MADE WITH LITTLE STORYBOOK

The Secret Web Under the Woods

Discover how trees, roots, and fungi trade, warn, and grow together.



What's inside

1 A Forest Is a Neighborhood 4

2 The Great Underground Trade 8

3 Smells, Signals, and Sky Rivers 12

4 What We Know, What We Wonder 16



CHAPTER 1

A Forest Is a Neighborhood

A forest can look like a group of separate trees. Look closer: birds, squirrels, moss, roots, soil, and fungi all share this place. Above ground is only the beginning. Beneath your feet, another busy part of the neighborhood is growing.

Leaves Make Sweet Food

A leaf is like a tiny sun-powered kitchen. It uses sunlight, air, and water from the roots to make sugar. This sugar is food for the tree. Some can travel down from the leaves to places that need it, including the roots. The tree does not eat sunshine itself; it uses sunshine to build sugar.

IN THIS PICTURE
Sunlight, air, and water help green leaves make sugar.



IN THIS PICTURE
Roots grip the ground and collect nearby water and minerals.



Roots Reach and Drink

Roots are a tree’s underground anchors. Thick roots help hold the trunk steady. Fine roots take in water and minerals—tiny bits from soil that help a plant grow. But soil is full of tiny gaps between grains and pebbles. Even a fine root cannot squeeze into every space. That is where a helpful partner can explore.

Tiny Treasure Threads

Under the moss, a fungus grows threads much thinner than roots. These branching threads are called hyphae, pronounced HY-fee. Think of a root as a thick crayon and hyphae as wispy pencil lines. They can slip between soil grains and explore tight spaces. Many threads together make a hidden web called mycelium.

WOW FACTS

A mushroom is only one visible part of a fungus. Much of its body may be hidden in soil.



IN THIS PICTURE

Hair-fine hyphae explore gaps between soil grains.



2

CHAPTER 2

The Great Underground Trade

Beneath your feet, roots and fungi can make a useful deal. The tree shares sugar made in sunny leaves. The fungus brings water and tiny soil nutrients. Together, this partnership is called a mycorrhiza.



IN THIS PICTURE *Leaves make sugar; fungal threads gather water and minerals.*

Sugar for Soil Gifts

Leaves use sunlight, air, and water to make sugar. Sugar is food the tree can share with its fungus partner. In return, hyphae—fungal threads thinner than roots—reach tight soil spaces. They bring water and minerals, tiny nutrients like nitrogen and phosphorus, close to the roots. Both partners gain something they need.

IN THIS PICTURE
One fungal web can touch roots from several plants.



Roots Can Be Linked

One fungus can grow threads to more than one plant. Its hyphae may touch roots from an oak, a birch, and a young sapling. This is a common mycorrhizal network: a living web of fungus and roots. It is not like internet cables. The threads are living, growing partners that need food, water, and the right soil.

A Little Help, Maybe

Can linked plants pass tiny bits of food or nutrients? In some studies, scientists have measured carbon or nutrients moving between connected plants. But forests are busy, complicated places. It is hard to tell the exact path and whether a small sapling truly benefits. Many people say big trees feed baby trees. Sometimes movement happens, but scientists are still testing what it means.

IN THIS PICTURE
Scientists carefully test what moves through connected roots and fungi.





CHAPTER 3

Smells, Signals, and Sky Rivers

A leaf can do more than sit in sunshine. When a beetle chews it, the leaf may send a smell-like clue into the air. Nearby plants can notice this chemical cue. Let’s follow the drifting scents, the busy soil, and the puzzle gaps high overhead.

Leaves Get Ready

Imagine smelling toast before breakfast. The smell tells you something is happening nearby. A chewed leaf can release smell-like chemicals too. Other leaves may notice these chemicals. Then they may get ready to defend themselves, perhaps by making their tissues less tasty to hungry insects. This is chemistry, not tree talk.

> **WOW FACTS**
> Some green leaf smells can appear within seconds after a leaf is damaged.



IN THIS PICTURE
A chewed leaf releases a cue; nearby leaves may prepare.

IN THIS PICTURE
Airborne scents and underground root-fungus connections are different clues.



Two Kinds of Clues

Above ground, scent chemicals can float on the breeze. Below ground, roots and fungal threads sit in damp soil together. Scientists are still testing whether warning chemicals move through these underground links, how they travel, and how much they matter. So do not picture phone calls underground. Picture living roots, tiny threads, and chemistry.

Puzzle Pieces of Sky

Look straight up through some forests. You may see bright, skinny rivers of sky between treetops. These gaps are called crown shyness. In wind, neighboring branches sway and can rub or break. Over time, their crowns may keep narrow spaces between them. It looks like a leafy puzzle, not trees politely making room.

WOW FACTS

Broken twig tips give one clue that rubbing branches can help make these gaps.

IN THIS PICTURE

Swaying branch tips leave narrow puzzle-like gaps of sky.





CHAPTER 4

What We Know, What We Wonder

How do we learn about a web we cannot easily see? Forest ecologists are nature detectives. They test small ideas carefully, then check again. Their work shows a forest can hold both helpful trades and competition for space, water, and light.

Hidden Web Wow

1. About 70% of plant species are thought to have arbuscular mycorrhizal fungal partners.
2. A mushroom is a fruiting body. Much of its fungus may be hidden underground as mycelium.
3. Mycelium is a web of tiny fungal threads called hyphae.
4. Earth’s topsoils may hold so many living fungal threads that, together, they could reach from Earth to the Sun nearly a billion times.



The Web Is Not a Phone

People sometimes call this the “Wood Wide Web.” It is a handy nickname, but do not picture a phone network. Fungi are living partners, not cables that trees control. Their threads grow unevenly through soil and need food too. Some materials can move between connected plants. Yet scientists are still testing the paths, amounts, and whether young trees truly benefit.

WOW FACTS

A single fungal network can connect the roots of two or more plants.

IN THIS PICTURE

Living fungal threads weave unevenly among roots and soil creatures.



TRY IT!

Your Tree Detective Walk

Take a slow forest detective walk with a grown-up and notice what is already there.

1. Ask a grown-up to choose a safe path in a park or woods, and stay on it when signs ask you to.
2. Look closely at one tree’s bark, fallen leaves, and surface roots. Notice shapes, lines, and colors.
3. If you see a mushroom, admire it from a distance. Do not pick it, touch it, or pull up roots.
4. With your grown-up, gently touch only a fallen leaf or bark if it is allowed, then put everything back where it belongs.
5. Wash your hands with soap and water after your walk, especially if you touched bark, leaves, or soil.

Do this together with a grown-up.



Check your wonder

1 **How do a tree and a mycorrhizal fungus often help each other?**

- **A.** The tree gives sugar, and the fungus helps find water and minerals.
- **B.** The fungus makes sunlight, and the tree gives it soil.
- **C.** The tree makes minerals, and the fungus makes leaves.

2 **Why are fungal hyphae helpful in soil?**

- **A.** They turn into tree branches.
- **B.** They can explore tiny spaces roots cannot reach.
- **C.** They make all plants grow without sunlight.

3 **What might happen when insects chew a plant's leaves?**

- **A.** The plant may release smell-like chemicals into the air.
- **B.** The roots turn into mushrooms overnight.
- **C.** Every nearby tree sends a message through fungi.

4 **What is the best way to think about an underground fungal network?**

- **A.** It is exactly like the internet, controlled by trees.
- **B.** It can connect roots, but scientists are still testing what moves and how much it helps.
- **C.** It makes every tree share all its food with smaller trees.

ANSWERS 1-A 2-B 3-A 4-B

1. Leaves make sugar, while fungal threads can reach extra water and minerals. 2. Hyphae are very thin threads that can grow into tiny soil spaces. 3. Chewed leaves can release chemical cues that nearby plants may notice. 4. Fungal links are real, but forests also include competition and many unanswered questions.

New words

forest
A home where trees, plants, fungi, animals, and tiny living things live together.

fungus
A living thing, like a mushroom or mold, that is not a plant or animal.

mycelium
A hidden web made of many fungal threads.

minerals
Tiny bits in soil that plants need to grow.

crown shyness
Narrow gaps of sky between some neighboring treetops.

root
The underground plant part that holds it steady and takes in water.

hyphae
Very thin fungal threads that grow through soil.

mycorrhiza
A trade partnership between a fungus and a plant root.

chemical cue
A tiny chemical clue that a living thing can notice and respond to.

Where we looked

We used web research from forest scientists, ecology studies, museums, and university sources to check the facts in this book.

Mycorrhizae
research.fs.usda.gov

letters to nature
courses.cit.cornell.edu

First global map reveals underground fungi networks long enough to reach the sun a billion times | News | The University of Sheffield
sheffield.ac.uk

Global hotspots of mycorrhizal fungal richness are poorly protected
nature.com

Mycorrhizal Fungi - Soil Management | NC State Extension
soilmanagement.ces.ncsu.edu

Crown shyness: are trees social distancing too? | Natural History Museum
nhm.ac.uk

Belowground carbon transfer across mycorrhizal networks among trees: Facts, not fantasy
pmc.ncbi.nlm.nih.gov

Positive citation bias and overinterpreted results lead to misinformation on common mycorrhizal networks in forests
doi.org

Now you know that a forest is a busy neighborhood, above and below the soil. Roots, fungi, air, and leaves can all help living things respond to their world. On your next walk, look closely—and keep wondering what hidden jobs are happening under your feet!

THE END

What secret threads might be waiting under the next tree you meet?

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littlestorybook.ai/books/how-trees-talk-secret-web-under-the-woods

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