PLANT HEROES

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

RAMORUM BLIGHT

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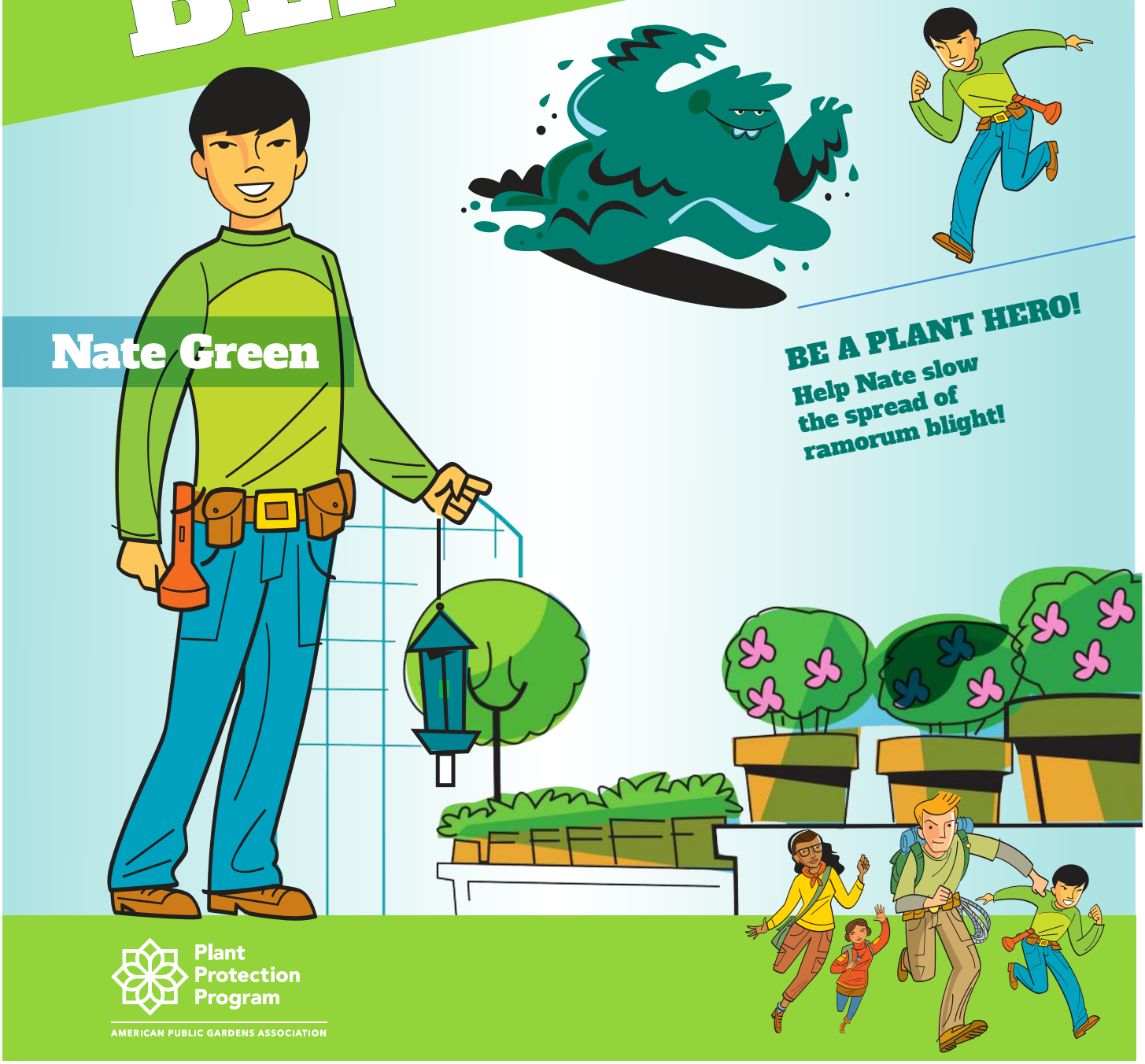
ADVANCED ACTIVITY BOOK



Nate Green

BE A PLANT HERO!

Help Nate slow the spread of ramorum blight!

Plant Protection Program

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)

plantheroes.org

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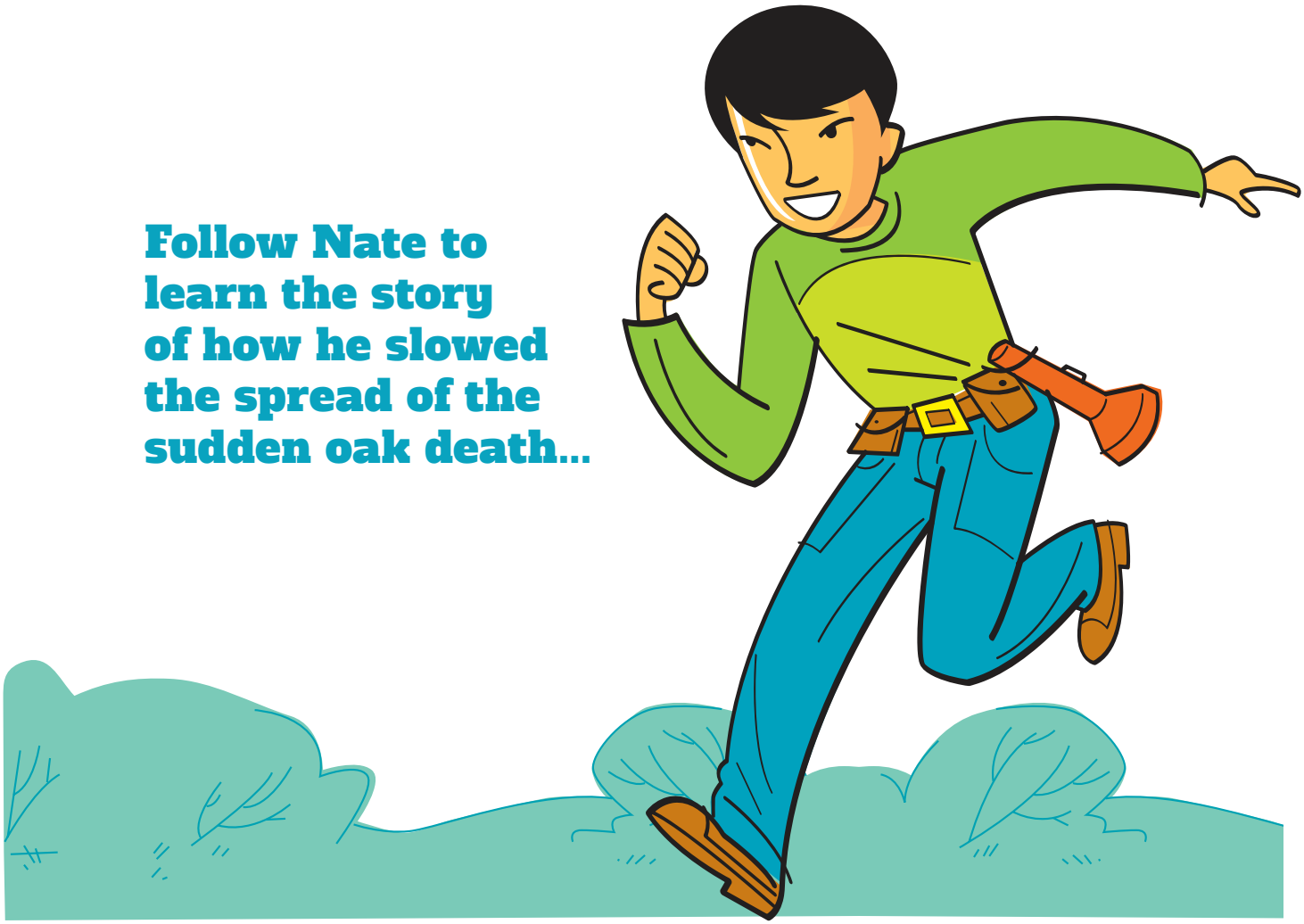
The Plant Heroes are four friends who love spending time in nature more than anything else! They enjoy climbing trees, walking trails, and camping.

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 Nate to learn the story of how he slowed the spread of the sudden oak death...



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THE FUNGUS AMONG US!

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Nate, forever focused on fungi, notices a fungus lurking in the local nursery...

Nate was helping his parents pick out plants for their house at a new local nursery. Forever looking for funky mushrooms and molds, a cluster of unusual black and spongy bumps on the trunk of a large oak caught his eye.

He collected some spores which helped him identify the growths as fruiting bodies of a sapwood decay fungus, *Hypoxylon thouarsianum*, that are frequently found on trees in advanced stages of ramorum blight (also known as sudden oak death).

Nate tells his parents that he is afraid the azaleas and camellias they had just bought might be infected too, as they are both susceptible to this pest.

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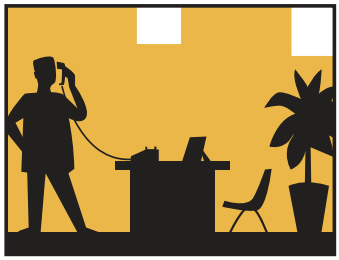
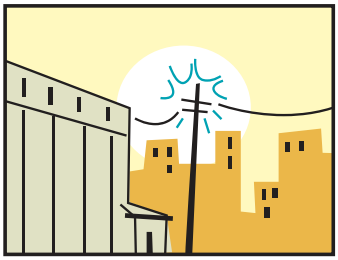
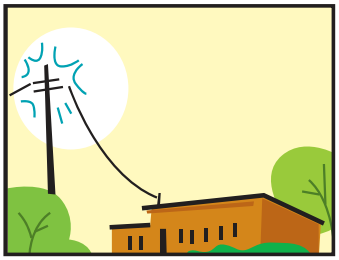
THIS PEST NEEDS TO BE STOPPED!

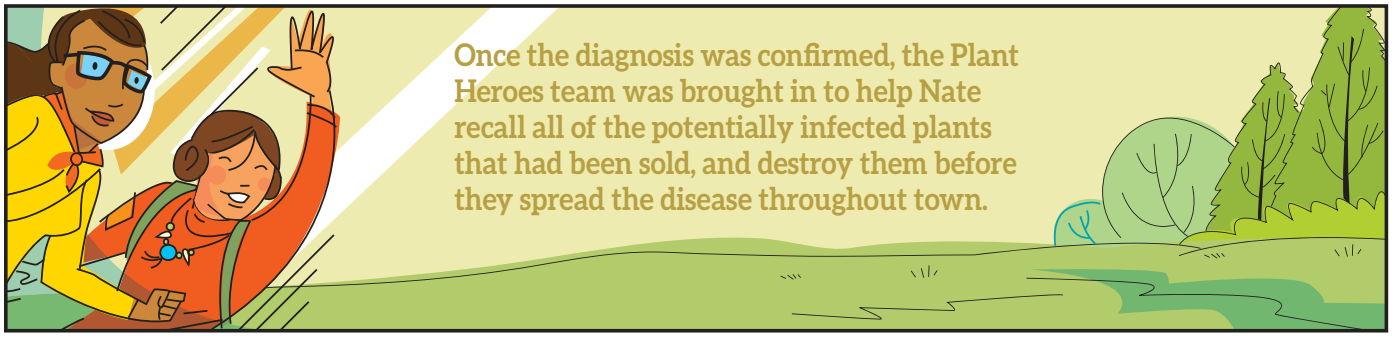
The next day, they return to talk with the nursery owner.

The nursery owner contacted the county and state officials.









Once the diagnosis was confirmed, the Plant Heroes team was brought in to help Nate recall all of the potentially infected plants that had been sold, and destroy them before they spread the disease throughout town.

Fortunately, the nursery owner was able to remove the diseased tree, disinfect all of the plant containers, and remove all the contaminated soil from the plant growing area to prevent the further spread of the fungus!

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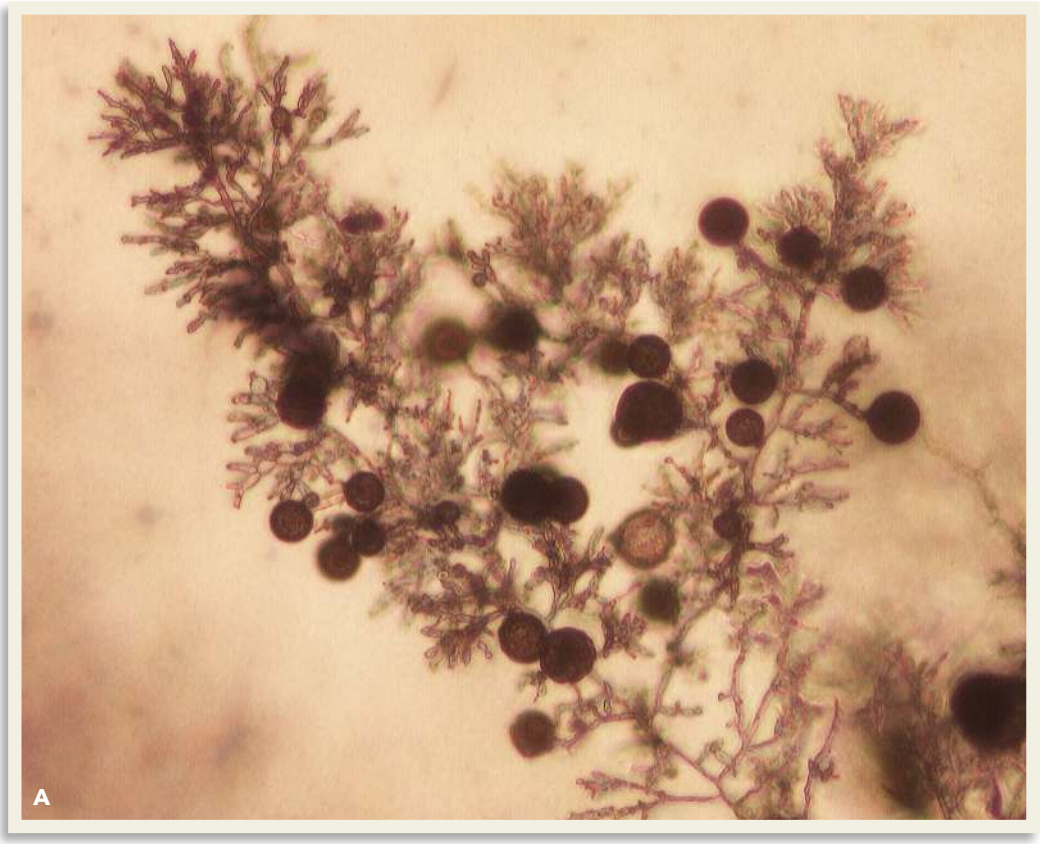
What in the World is Water Mold?

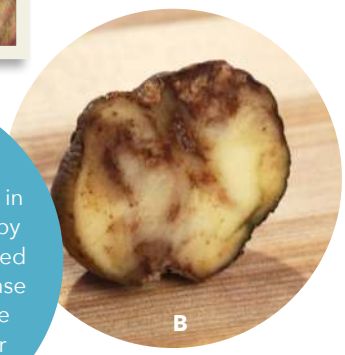
The pathogen that causes ramorum blight and sudden oak death is a water mold. Although water molds are not really "molds," they are very similar to fungi which is how they got their name. They need wet conditions to live and reproduce. Like fungi, they live off organic matter (trees or animals), oftentimes dead and decaying organic matter. The water mold we will be studying is called *Phytophthora ramorum*.



This is a photo of *Phytophthora ramorum*'s "fruiting bodies" as seen under a microscope. These structures produce the spores, or little black structures, that contain the information to produce a new water mold (similar to a seed). Does this photo remind you of a plant you know—one you might spot when you go to the beach? If you said kelp, you guessed it! Water molds are related to kelp and algae. Pretty neat!

Phythophthora ramorum causes different symptoms (or clues that a plant is suffering) in different plants. The leaves and stems of smaller plants and shrubs are damaged; when we see these symptoms, it is called ramorum blight. Large trees are much more harmed by this water mold, and it harms their trunks. When tree trunks are infected, we call the disease sudden oak death. Learn more on the following page!

DID YOU KNOW?
The Irish Potato Famine in the 1840s was caused by a water mold that infected potato plants. The disease caused the Irish to lose more than half of their potato crop.



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A Water Mold Buffet – Ramorum Blight

Water molds do not choose just anywhere to set up camp—they like to feed on very specific plants. These plants are called "host" plants because water molds are the "guests" that live inside them. Shrubs rarely die from ramorum blight, they just do not look very healthy. Unfortunately, these shrubs can help the water mold spread to trees which are very harmed by the water mold. Match the descriptions with the photos of the plants to learn more about ramorum blight host plants!

1

A

- Bay leaves that are used in soup come from this shrub. If you crush a leaf, you will notice that it is very fragrant.
- Leaves are shiny and have a wavy edge.

2

B

- This plant has leathery leaves that often stay on the plant during the winter.
- Flowers come in red, orange, yellow, white, pink, and purple and are clustered in groups.

3

C

- This plant has oval-shaped leaves with a point at the end and are serrated on the edges.
- Large flowers are not clustered, have many petals, and sometimes look like a rose.

Can you spot any of these plants in a garden or park near you? If so, put a checkmark next to the ones you found!

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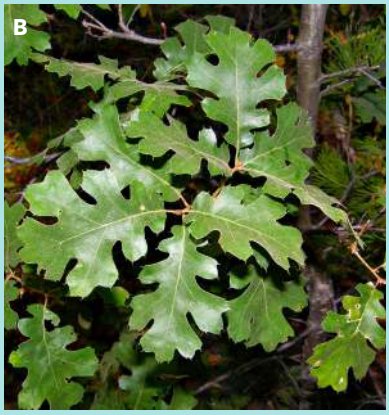
A Water Mold Buffet – Sudden Oak Death

Phytophthora ramorum affects trees quite differently than it does shrubs. The water mold attacks their trunks which blocks off the cells inside that help transport nutrients through the tree. See if you can spot an oak tree near you. Oaks come in all shapes and sizes, but if you spot some acorns, it is a dead give-away! Learn about some of the oaks you might find in the woods near you, and see if you can identify what kind of oak you've found.

Coast Live Oak

- Thick leaves are 1-2 inches in length.
- A few small teeth run along the leaf margins (edge areas) and the leaf margins fold downward.
- The bark has deep ridges.
- Inside the acorn cup is wooly!

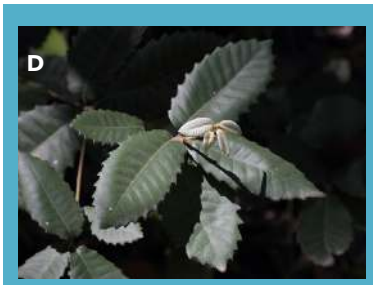


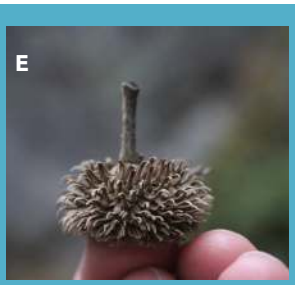
California Black Oak

- Leaf margins are lobed, which means they have finger-like projections.
- Leaves are 4-8 inches long.
- Trunk has deep ridges and is dark in color.

Canyon Oak

- Leaves may have a couple of teeth on the margins, and their undersides are pale gray with soft yellow hairs.
- Acorns are gigantic-- up to 3 inches long!
- Young twigs are covered in fuzzy hairs.
- Bark is dark brown and scaly.





TANOAK MAY LOOK LIKE AN OAK, BUT IT IS NOT! Unfortunately, tanoaks can suffer from both leaf and trunk infections from *Phytophthora ramorum*. Tanoaks produce acorns that have spiky projections on the cap which makes them look like sea anemones! The leaves have deep veins and toothy leaf margins.

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Plants in Trouble

Below are some plants suffering from ramorum blight and sudden oak death, caused by the water mold *Phytophthora ramorum*. Shrubs experience damage to their leaves, and trees to their trunks. Match the descriptions with the photos to learn more about some of the symptoms you might spot. Label photos with an "R" if they show a ramorum blight infection, or "S" if they like sudden oak death!

1 _____ _____

2 _____ _____

3 _____ _____

4 _____ _____

5 _____ _____

6 _____ _____

A. This tree is weeping (or exuding) a dark-colored liquid from its trunk.

B. This photo shows a hypoxylon canker, a type of fungus that grows on the trunk of trees when they have already been weakened or have died from a different infection.

C. The plant in this photo is brown and wilted near the growing tip, or very top of the plant.

D. All the leaves on a tree can turn brown in just a few weeks from *Phytophthora ramorum*, although the tree has suffered from the infection for much longer.

E. These leaves have brown tips from a *Phytophthora ramorum* infection. Water collects at the tip of the leaves and creates perfect conditions for the water mold to live.

F. This photo shows brown leaf spots on a rhododendron leaf.

For more photos of plants in trouble, see pages 2-5 in your field guide!

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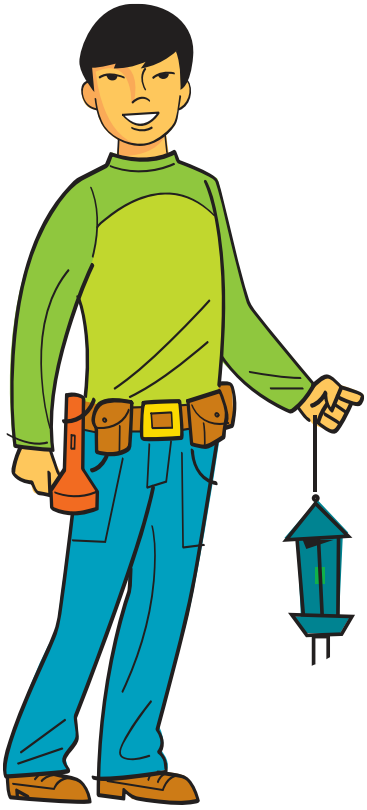
PHOTO CREDITS: A,B: Joseph OBrien, Bugwood.org; C: CountryMouse13, Flickr.com; D: Ken-ichi Ueda, Flickr.com; E: Oregon Dept of Ag, Flickr.com; F: Martin Jambon, Flickr.com

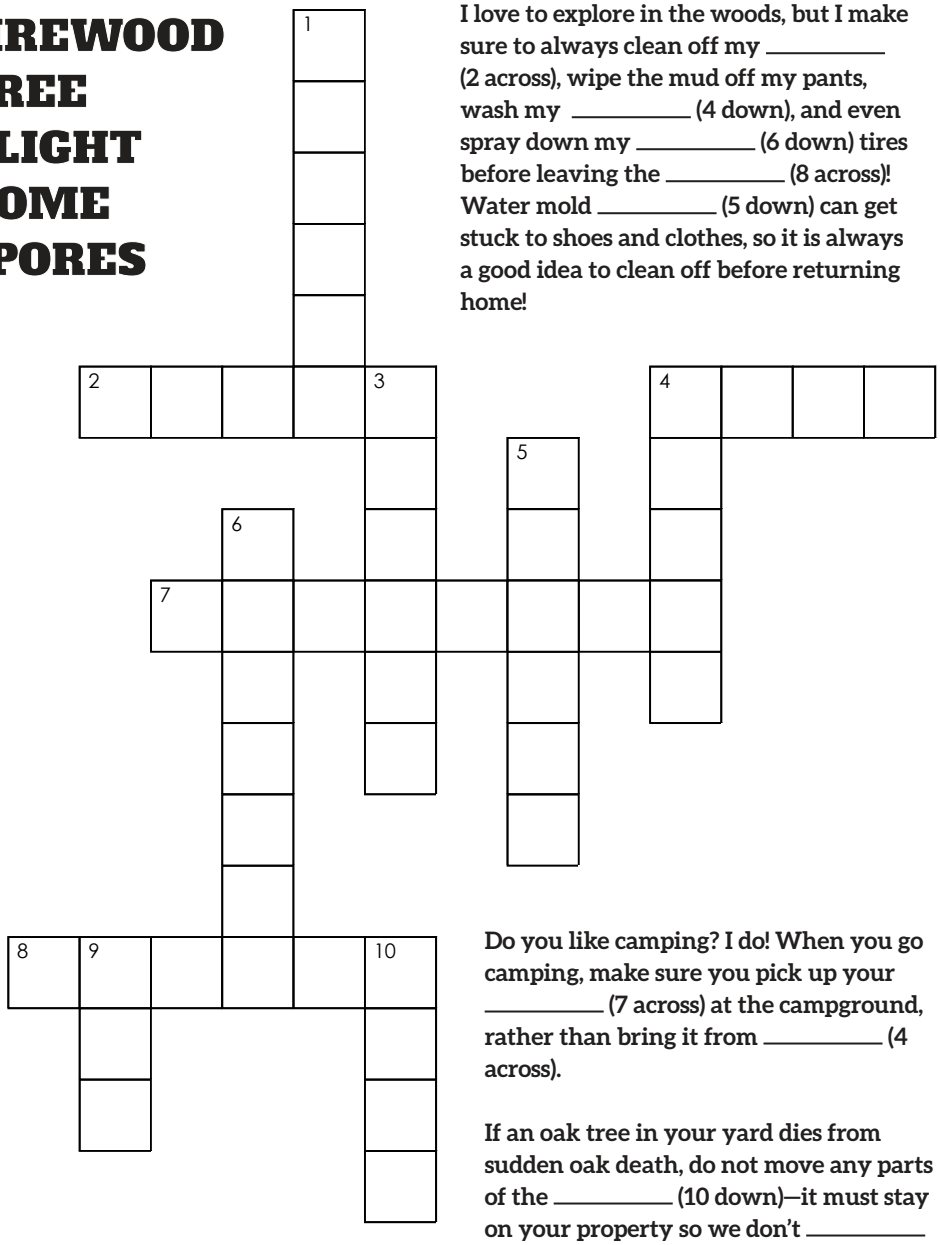
Stop the Spread!

With his adventurous spirit and enthusiasm for studying diseases, Nate has become quite the water mold expert! To learn all of Nate's tips and tricks for stopping the spread of sudden oak death, fill in the blanks below and solve the crossword.

WORD BANK:

FOREST
BOOTS
SPREAD
OAK
BICYCLE
HANDS
FIREWOOD
TREE
BLIGHT
HOME
SPORES





I love to explore in the woods, but I make sure to always clean off my _____ (2 across), wipe the mud off my pants, wash my _____ (4 down), and even spray down my _____ (6 down) tires before leaving the _____ (8 across)! Water mold _____ (5 down) can get stuck to shoes and clothes, so it is always a good idea to clean off before returning home!

Do you like camping? I do! When you go camping, make sure you pick up your _____ (7 across) at the campground, rather than bring it from _____ (4 across).

If an oak tree in your yard dies from sudden oak death, do not move any parts of the _____ (10 down)—it must stay on your property so we don't _____ (3 down) *Phytophthora ramorum* further!

If you spot any signs of ramorum _____ (1 down) or sudden _____ (9 down) death, be sure to tell an adult about what you have found!

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Time to Journal

1) What is the most interesting thing you learned in this book?

2) What is your favorite host plant of either ramorum blight or sudden oak death and why is it your favorite?

3) What will you do to be a Plant Hero and help to slow the spread of sudden oak death and ramorum blight?

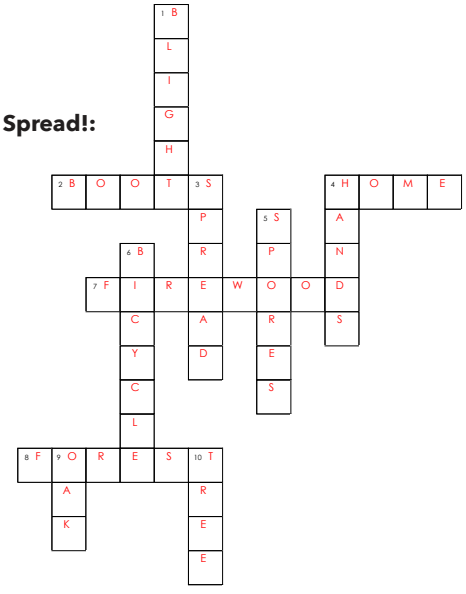
4) Can you think of some signs that a plant is unhealthy? Maybe look at plants near you—do any look like they are struggling to survive? What makes them look so unhealthy?

ANSWER KEY

A Water Mold Buffet – Ramorum Blight: 1. b; **2.** c; **3.** a

Plants in Trouble: 1. sudden oak death, d; **2.** ramorum blight, f; **3.** sudden oak death, b; **4.** sudden oak death, a; **5.** ramorum blight, c; **6.** ramorum blight, e

Stop the Spread!:



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PLANT HEROES

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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