

Learning Guide



Forests

We hope you enjoyed learning all about how trees communicate and forests help keep our planet healthy. Extend your learning with this print-ready Learning Guide!



What's in this Learning Guide?

Get Set to Listen

Check your knowledge before and after listening to the episode by determining if statements are TRUE or FALSE.

Vocabulary

Discussion Questions

CCSS.ELA-Literacy.SL.3-8.1; CCSS.ELA-Literacy.SL.3-8.3

Writing Prompts and Extension Projects

CCSS.ELA-Literacy.W.3-8.1; CCSS.ELA-Literacy.W.3-8.2; CCSS.ELA-Literacy.W.3-8.3; CCSS.ELA-Literacy.W.3-8.4; CCSS.ELA-Literacy.W.3-8.7; CCSS.ELA-Literacy.W.3-8.8

Forests, Carbon, and Why Trees Matter: Reading Passage & Comprehension Questions

NGSS: 5-LS2-1, LS2.B, 5-ESS3-1, ESS3.C; CCSS: RI.4.1 / RI.5.1, RI.4.3 / RI.5.3

Careers Related to Forests: Research Project

NGSS: 3-LS4-4, LS2.A, 5-ESS3-1; CCSS: RI.3.1 / RI.4.1 / RI.5.1, W.3.2 / W.4.2 / W.5.2

Tree Diagram

NGSS: K-LS1-1

Forest Layers Diorama

NGSS: 5-LS2-1

Forest Sound & Signal Lab

NGSS: 4-PS4-1, PS4.A, 4-LS1-2, LS1.A

Underground Network Role-Play

NGSS: 5-LS2-1, 5-LS2-2, LS2.A, 4-LS1-2

Forest Time Scale

NGSS: 5-LS2-1, LS2.C, 3-LS4-4, ESS3.C

Additional Resources & Book List



The Children's Hour
kids public radio

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<https://www.childrenshour.org/forests/>



Get Set to Listen

1. Before listening!

Read each statement and write TRUE or FALSE based on what you already know.



2. After listening!

Based on what the experts said in the episode, write TRUE or FALSE.



Before Listening	TRUE or FALSE?	After Listening
	1. Some species of trees can live up to 5,000 years.	
	2. Trees have centralized brains like animals do.	
	3. Trees don't have eyes but can sense light.	
	4. Trees don't have ears but can sense vibrations.	
	5. Trees don't have mouths but can communicate by humming.	
	6. Forests attract clouds and rain.	
	7. About 50% of old-growth forests remain in the world.	

What did you learn?



Get Set to Listen

Answer key

1. TRUE! Bristlecone pines can live up to 5,000 years old! And creosote bushes can live up to 11,000 years!
2. FALSE
3. TRUE. They have photoreceptors in their leaves to sense light.
4. TRUE. This is similar to how some insects without ears can “hear” sound.
5. FALSE. Trees communicate with chemicals to warn their neighbors about dangers, such as insect predators.
6. TRUE
7. FALSE. Less than 20% of old-growth forests remain in the world.



Vocabulary

Listening for Words

1. Make a four-column chart and label the columns “I don’t know,” “I’ve seen or heard, but don’t know the meaning,” “I think I know the meaning,” and “I know the meaning.”
2. Write the vocabulary word in the column that describes how well you know the meaning of the word.
3. Listen to [the episode](#). Note how the speaker uses the words.

Matching Words with Definitions

1. Print and cut apart the word and definition cards.
2. Spread out the word cards so you can see them all. One by one, attach a definition card to each word card.

Writing with New Words

After working with the words and definitions, write a one-page essay or story that uses at least three of the words.

forest

A large area covered mostly with trees, plants, and animals that live together.

ecosystem

All the living and nonliving things in an area and how they work together.



Vocabulary

canopy

The leafy top layer of trees in a forest that forms a roof of leaves.

microclimate

A small area that has slightly different weather than the area around it, like under a log or in the shade.

carbon sequestration

The process by which trees absorb carbon dioxide from the atmosphere and store carbon in biomass and soil.

mycorrhizal fungi

Special fungi that live on tree roots and help trees get water and nutrients.



Vocabulary

chemical signals

Messages released by plants into the air or soil to warn or help other plants.

biodiversity

The variety of living things in an ecosystem.

symbiosis

A close, long-term interaction between different species.

interdependence

When living things depend on each other to survive.



Discussion Questions

1. Which forests have you visited? What did you notice about the trees and other living things there?
2. How are forests important in your life?
3. How are forests important to the environment?
4. What makes a forest more than just a group of trees?
5. Why do older trees play a special role in forests?
6. How are trees similar to animals, and how are they different?
7. How do forests affect air, water, and climate?
8. How do trees help with climate change?
9. What might happen if forests disappeared?
10. Why should humans care about protecting forests?
11. What choices do people make that help or harm forests?
12. How can kids help protect forests where they live?

Group Discussion Strategies

Think Pair Share:

1. Individually, student writes down their answer to a question.
2. Students pair up and tell each other their answers.
3. Teacher calls for volunteers to share with the whole class their answer (and/or their partner's answer). Teacher notes key words/phrases on board.

Round Robin:

1. Teacher poses one question (written on top of a large page) to students, who are assembled into small groups of 3 or 4.
2. Students take turns brainstorming the answers. The recorder of the group writes down all answers.
3. The leader reads the group's ideas to the entire class. Teacher moderates.



Writing Prompts

Narrative Prompts

1. Write a narrative from the point of view of a tree living in a forest. Include interactions with animals, fungi, or weather.

Extensions:

- Use at least five science vocabulary words.
- Show how the tree changes over time (young → old).

Informative/Explanatory Prompts

1. Explain how forests help plants, animals, and people survive. Use at least three examples.

Extensions:

- Add a diagram or labeled drawing to support your explanation.
- Include one example of how forests help the climate.
- Challenge: Explain what might happen if forests disappeared.

2. Explain how trees and fungi work together in forests.

Extensions:

- Draw and label a diagram showing roots and fungi.
- Explain why scientists compare fungal networks to communication systems.
- Research extension: Find another example of cooperation in nature.

3. Use evidence from the episode to explain how trees sense and respond to their environment.

Extension:

- Compare tree communication to human or animal communication.
- Opinion extension: Should we think differently about plants? Why?

Opinion/Persuasive Prompts

1. Should old-growth forests be protected? Support your opinion with reasons, including both environmental and human needs.

Extension: Write a counterargument and respond to it.

2. Explain why forests are important to you or your community.

Extension: Present your opinion at a community meeting.



Forests, Carbon, and Why Trees Matter

Listen

- [Part 1: What Makes a Forest?](#)

Read the following passage, then answer the comprehension questions on the next pages.

Forests play an important role in Earth's carbon cycle. Carbon is an element that moves through the air, living things, the soil, and even underground. Trees help control this cycle by taking in carbon dioxide from the atmosphere. They use it to make their own food through a process called photosynthesis.

Trees store carbon in their trunks, branches, roots, and leaves. In fact, about half of a tree's weight is made of carbon. Old-growth forests are especially important because they store carbon for very long periods of time. Even after trees die, much of the carbon stays in the forest soil as the trees slowly decay. However, when forests are logged or cut down, a large amount of this stored carbon can be released back into the atmosphere.

Carbon dioxide is also released when fossil fuels like coal, oil, and gas are taken from the ground and burned for energy. Healthy forests can absorb some of this extra carbon dioxide—if they are left standing.

Deforestation is the cutting down or clearing of forests by humans. It is different from natural events like wildfires or hurricanes. When forests are cleared, many plants and animals are harmed or lose their homes. Underground fungal networks are damaged, and some species may be forced to move or even become extinct. Deforestation can also deeply affect Indigenous peoples whose cultures and ways of life may depend on forests.

One tree can absorb up to 48 pounds of carbon dioxide each year, which makes forests a powerful tool in slowing climate change. Even so, forests around the world are disappearing quickly. The main causes include farming for crops like palm oil and soy, raising cattle, logging for wood and paper, and building cities.

Since prehistoric times, Earth has lost about one-third of its forests. Today, more than 15 billion trees are cut down every year. Protecting mature and old-growth forests is one of the best ways to keep carbon out of the atmosphere and reduce climate change.

Planting new trees, called reforestation, can also help. When people plant native trees, damaged land can slowly recover, and healthy forests can grow again over time.



Forests, Carbon, and Why Trees Matter

Answer the following questions about the passage:

1. What is the carbon cycle? _____

2. How do trees take in carbon from the atmosphere? _____

3. Where do trees store carbon? _____
4. What is deforestation? _____
5. Name two human activities that cause deforestation. _____
6. Why are old-growth forests especially important for storing carbon? _____

7. How does cutting down forests affect plants and animals? _____

8. What happens to stored carbon when forests are logged or cleared? _____

9. How can deforestation contribute to climate change? _____

10. How does reforestation help the environment? _____

Write or Discuss

1. What is one action people could take to help protect forests or reduce deforestation?
Explain why it would help.



Tree Diagram

Listen

to [“What Are the Parts of a Tree?” by Marais & Miranda](#)

Diagram

Draw and label the parts of a tree. Use [this for reference](#).



Forest Layers Diorama

A **forest** is more than just a bunch of trees growing next to each other. Forests are large areas, usually at least 5 acres. They are covered mostly with trees that have grown together long enough that their **canopies**, or upper branches, are interlocking. Forests create **microclimates** that allow for all kinds of diverse plants and animals to live in relationship with each other. In this activity, you'll create your own model of a forest!

Listen

- [Part 1: What Makes a Forest?](#)

Watch

[this video](#) about the 4 layers of the rainforest.

Note: You can make your model of any type of forest.

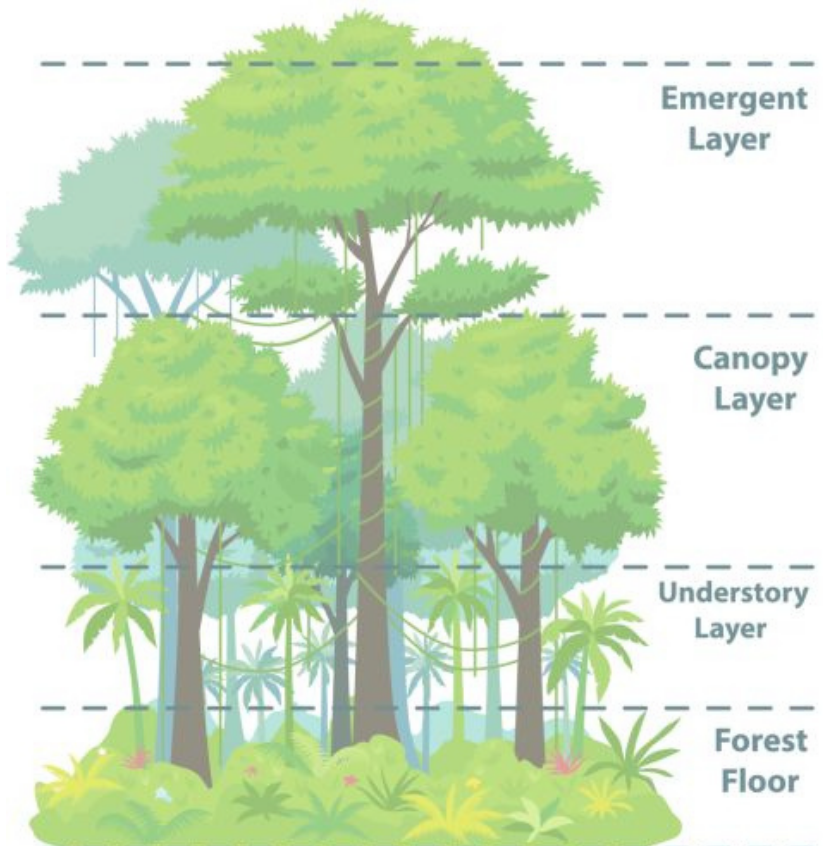
Build

a forest model showing:

- Canopy
- Understory
- Forest floor
- Roots & fungi

Extension

Label animals and fungi that live in each layer.





Forest Sound & Signal Lab

Listen to [Part 2: How Do Trees Interact with Their Environment?](#)

Directions

Work in pairs to explore how vibrations move through different materials and learn how plants can sense their surroundings.

- **One person taps an object or desk.**
- **The other person feels or listens for the vibrations.**

Materials

- Various materials to test vibrations (eg. desk, wall, taut piece of string, etc.)
- Small objects to tap (coins, pencils, blocks)

Material tested	What I felt or heard

1. Which material carried vibrations the farthest? _____

2. Draw the vibration traveling through the material:

3. What surprised you about vibrations today? _____

4. How could a tree use vibrations to survive in a forest? Think about how trees might “feel” vibrations from insects, animals, or falling branches. _____

5. How could this help the tree survive? _____



Underground Network Role-Play

Experience how trees and fungi work together to survive and see how cooperation keeps a forest healthy in this role-playing activity.

Materials

- Tokens (coins, beads, or paper squares) to represent water/nutrients and sugar
- Role cards (“tree” and “fungi”)
- Scenario cards

Listen

- [Part 2: How Do Trees Interact with Their Environment?](#)

Role-play

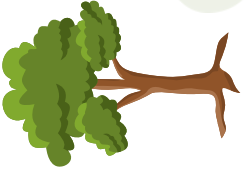
1. **Set up roles:** Divide students into two groups: Trees and Fungi.
2. **Simulate resource exchange:**
 - Fungi move around and “give” water/nutrient tokens to Trees.
 - Trees “photosynthesize” sugar tokens and give them back to Fungi.
 - Repeat the exchange for several rounds to simulate the forest network.
3. **Introduce environmental challenges:**
 - During some rounds, randomly hand a scenario card to a Tree (eg., drought, aphid attack, shade).
 - Students acting as Trees decide:
 - How will they respond? (e.g., request more nutrients, share differently, conserve resources)
 - What signal could they send to Fungi or other Trees? (eg., chemical “warning,” increased token exchange)
 - Fungi respond by adjusting how they share resources based on the Tree’s “signal.”
4. **Continue the simulation:** Alternate rounds with and without scenario cards to show how forests adapt to challenges while cooperating.

Discuss

- How did it feel to share resources instead of competing?
- What happens if a Tree or Fungi doesn’t share?
- How did Trees respond to the environmental challenges?
- Why is cooperation important for forests, especially during challenges?
- How do you think these networks help the forest stay healthy over time?



Role Cards: Underground Network Role-Play



TREE

Your Job:

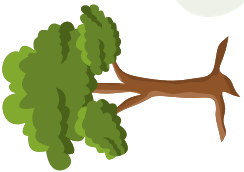
- Receive water/nutrient tokens from Fungi.
- “Photosynthesize” sugar tokens to give back to Fungi.
- Respond to challenges on scenario cards.



TREE

Your Job:

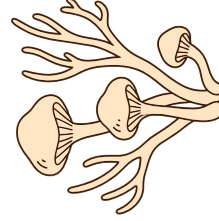
- Receive water/nutrient tokens from Fungi.
- “Photosynthesize” sugar tokens to give back to Fungi.
- Respond to challenges on scenario cards.



TREE

Your Job:

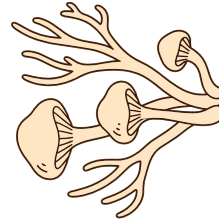
- Receive water/nutrient tokens from Fungi.
- “Photosynthesize” sugar tokens to give back to Fungi.
- Respond to challenges on scenario cards.



FUNGI

Your Job:

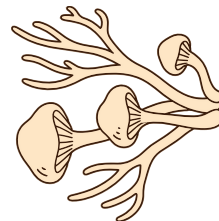
- Give water/nutrient tokens to Trees.
- Receive sugar tokens from Trees.
- Adjust sharing if Trees signal a problem.



FUNGI

Your Job:

- Give water/nutrient tokens to Trees.
- Receive sugar tokens from Trees.
- Adjust sharing if Trees signal a problem.



FUNGI

Your Job:

- Give water/nutrient tokens to Trees.
- Receive sugar tokens from Trees.
- Adjust sharing if Trees signal a problem.



Tokens: Underground Network Role-Play

Simulate resource exchange:

- Fungi move around and “give” water/nutrient tokens to Trees.
- Trees “photosynthesize” sugar tokens and give them back to Fungi.
- Repeat the exchange for several rounds to simulate the forest network.

	WATER & NUTRIENTS <i>Fungi give to Trees.</i>		SUGAR <i>Trees give to Fungi.</i>	SUGAR <i>Trees give to Fungi.</i>
	WATER & NUTRIENTS <i>Fungi give to Trees.</i>		SUGAR <i>Trees give to Fungi.</i>	
	WATER & NUTRIENTS <i>Fungi give to Trees.</i>		SUGAR <i>Trees give to Fungi.</i>	WATER & NUTRIENTS <i>Fungi give to Trees.</i>
	WATER & NUTRIENTS <i>Fungi give to Trees.</i>		SUGAR <i>Trees give to Fungi.</i>	



Scenario Cards: Underground Network Role-Play

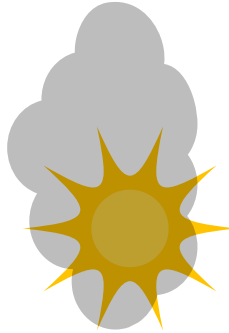
GROWING IN SHADE

Problem:

You are not getting enough sunlight.

Solve the Problem:

Signal Fungi to share extra nutrients to help you grow taller.



Introduce environmental challenges:

- During some rounds, randomly hand a scenario card to a Tree (eg., drought, aphid attack, shade).
- Students acting as Trees decide:
 - How will they respond? (e.g., request more nutrients, share differently, conserve resources)
 - What signal could they send to Fungi or other Trees? (eg., chemical "warning," increased token exchange)
 - Fungi respond by adjusting how they share resources based on the Tree's "signal."

DROUGHT

Problem:

There is very little water.

Solve the Problem:

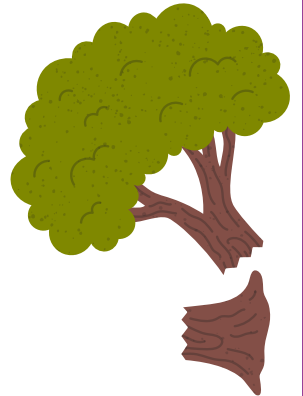
Ask Fungi to help you conserve water.



NEARBY TREE DIES

Problem:

A neighboring tree has fallen. Decide whether to share extra resources with nearby Trees or keep them for yourself.



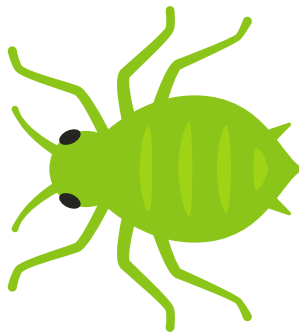
APHID ATTACK

Problem:

You are being eaten by insects.

Solve the Problem:

Ask Fungi for extra nutrients to protect yourself.



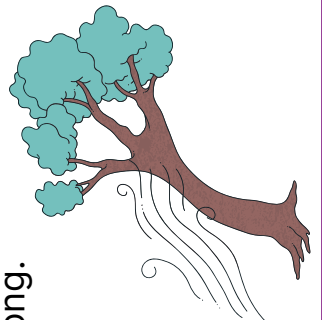
STRONG WINDSTORM

Problem:

Your branches are breaking.

Solve the Problem:

Ask Fungi for extra support to stay strong.





Forest Time Scale

How old is old?

Some living things on Earth are much older than any human, building, or civilization. In this activity, you'll explore deep time by comparing human lifespans to some of the oldest plants on Earth—and think about what it means to protect them.

Listen

- [Part 3: How to Preserve Old Growth Forests](#)

As you listen, think about:

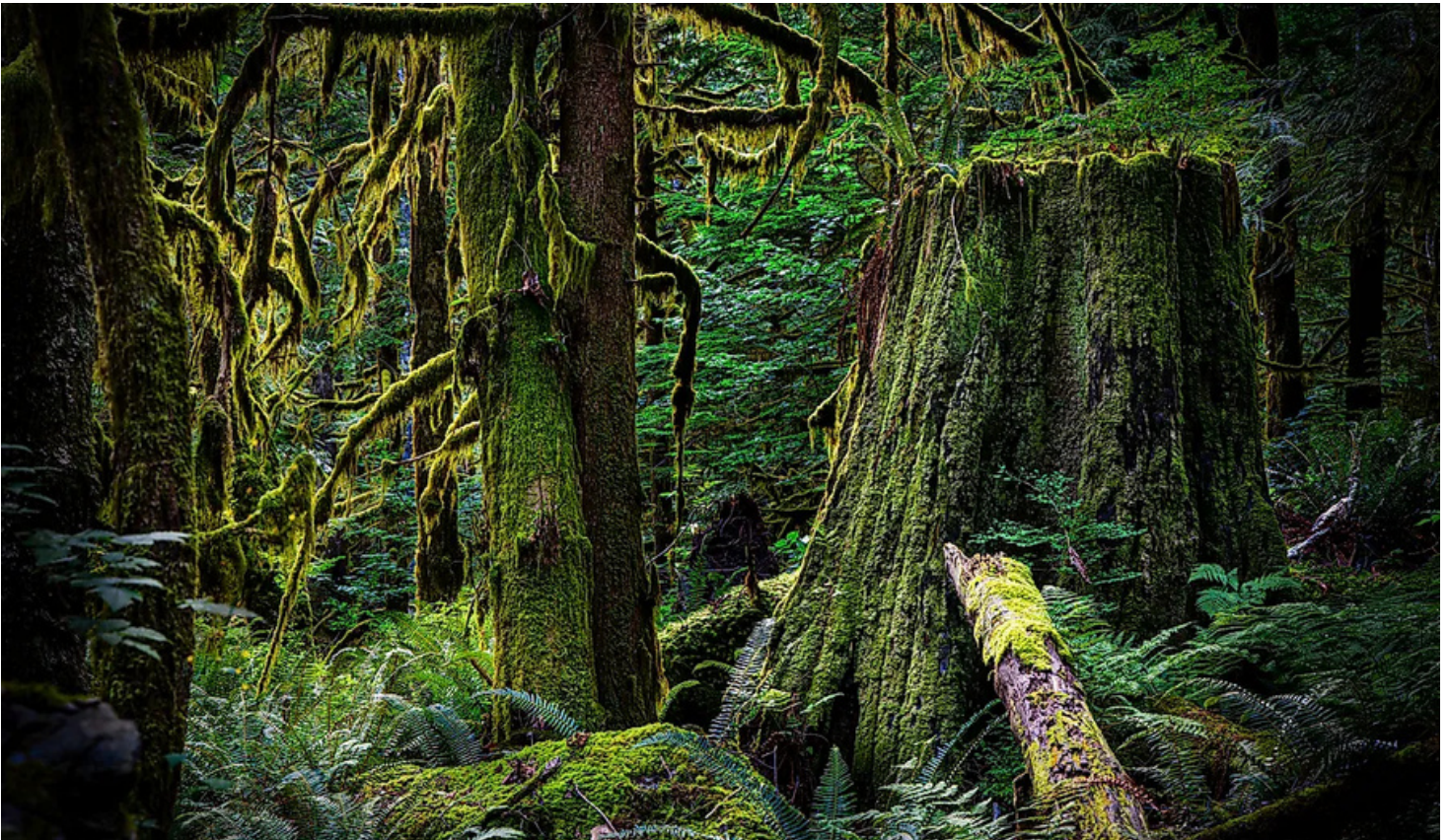
- *How long forests can live*
- *Why old-growth forests are rare*
- *Why protecting ancient living things matters*

Explore

Examine [maps and images of old-growth forests](#).

Notice:

- *Where they are located*
- *How few remain*
- *How long they take to grow*





Forest Time Scale

How old is old?

Create

a visual timeline that shows how different ages compare across human life and ancient forests.

Your timeline should include:

- ✓ A human lifespan (about 80 years)
- ✓ Your age or school age
- ✓ A 200-year-old tree
- ✓ A 5,000-year-old bristlecone pine
- ✓ An 11,000-year-old creosote bush
- ✓ Some [major human events](#) (eg. invention of writing, pyramids built, first cities)

Timeline options:

- Long paper strip
- Poster
- Foldable timeline
- Digital timeline (slides or Canva)
- Walkable timeline

Directions:

1. Draw a long line across your paper (or sidewalk).
2. Mark years starting from today and going backward in time. *Tip: Use increments of 100 years.*
3. Label each life form/event with its age.
4. Optional: Use symbols or drawings for each life form/event.

Reflect

- *What surprised you most about the timeline?*
- *How does seeing time this way change how you think about forests?*
- *What does it mean to protect something older than human civilizations?*

Old-growth forests are not just trees—they are living records of Earth's history. Protecting them means respecting time, life, and the future.



Forest Jokes

These are the jokes, folks!

What did the tree wear to the pool party?
Swim trunks!

What's a tree's favorite radio station?
One that plays poplar songs.

What kind of stories do giant sequoia trees tell?
Tall tales.

What type of tree likes to give high fives?
A palm tree.

How can you identify a dogwood tree?
By its bark.

Why did the pine tree get in trouble?
It was being knotty.

Where do cottonwood trees keep their valuables?
In a riverbank.

How do trees send emergency messages in the forest?
They use moss code.

What did the tree say to the bully?
Leaf me alone.

Why did all the forest's worker bees go on strike?
They wanted shorter flowers and more honey.

Did you know that I can cut down a tree just by looking at it?
Yep. I saw it with my own eyes!

I'm a part of a tree that is not in the sky or under the ground. I can move throughout the day and change shape. What am I?
I am the tree's shadow.

What falls all over the forest but never gets hurt?
Rain.

Where do you find forests without trees, roads without cars, and towns without houses?
On a map.

Why don't you ever see hippos hiding in the trees?
Because they're really good at it.

How many trees can you plant in an empty forest?
One. After that, it's not empty anymore.

What does Obi-Wan Kenobi say after he plants a tree?
May the forest be with you.

Why do trees dislike riddles?
Because they don't like getting stumped.





Careers Related to Forests

Explore real-life scientists who study and protect forests, learning about their work and the impact of their research.

Choose a Scientist

- [Ecologist](#) – studies relationships between plants, animals, and their environment
- [Mycologist](#) – studies fungi and their role in forests
- [Conservationist](#) – works to protect forests and wildlife
- [Others](#)

Research

- Use books, articles, or online resources to learn about your scientist.
- Focus on:
 - What kind of forest they study
 - The methods they use (fieldwork, lab work, monitoring)
 - How their work helps forests and ecosystems

Write

- “How does this scientist help protect forests?”

Extensions

- Create a poster or infographic highlighting your scientist and their work.
- Present your research to a group.
- Compare multiple scientists to see how different roles work together to protect forests.

Discuss

- *Why do you think scientists study forests?*
- *What challenges might they face in their work?*
- *How could you imagine yourself helping protect forests in the future?*





Additional Resources

[WildEarth Guardians](#)

Learn more about the organization that our guest, Lisa Markovchick, PhD, a conservation advocate and ecologist, is a part of.

[Read more about mycorrhizae](#)

[Why Deforestation Matters—And What We Can Do to Stop It](#)

Read more about deforestation across the world in this National Geographic article.

View [photos of old-growth forests in the US](#)

[World Atlas: Old-Growth Forests](#)

Learn about old-growth forests around the world.

Read more about old-growth forests all over the world in [this article from Smithsonian Magazine](#).

Get more [forest facts](#) (with a printable infographic) online.

Get involved in knowing, protecting, and restoring forests:

[Discover the Forest](#)

Find a forest near you! This website includes activities and tips for how to engage with your local forest.

[National Forest Foundation](#)

Do tree and forest activities.

[North American Mycological Foundation](#)

Find a group near you, and learn how to identify mushrooms!

[Smokey Bear](#)

Learn tips for preventing forest fires.

[Forest Stewardship: Teaching Youth About Forest Stewardship](#)

This article is for parents, educators, and other adults who are interested in teaching youth about land management and forest stewardship.

[Kid Governor](#)

Write a letter to your elected officials encouraging them to protect forests.



Additional Resources

Videos

[How Trees Secretly Talk to Each Other in the Forest | Decoder](#)

See how trees form symbiotic relationships with mycorrhizal fungi in this video from National Geographic.

[How Do Trees Clean the Air and Store Carbon?](#)

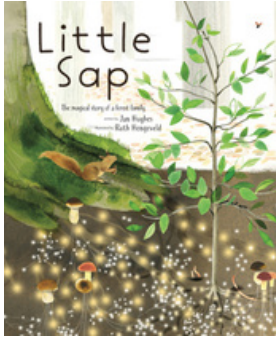
Find out in this video from One Tree Planted.

[What is Deforestation?](#)

Deforestation is a major environmental challenge—but what does it really mean? What causes forests to be cleared, and how can we protect, restore, and care for the world's forests? Find out in this video from One Tree Planted.



Book List



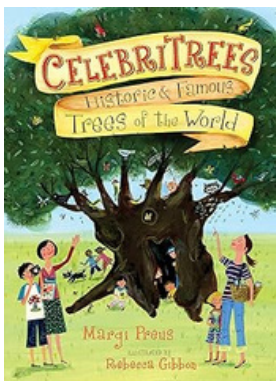
Little Sap: The Magical Story of a Forest Family

by Jan Hughes

"The titular tree's biography is the platform for teaching young children little gems of current science about tree behavior and the recently coined wood wide web...A sweet introduction for blossoming naturalists."

--Kirkus Reviews

ages 2-7



Celebratrees: Historic & Famous Trees of the World

by Margi Preus, illustrated by Rebecca Gibbon

This book highlights remarkable trees from around the globe and tells the fascinating stories behind their history, fame, and cultural significance.

ages 6-10

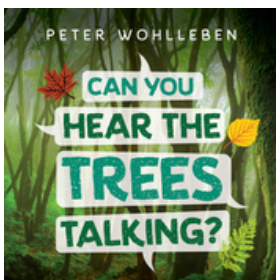


Forest Magic: A Guidebook for Little Woodland Explorers

by Sarah Grindler

A beautifully illustrated, hands-on nature guide that invites young readers to explore the forest.

ages 5-9



Can You Hear the Trees Talking?

by Peter Wohlleben

Based on the NYT bestseller *The Hidden Life of Trees*, this interactive book introduces the science of the forest through outdoor activities kids can try on their own, quizzes, fun facts, and photos.

ages 8-12



Save Our Forest!

by Nora Dåsnes, Lise Laerdal Bryn (Translator)

In this environmental activism-themed graphic novel, Bao and her friends band together to protect their beloved forest from being replaced by a parking lot.

ages 10-13