

Plant Plague: Sudden Oak Death

Watch it online <http://www.kqed.org/quest/television/view/250>

TV story length 12:34 minutes

QUEST SUBJECTS

Life Science **Biology**
Health
Environment

Earth Science Geology
Weather
Astronomy

Physical Science Physics
Chemistry
Engineering

CA SCIENCE STANDARDS

Grade 4

Life Sciences

3. Living organisms depend on one another and on their environment for survival. (a,b,c)

Grades 9-12

Ecology

6. Stability in an ecosystem is a balance between competing effects. (a,b)

Evolution

8. Evolution is the result of genetic changes that occur in constantly changing environments. (b)

PROGRAM NOTES

In the past 10 years, sudden oak death has devastated over one million oak trees across Northern California and southern Oregon. It has been detected in 21 states. It's a killer with no cure. Biologists now are studying the genetics of resistant trees with the hope that this research will provide insight into preventing the disease from spreading further.



In this segment you'll find out...

- ⦿ what sudden oak death is and when it first was recognized as a problem.
- ⦿ how the pathogen *Phytophthora ramorum* affects oak trees and other plants.
- ⦿ what scientists are doing to prevent the spread of the disease.

TOPIC BACKGROUND

Sudden oak death (SOD), also known as ramorum blight, is a canker disease that kills tanoak and oak trees and affects many other plant species. It's caused by a pathogen (*Phytophthora ramorum*) thought to have originated in Asia and been distributed through the nursery industry. It has been found in nurseries in the United States and Europe. Since the early 1990s, *P. ramorum* has affected one million native oak and tanoak trees in 14 counties in California as well as Curry county in southern Oregon.

Phytophthora ramorum is a water mold that affects plants and trees in two ways. It can cause lesions and cankers in oaks and tanoaks like coast live oaks, California black oaks, Shreve oaks and canyon live oaks, and it can cause lesions and browning of the twigs and leaves in many other tree and plant species. It's often spread during the rainy season in cool and wet climates. Once an area has been infested, *P. ramorum* may spread quickly from one tree to another. In such cases you are likely to see large areas of the forest affected by the pathogen.



The lesions, or cankers, are red-brown to black and seep dark black to red or amber sap. It may take up to two years for an infected oak to die, but the leaves may turn brown quickly (in two to four weeks). Tanoaks are the most susceptible and their trunk, leaves and branches may all be affected. There is a long list of plants whose leaves are affected, but the most common are bay laurel, camellia and rhododendron. Symptoms on

these hosts vary depending on the species, but generally there is discoloration of the leaves, or leaf spots, often near the tips. Sometimes whole branches can be affected. In some conifer species the pathogen kills the shoots.

In California's coastal counties, SOD could have devastating ecological and cultural effects. Oaks and tanoaks are important for forest balance through their production of acorns, an important food source for many animals. The trees also contribute to soil stability and have a significant relationship with fungi. Large areas of dead trees can cause fire and safety hazards. Also, the widespread loss of tanoaks can have a devastating effect on Native Americans from a cultural and ceremonial perspective.

Media Enhance Education

Video and audio can be powerful tools for meaningful learning. It all depends on you, the educator. The key to using media effectively is preparation. Make the most of learning opportunities by encouraging students to become active viewers and listeners. Pick and choose from the suggested questions and activities to offer an engaging media experience.

Questioning

Oftentimes, teachers and students become frustrated during a media segment when students can't find the answers to a long list of questions. Provide a limited number of questions or topics for students. This focuses their attention on during a media segment, helps to keep them engaged and generally results in higher quality answers. QUEST Ed. has provided a number of options for focus questions ranging from fact based to opinions, as well as "big picture" ideas. The questions are listed in order of increasing complexity of thought.

PRE-VIEWING

- Discuss some of the different types of oak trees found in the Bay Area. Look at habitat, appearance and natural history characteristics.
- What type of organisms can kill trees (fungus, water mold, insects and so on)? How?
- Which animals depend on oaks and acorns?
- Discuss the concept of extinction. What happens when one plant or animal becomes extinct? What impact does it have on other organisms?
- Review the structure and parts of trees. Which layers are living? What are the functions of all the different layers?

VIEWING FOCUS

NOTE: You may choose to watch the television segment twice with your students: once to elicit emotional responses and get an overview of the topic and again to focus on facts and draw out opinions.

- Record any facts you find interesting while you watch.
- What causes sudden oak death?
- What is a plant pathologist?
- What part of the tree does *Phytophthora ramorum* affect?
- What are the researchers looking for in the UC Berkeley study?
- What are the ecological consequences of losing oaks and tanoaks?
- How is sudden oak death spread?

POST-VIEWING – Links to activities mentioned can be found on the following page.

- **Review** students' answers to the Viewing Focus Questions.
- **Learn** about the importance of food chains and create your own food web.
- **Research** animals commonly found in oak woodlands.
- **Develop** a brochure explaining the cause and effects of sudden oak death.

“The oak is an icon of California. It is an important species for forest balance and forest health.”

— Katie Palmieri

LESSON PLANS / ACTIVITIES

Oak Woodlands Explorations Acorn Naturalists Web site

<http://www.acornnaturalists.com/store/Oak-Woodland-Explorations-C34.aspx>

- This site has activity kits, books and lots of resources about oak woodland communities.

Elementary Ecosystems National Geographic Xpeditions

<http://www.nationalgeographic.com/xpeditions/lessons/08/gk2/ecosystem.html>

- Teach students the basics of species interdependency within an ecosystem or habitat. Students perform a simple simulation to see how one species affects many others. Through the lesson they gain a basic understanding of the importance of biodiversity.

ARTICLES / READING

California Oak Mortality Task Force

<http://nature.berkeley.edu/comtf/>

- Find an overview of sudden oak death along with information on its history, a photo gallery and maps, current research reports, how to diagnose a tree and treatment and management options.

Monitoring Sudden Oak Death OakMapper Web site

<http://kellylab.berkeley.edu/SODmonitoring/OakMapper.htm>

- A comprehensive list of maps, available for downloading, show where sudden oak death has been found.

California Oak Foundation

<http://www.californiaoaks.org>

- This nonprofit organization is dedicated to preserving oak ecosystems in California.

Integrated Hardwood Range Management Program University of California

<http://danr.ucop.edu/ihrmp/>

- Find resources, current research and publications on oak woodlands and sustainability of California's hardwoods.

Look for the



indicating resources from QUEST partner organizations

QUEST QUAD

FIELD NOTES




Go outside and...

- See if there are signs of sudden oak death in your area.
 - Look at the online photo gallery listed above to see symptoms.
 - Go for a hike and check out the bay laurel, tanoak, and oak trees to see if you can find the signs.
- Make oak leaf rubbings
 - Collect some fallen oak leaves. Put a piece of paper over them and with a crayon make a rubbing of the leaves. Try this with different shaped leaves and colors.

FIELD TRIP



Visit...

- Oak woodland areas 
 - Investigate the East Bay Regional Parks www.ebparks.org or Golden Gate National Parks www.nps.gov/goga
 - Draw a picture of an oak forest. What animals would you put in your picture? What other plants might be in your picture also?

FIELD RESEARCH



Find out more about...

- Acorns
 - Which animals eat them?
 - How did Native Americans use them?
 - Can they be a resource for anything else?
- The importance of oak woodlands
 - Why are oak woodlands important ecosystems?
 - What plants are usually found there?
 - Which animals depend on them?
 - Where is the closest oak woodland to your home or school?

FIELD TEST



Experiment with...

- Preparing your own acorns to eat
 - Collect fallen acorns.
 - Dry them completely, either in the sun or by putting them in an oven set on low heat.
 - Shell the acorns with a nutcracker or hard object.
 - Place acorns in a blender or food processor full of water and process to make a thick paste.
 - Line a sieve with a towel and put the acorn mush on the towel. Run water over the acorns for at least five minutes, until the water runs clear and the acorns are not bitter tasting. (This leaches out the tannic acids.)
 - Squeeze out all the excess water and dry the acorns slightly in an oven set on the lowest heat. You have made acorn meal!

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WATCH

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