



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

RAPID 'ŌHI'A DEATH

PLANTHEROES.ORG
ADVANCED
ACTIVITY
BOOK



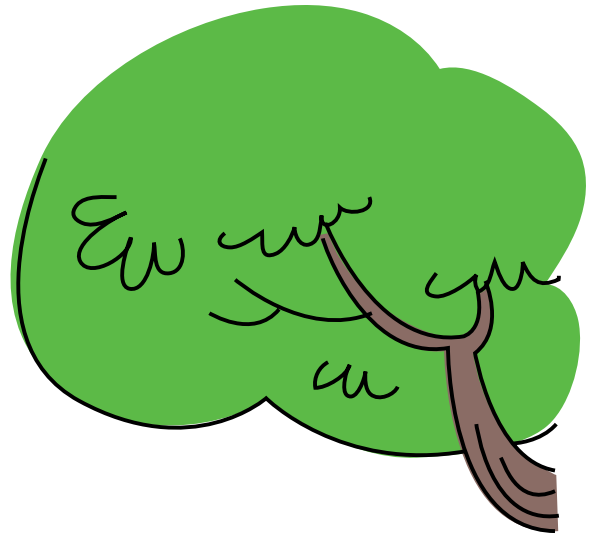
Aponi Star



BE A PLANT HERO!
Help Aponi slow
the spread of rapid
'ōhi'a death!



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 Aponi to learn the story of how she helped slow the spread of rapid 'ōhi'a death...



Hit the brakes!

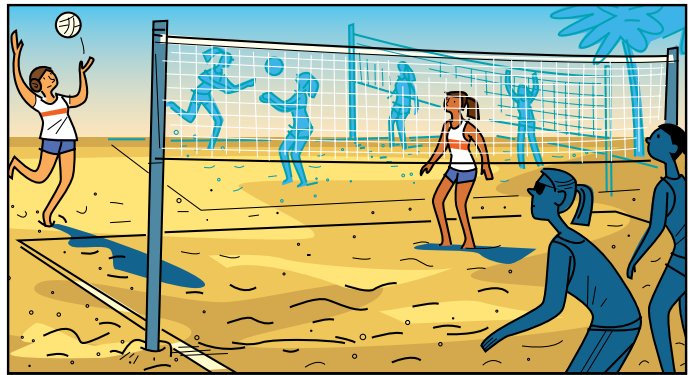
Slowing the spread of Rapid 'Ōhi'a Death...

PLANT HEROES



Aponi and the rest of the high school girls volleyball team are traveling to Hawai'i Island for a national tournament. They are looking forward to seeing volcanoes, hiking in the rainforest, snorkeling with tropical fish, and of course—playing LOTS of volleyball!

When the plane begins its descent, Aponi watches an in-flight movie about the ecological and cultural importance of Hawai'i's 'ōhi'a lehua trees, and a disease that is killing them—**rapid 'ōhi'a death...**



After getting settled at the hotel, Aponi and her friends jump right into practice—there are volleyball teams from all over the country!



The tournament organizers planned a break mid-week so that all the teams could spend a day doing some volunteer work on the island. Aponi and her friends sign up for trail restoration so they can see the tropical rainforest.

Aponi notices that there are several dead and dying 'ōhi'a trees in this section of the forest.

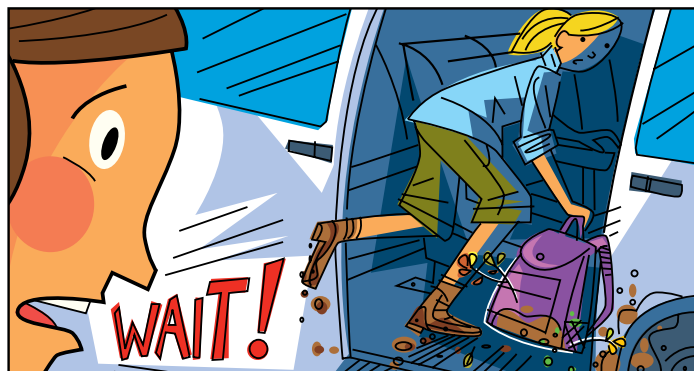
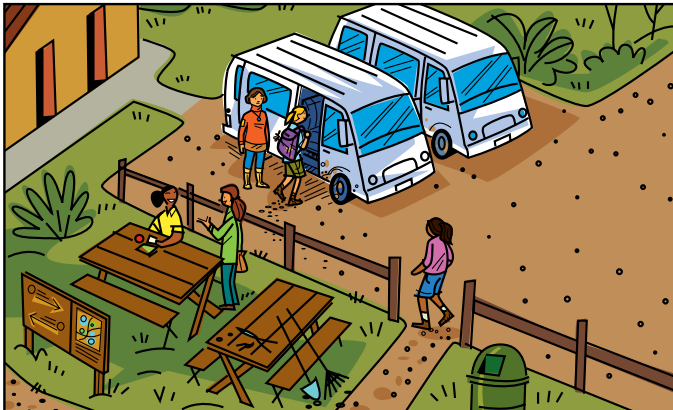


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PLANT HEROES

The volunteers break for lunch. Afterwards, they start piling into their vans so they can drive to another site where they will continue working for the rest of the afternoon...



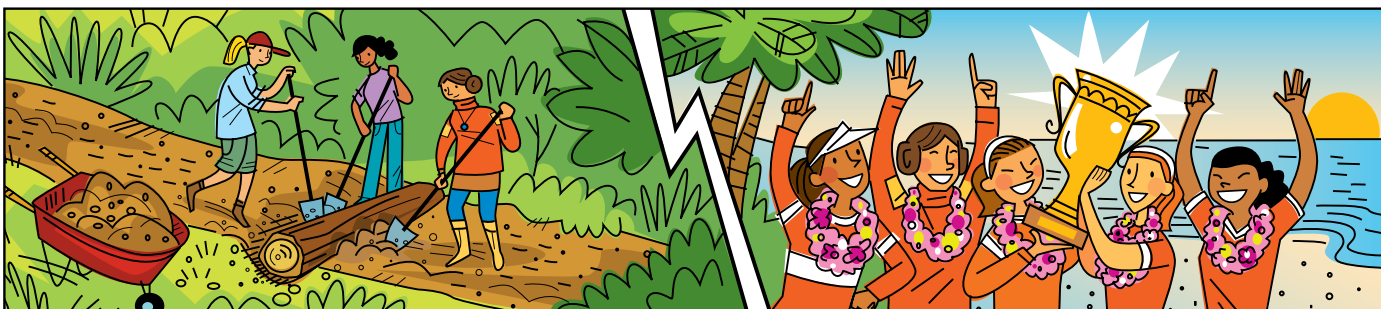
As one of her teammates climbs into the van ahead of her, Aponi notices that her shoes are covered in mud, and she has some 'ōhi'a branches tucked into the pockets of her backpack. She remembers from the video how important it is not to move soil or 'ōhi'a plants to avoid spreading the fungus that causes rapid 'ōhi'a death.

Aponi tells her teammates about the video, and about the dead 'ōhi'a trees she noticed when they walked along the trail.



Coach helps them use rubbing alcohol from their first aid kit to clean off all of their tools. They clean all the mud off their shoes and a local forest ranger takes care of the 'ōhi'a branches. **That was a close one!**

Aponi and the rest of the team spent the rest of the day installing water bars on a trail at another park. They return to the hotel and, after a good night's rest, win the rest of their volleyball matches! Taking 1st place in the tournament feels extra good knowing that they also had a chance to give back to the island, and they avoided spreading such a terrible disease into a new part of the rainforest.



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A Bountiful Tree



The 'ōhi'a tree is known as a "keystone" species. A keystone species is a plant or animal that supports many other plants and animals in an ecosystem (or community of living things and their environment). Without the 'ōhi'a tree, Hawai'i would be changed forever. Many animals that rely on the 'ōhi'a could become extinct, invasive plants might take over the forests, and the environment would be drastically different.

Why is 'ōhi'a so special? Solve the riddles by filling in the blanks below to find out who relies on the 'ōhi'a tree. Use the words in the list to help you fill in the blanks.

1. I rely on the sweet _____ of the 'ōhi'a flowers for my food, and I make my _____ in the branches of the tree. What am I?
2. Another name for me is an epiphyte, or a _____ that grows on another plant, like a _____ or an _____, and my roots rely on the 'ōhi'a tree for support. What am I?
3. All living things need me to survive. 'Ōhi'a trees collect me during a _____ so that the _____, _____, and _____ do not dry out. What am I?
4. We use the 'ōhi'a to make _____, use it for _____ for our buildings, and it provides us with _____ on a hot day. What are we?
5. I am a small animal that visits the 'ōhi'a flowers for their nectar and pollen. I have _____ legs and _____ love to eat me! What am I?

WORD BANK:

**wood
shade
nectar
fern
rivers
waterfalls
orchid
six
birds
lakes
nest
rainstorm
leis
plant**

Did you know that the 'ōhi'a tree is only native to the state of Hawai'i? 80% of the trees in the native forests are 'ōhi'a trees! In other words, four out of five trees in a typical Hawaiian forest are 'ōhi'as!



What is Rapid 'Ōhi'a Death?

Scientists first discovered that rapid 'ōhi'a death was caused by a fungus in 2014, but since the fungus that causes the disease is microscopic, they did not know exactly which fungus it was. In 2018, scientists discovered it was not just one fungus . . . but two! The new species of fungi were named after their impact on 'ōhi'a: *Ceratocystis lukuohia* (destroyer of 'ōhi'a) and *Ceratocystis huliohia* (disruptor of 'ōhi'a). The fungi block the water transport cells of the tree, causing trees to die from lack of water.



The 'ōhi'a tree is a "host" for the fungi because the fungi are the "guests" that use the tree as their home. The fungal spores, which allow the fungus (singular of "fungi") to reproduce, enter the tree through a wound or broken branch. The fungus begins to grow, spreading throughout the tree.

After the spores land on an 'ōhi'a tree, they begin to grow into a thread-like network of hyphae, which together are called "mycelium."



The fungi that cause rapid 'ōhi'a death can only be seen under a microscope. Therefore, they are difficult to detect! Here are some clues that an 'ōhi'a tree might be hosting a fungus. Look in the forest near you; do you see any of these symptoms on your trees? Check off any of the symptoms you see.



Black staining from the fungus inside the tree.

Yellowing or browning leaves.



Fascinating Fungi



Fungi are living beings that are neither plants nor animals. Some common fungi that you might recognize include mushrooms and molds. They are often parasites (organisms that steal resources from and cause harm to other living things), but they don't always cause harm! They are the great recyclers of the environment, taking their nutrition from organic matter—often dead animals or plants. Match the descriptions of how some fungi are beneficial to the pictures below.



MEDICINE

A

Some fungi help plants to grow by moving important nutrients from the soil to the plants' roots. Other fungi help to control pests that feed on crops.



FARMING

B

Some fungi help transform food like milk into different cheeses, including blue cheese. Another important type of fungus, yeast, is used to make bread.



FOOD

C

Some fungi can kill or slow the growth of bacteria. Scientists can use some of the unique properties of fungi to create helpful medicines, including penicillin.



The Many Forms of 'Ōhi'a Lehua

'Ōhi'a lehua's scientific name, *Metrosideros polymorpha*, is named for the plant's ability to be found in "many forms" (polymorpha). 'Ōhi'a lehua can grow as a small two-foot shrub or as a large 90-foot-tall tree. Its flowers can be several different colors and its leaves can look different too! The photos below are both of 'ōhi'a lehua. Answer the questions below to compare the two plants.



What is different about these two plants? (size, leaves, flowers?)

.....

.....

.....

.....

What is similar about these two plants?

.....

.....

.....

Have you seen an 'ōhi'a that looks different from the ones above? If so, how was it different?

.....

.....

.....



Rapid 'Ōhi'a Death in Your Backyard!

Rapid 'ōhi'a death has invaded your backyard! Where did you find the fungus? How did the fungus get there? Who will you contact to help you? What will you do to make sure it doesn't spread? Draw your own comic below telling the story of how you saved your 'ōhi'a trees from the fungus!





Stop the Spread!

It is easy for the fungi which cause rapid 'ōhi'a death to spread, but fortunately you can stop the fungi in their tracks! Fill in the blanks to learn more; you can use the comic for help!



WORD BANK:

WOOD, RUBBING ALCOHOL, MUD, FUNGAL SPORES, MOVE, TOOLS, SHOES, DISINFECT, LEIS, INFECT, TREES

When you go hiking or camping out in the woods, make sure you clean and wash the _____ off your _____ and clothes before you return home.

The _____ that cause rapid 'ōhi'a death can stay alive in the soil for over a year, and can _____ 'ōhi'a _____ on your property if you aren't careful! Make sure you don't _____ any parts of the 'ōhi'a tree to use for _____ or _____ for your campfire!

If you use any _____ to cut down or trim branches or flowers on an 'ōhi'a tree, make sure you _____ them with _____ to kill any fungal spores.

Why are scientists so concerned about rapid 'ōhi'a death?

Concern 1: Rapid 'ōhi'a death spreads easily and kills quickly. A tree might appear healthy and be completely dead several weeks later!

Concern 2: There is nothing that can be done to help the tree once it has the disease—it must be cut down.



ANSWER KEY

A Bountiful Tree: 1. nectar, nest; I am a bird. 2. plant, fern, orchid; I am a plant. 3. rainstorm, rivers, lakes, waterfalls; I am water. 4. leis, wood, shade; We are humans/people. 5. six, birds; I am an insect.

Fascinating Fungi: A. Farming; B. Food; C. Medicine

Stop the Spread!: (in order) mud; shoes; fungal spores; infect; trees; move; leis; wood; tools; disinfect; rubbing alcohol





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

PLANTHEROES.ORG

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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