I

A Day in Our Life is Full of Trees

Humans use trees and tree products every day. Some of these uses are obvious, such as walking across a hardwood floor. Other uses are less obvious, such as the amount of beef we consume impacts the removal of forests. This activity asks students to think about all the ways they use trees and brainstorm alternatives.

Grade Levels: 7-10 (A modified version could be used with grades 3-6.)

Duration: Two 45 minute class periods + homework

Learning Objectives:

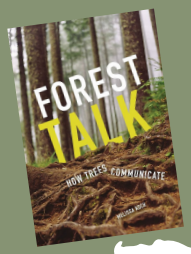
- Understand how much humans rely on trees.
- Consider how increases in human population impacts trees, and what alternatives to tree consumption would be better for the Earth.

Materials:

- Journal
- Tree Use Chart Handout
- Tape

To Do:

1. Ask students to read Chapter 1, pp.12-21 in Forest Talk, or read aloud for younger students.
2. Lead a brainstorming session to generate ideas on the different things that come from trees that humans use every day. All ideas are welcome in brainstorming.
3. Have students keep a journal for two days (or at least a full 24 hours) of all the tree products that they touch in their daily life. Encourage students to think deeply and go beyond the obvious.
4. After journalling for a day or two, in pairs or on their own, ask students to use the Tree Use Chart to
   a. organize which activities consume trees (e.g. paper, furniture, house building), use products/benefits from trees (e.g. fruit, soil retention), and remove trees (e.g. ranching, farming).
   b. tally up which of the three types of tree uses they experience the most in their lives.
5. In their journals, ask students to write some alternatives to specific acts of consuming and removing trees.
6. Discuss ideas as a class.



LESSON PLAN II

Careers in the Trees

Careers in STEM that touch trees in some way seem almost as vast as a forest. This lesson will give students insight into the variety of forestry careers and their goals, the efforts underway to protect trees, and the array of scientific research involved in understanding trees and forests.

Grade Levels: 7-10. (A modified version could be used with grades 3-6.)

Duration: Homework and one 45 minute class period

Learning Objectives:

- Understand the different ways scientists study trees and forests
- Gain awareness of STEM careers in forestry

Materials:

- Journal
- Compare & Contrast Handout
- Careers in Forestry links:

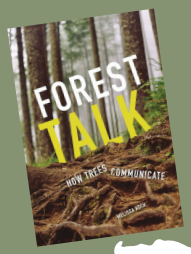
https://forestrycareers.com
https://www.bls.gov/green/forestry/sustainable_forestry.htm
https://www.bls.gov/careeroutlook/2016/article/forestry-careers.htm

To Do:

1. Ask students to choose two of the science careers profiled in *Forest Talk* to compare and contrast.
   a. Forest economist Geoffrey Donovan pp 22-31
   b. Professor of forest ecology Suzanne Simard pp. 32-42
   c. Professor of biology and forest ecology, Nalini Nadkarni pp. 50-56
   d. Geographer Paulo Arevalo Orduz pp. 67-69

Students may choose one or two other forestry careers to compare instead from the Careers in Forestry links.

1. Tell students to read the profiles of their scientists in *Forest Talk*, plus two other sources.
2. Have students complete the Compare & Contrast Handout.
3. Have students post the completed Compare & Contrast Handouts on the wall, grouping them by same or similar careers. You may want to create column headers on the wall to help guide students on where to put their comparisons.
   a. Discuss clusters.
   b. Ask students what they notice about the variety of careers in forestry.
   c. What are the similarities among the careers?
   d. What are some of the big differences?



LESSON PLAN III

The Wood Wide Web

The mycorrhizal network—a symbiotic relationship in which fungi and plants share nutrient, water, and information—has been known to scientists for several decades. New scientific discoveries continue to show the importance of these interconnections for plant and soil health.

Grade Levels: 3-7

Duration: 45 minute class

Learning Objectives:
- Understand what a mycorrhizal network looks like, its functions, and ecological importance.
- Explore the types and benefits of mycorrhizal interactions for trees.
- Understand symbiotic relationships in nature

Materials:
- Journals or paper
- Pictures of trees and mycelium on mycorrhizal networks.
- Chart of which trees are on which networks, such as the example in *Forest Talk*, p. 45

To Do:
Before class, identify trees in your immediate area and their associated mycorrhizal networks. If possible, have some mycorrhiza exposed for students to see.

1. Read pp 42-9 aloud to younger students. Older students can take turns reading aloud to the whole group or read silently.
2. Lead a discussion of the roles of the trees and fungi on the network. Make a Venn diagram to capture comments.
3. Have students look at pictures and diagrams of trees and mycorrhizal networks. Encourage students to identify which trees are on which types of networks and which ones are not.
4. Look out the window or go outside to identify trees and the mycelium they see.
5. Have students bring their journal to begin sketching and labeling what they see.
6. Ask students to draw a specific mycorrhizal network labeling the types of trees and fungi on the network.

Tree Use Chart

Put each item from your list of ways you use trees throughout your day into one of the three columns: **consume** trees (e.g. paper, furniture, building), **use product**/benefits from trees (e.g. fruit, soil retention), and **remove** trees (e.g. beef production). Give yourself 1 point for each type of use. Tally each column to see which type of use you do most and least frequently. Use additonal spreadsheets if necessary.

Consume	Use Product	Remove
Total		

Compare & Contrast

Choose two forestry careers from *Forest Talk* and resources from your teacher. Answer the questions for each career and compare.

Where do they spend their time?		
When do they work?		
What types of tools & technology do they work with?		
What types of data do they work with/what do they study?		
Do they work with others or alone?		
Do they travel for their work?		
How do they communicate their knowledge to their colleagues? to the public?		
How dangerous is their job? (high, medium, low)		
What level of education and field(s) of study did they need?		
What is their annual salary?		