



Help the Plant Heroes protect our forests
by slowing the spread of pests and diseases!

PLANTHEROES.ORG
**BEGINNER
ACTIVITY
BOOK**

ARMILLARIA SHOESTRING ROOT ROT

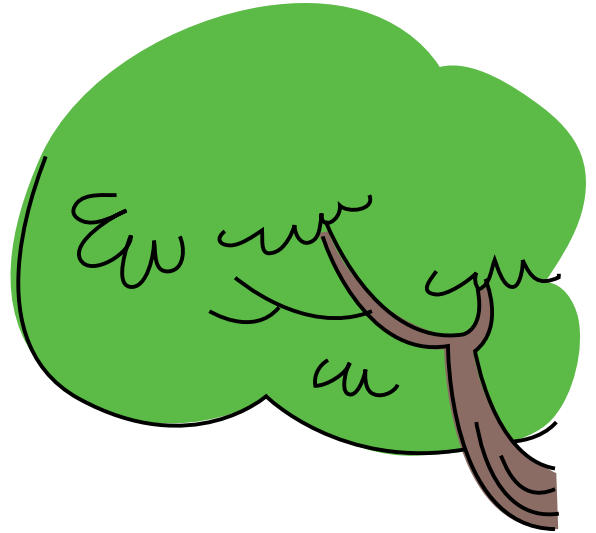


BE A PLANT HERO!
Help the Plant Heroes
slow the spread of
Armillaria Shoestring
Root Rot!



AMERICAN PUBLIC GARDENS ASSOCIATION

Meet the PLANT HEROES!



LAURA WILKINS

From: Athens, Georgia
Hobbies: playing the trumpet,
gardening, studying ecology

FRANKIE BARKER

From: Shrewsbury, Massachusetts
Hobbies: climbing trees, camping

NATE GREEN

From: Tacoma,
Washington
Hobbies: going on
adventures, learning
about fungi

APONI STAR

From:
Southeast
Illinois
Hobbies:
learning
more about
entomology
(the study of
insects)



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The Plant Heroes are four friends who love spending time in nature more than anything else! They enjoy climbing trees, walking trails, and camping.

The heroes are learning about why our forests are in danger. There are insects and fungi that can impact trees, sometimes affecting the health of whole forests. Trees may become sick or die when they are weakened by an invasive species, a living thing that is introduced to a new environment where it can cause damage to existing organisms.

**Follow the Plant Heroes
to learn the story of how
they helped slow the
spread of
Armillaria
“shoestring”
root rot...**



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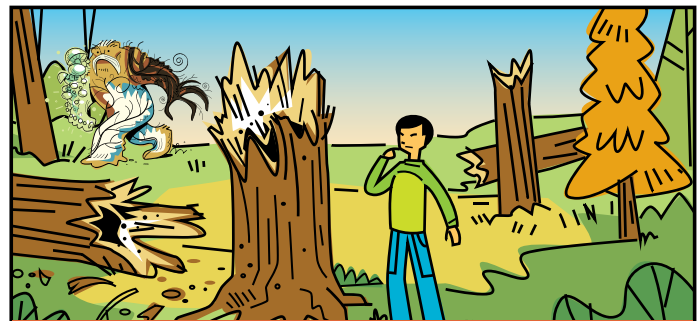
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Untangling the Mystery of Shoestring Root Rot



SUMMER BREAK has been great and the Plant Heroes (Aponi, Frankie, Laura and Nate) have been busy, but before starting the new school year they meet up for their annual camping trip reunion! After they pitch the tents, they start exploring the rest of the surrounding clearing and nearby forest...

Aponi discovers big clusters of honey-brown mushrooms growing and sprouting out of several old stumps.



Nate finds a few fallen trees nearby, some snapped near the base and others with roots pulled out of the ground.



Laura sees some trees around the edge of the clearing that are clearly dead but still standing.



Laura chips some bark off of one and, underneath, finds some freshly decayed wood that is unusually white. Curious, she uses her hatchet to chop out a few pieces and puts them in a plastic bag in her backpack.



Frankie is practicing his climbing skills on some trees just outside the clearing and notices that a few have some yellowing needles and dead tips.

**Over the campfire that evening...
the Heroes trade stories about what each of them saw and where.**



Pretty quickly they see the pattern ... trees in the middle of the clearing have been dead the longest and that whatever killed them is **GROWING INTO THE FOREST!**

As they turn to look around, they notice the eerie glow coming from the top of Laura's backpack on the picnic table.



THAT'S FOXFIRE!



Nate explains to the others that he's heard lots of different kinds of fungi glow but that some of them are **REALLY BAD** for the forest and they need to try to find out what kind it is.

The next morning they take a closer look at some of the dead trees and, under the bark, find thick mats of dark stringy fibers. "UH-OH!" says Nate, "THAT LOOKS LIKE SHOESTRING ROOT ROT!"



The Heroes rush to the park headquarters and tell the local forester what they've seen. She runs some tests to be sure and then brings in excavators to remove all of the dead and dying trees. It's a mess, but at least they've stopped the fungus from spreading further into the woods!



After all the stumps are gone, the Heroes help restore the forest by replanting the area with trees that are resistant to the fungus.



The Plant Heroes are brought to you by the American Public Gardens Association. This comic was developed with financial support from the USDA – Animal and Plant Health Inspection Service and reproduced with financial support from the USDA – Forest Service. Play games and learn how you can protect plants at plantheroes.org.



A Glowing Fungus

A fungus is a living organism or being that is neither a plant nor an animal. Fungi are the great recyclers of the environment, taking their nutrition from organic matter (like a tree). Some common fungi that you might recognize include mushrooms and molds. The fungus we will be studying today is called *Armillaria* “shoestring” root rot. When the fungus grows on trees, it damages the trees’ ability to get water and food to leaves. This can kill the trees or make them grow very, very slowly.

At night, this fungus gives off a dim blue-green light that is sometimes called “foxfire.” Many different fungi can produce a dim light like this. If you have the chance to go to the forest at night with an adult, see if you can spot the dim glow of fungi!



HANDY TIP!
“Fungi” means more than one fungus; “fungus” means just one fungus.

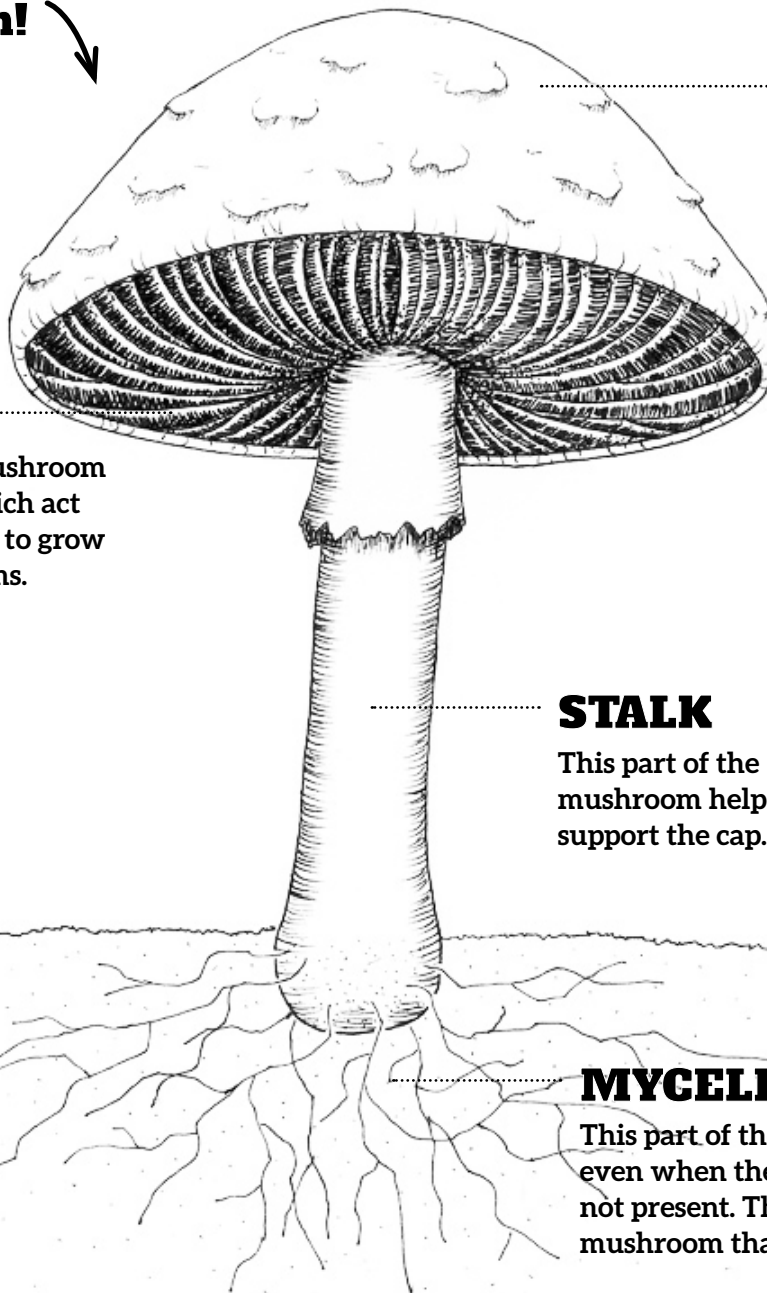


Parts of a Mushroom



Did you know mushrooms have gills? But these aren't like the gills of a fish! Learn more about the parts of a mushroom by coloring the fungus below.

Color the Mushroom!



CAP

The cap of the mushroom protects the gills and spores as the mushroom forms.

GILLS

The gills of a mushroom hold spores, which act like tiny "seeds" to grow more mushrooms.

STALK

This part of the mushroom helps support the cap.

MYCELIUM

This part of the mushroom is present even when the other parts are not present. This is the part of the mushroom that absorbs nutrients.



Fungi Fun

Fungi come in all shapes and sizes and are sometimes named after what they look like. Draw lines to match the fungi to what they are named after.



1



2



3



4



A



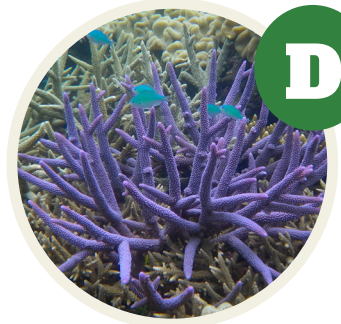
B



C



D

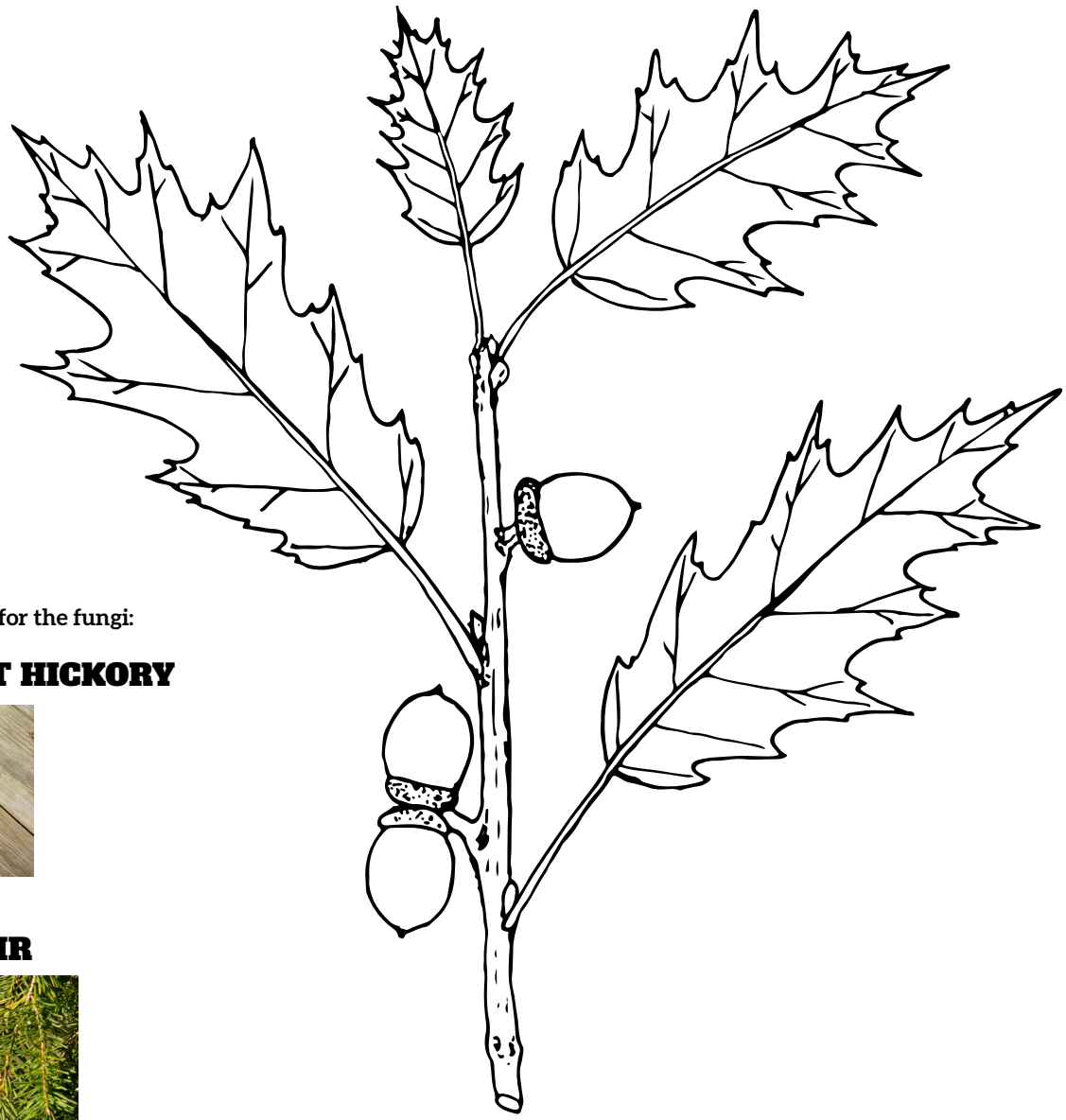


Meet the Trees!

Armillaria “shoestring” root rot can impact many different trees. These trees are called “hosts” because the fungi are the “guests” that feed on them. Below are some of the favorite host trees of *Armillaria* “shoestring” root rot. Color in the northern red oak below.



NORTHERN RED OAK



More tasty snacks for the fungi:

BITTERNUT HICKORY



DOUGLAS FIR



Underground Maze



Armillaria can be identified by its three different parts. Learn more about the different parts of *Armillaria* “shoestring” root rot by completing the maze below.



Honey-Colored Mushrooms

These mushrooms are only present some of the time and are found at the base of the tree.



Mycelium

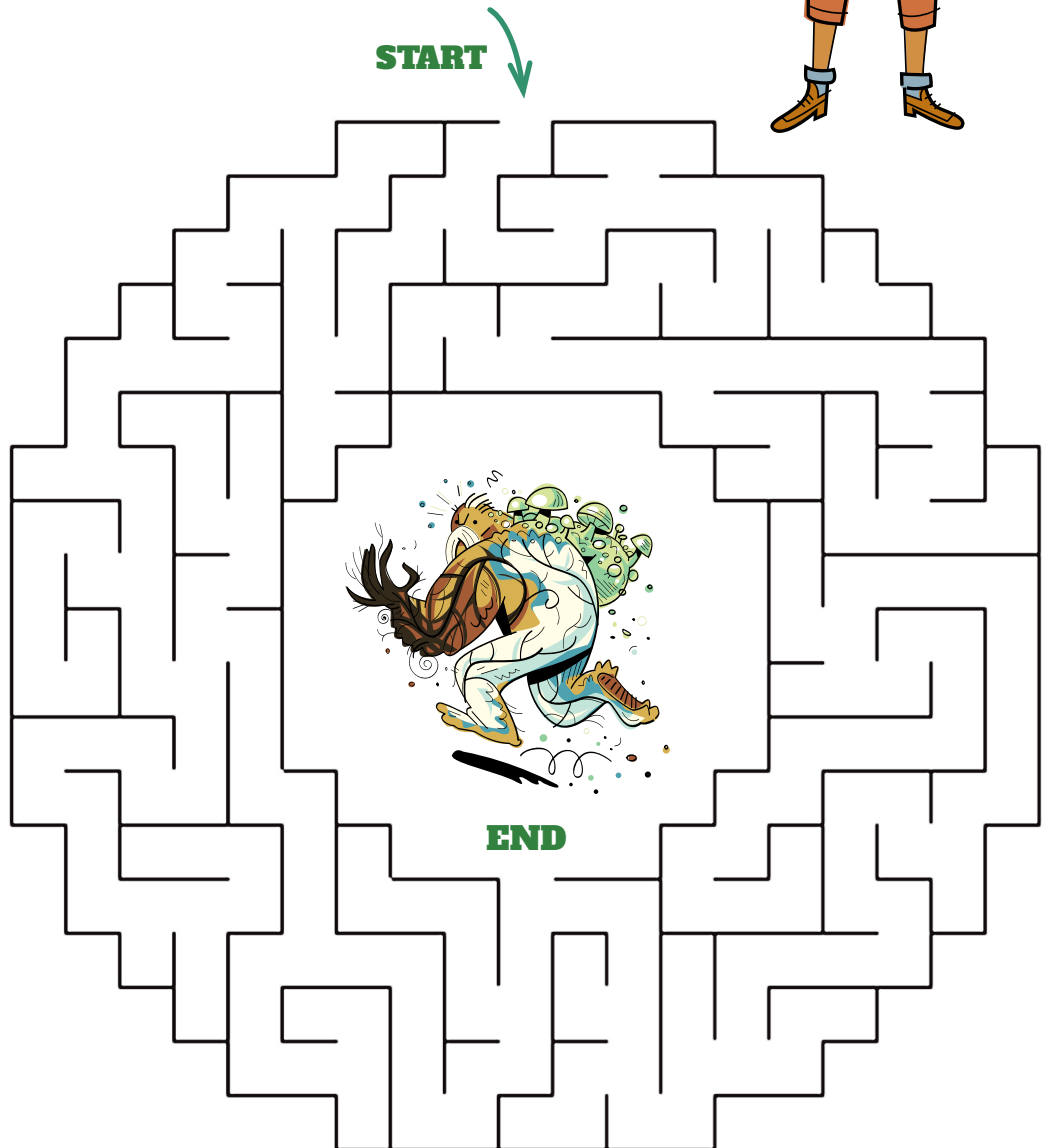
This white stuff grows beneath the bark of a tree. This is the part of the mushroom that absorbs nutrients.



Rhizomorphs

These spaghetti-like strings are called “rhizomorphs” and give the fungi the name “shoestring” root rot. This part of the fungus also helps absorb nutrients.

START



END



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Find a Fungus

Look around in a park or garden near you. Can you find any fungi? They will probably be growing on rotting logs near the forest floor. Be sure not to touch or eat any fungi you find outside—some fungi are very poisonous!



Draw a mushroom you have seen before below:

FAIRIES AND FUNGI!

Some fungi grow from a center point in the soil, creating a circle. When the weather is just right, a ring of mushrooms appears at the edge of where the fungus is growing. A folk tale says that these rings appear where fairies danced the night before. When the fairies would grow tired of dancing, they would sit on the mushrooms to rest. Next time you see a mushroom, see if you can spot another one like it nearby. Are the fungi growing in a circle?



ANSWER KEY

- Fungi Fun:** 1. violet coral fungi to D. coral
2. turkey-tail fungi to A. turkey
3. bird's nest fungi to B. bird's nest
4. wood ear fungi to C. ear





Join our team of Plant Heroes and learn about trees, forests, and the natural world around you!

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You can be a Plant Hero!

Are you curious about plants and animals? Do you like asking questions about nature? Do you enjoy being outdoors and having fun, climbing trees, balancing on logs, or finding a new butterfly or beetle? If so, you are already on your way to becoming a Plant Hero! We invite you to join forces with Nate, Laura, Aponi, and Frankie to protect the plants and ecosystems we all love.

How can you become a Plant Hero?

Join our team and go on a journey with Nate, Aponi, Laura, and Frankie. As a Plant Hero, you will learn to notice when plants are in trouble. You will also find out ways you can act quickly to help find solutions in your own neighborhood. Follow their adventures and learn how they help plants and ecosystems stay healthy.

On the Plant Heroes website, you will find materials to help you learn about plants, forest health, and ecosystem balance. The more you know, the more you can help protect plants and ecosystems in your own yard, neighborhood, and community!

Plant Heroes strives to spark curiosity about nature and science in all children. Our program provides hands-on, nature-based learning materials for educators to engage children in topics of plant health, ecosystem balance, and forest health. We also spotlight the amazing work our public gardens do in protecting the plants and ecosystems we all depend on through our website and printed materials. Visit plantheroes.org today to learn more!

Plant Heroes is brought to you by the American Public Gardens Association, founded in 1940. Over the last eight decades, the Association has supported the work of public gardens in North America and beyond. Our mission is to champion and advance public gardens as leaders, advocates, and innovators in the conservation and appreciation of plants. Our vision is "A world where public gardens are indispensable" as they provide botanic, conservation, community, education, and economic resources to their community.

The Association is committed to increasing the knowledge of public garden professionals throughout North America through information sharing, professional development, networking, public awareness, and research, so that they have the tools to effectively serve visitors and members.



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