

Restoring San Francisco's Lost Manzanita Educator Guide

A resource for using QUEST video in the classroom

Watch it online <http://science.kqed.org/quest/video/science-on-the-spot-restoring-san-franciscos-lost-manzanita/> | 8:46 minutes

QUEST SUBJECTS

Life Science **Biology**
 Health
 Environment

Earth Science **Geology**
 Climate
 Weather
 Astronomy

Physical Science **Physics**
 Chemistry
 Engineering

CA SCIENCE STANDARDS

Grade 5
Life Sciences
 2. Plants and animals have structures for respiration, digestion, waste disposal and transport of materials

Grade 7
Ecology (Life Sciences)
 5 (e) *Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures and soil composition.*

Grade 9 – 12
Cell Biology (Biology)
 1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells.

PROGRAM NOTES

The manzanita is California's iconic plant, adapted to the state's many ecosystems. One of the two manzanitas that grew exclusively in San Francisco's foggy climate, the Franciscana, was thought to have gone extinct in the wild until it was rediscovered in 2009. **QUEST** explores how the San Francisco Botanical Garden is toiling to give one of the city's rare native plants a second chance.



In this segment you'll find...

- ⦿ a tour of the manzanita's history and anatomy.
- ⦿ an explanation for why the manzanita thrives in the Bay Area's unique climate.
- ⦿ a discussion of how plant cuttings are used in the field of botany.

TOPIC BACKGROUND

In California, there are roughly 50 species of manzanita (Spanish for "little apple"), but there are only a handful of species in the rest of the world. Most of them grow in hot, dry climates, but one of the two species native to San Francisco, Franciscana manzanita, is well adapted to the fog zone. The manzanita has shiny, reddish bark, white, bell-shaped flowers and edible fruit that look like tiny apples.

As San Francisco grew and became more urbanized, the populations of many native plants, including the manzanita, declined. Scientists believed that the Franciscana manzanita was extinct in the wild, but in 2009, a young biologist discovered one in the middle of a billion-dollar construction project at the south end of the Golden Gate Bridge. Cuttings were taken from the plant and donated to five botanical organizations so that new plants could be propagated. The ultimate goal is to establish genetically diverse manzanita breeding populations in the wild. Many organisms depend on healthy, abundant native plants for habitat and food. Ecological balance depends on the protection of native species like the manzanita. Removing just one key species can have a cascade of detrimental consequences on other organisms.

When scientists want to grow new plants from a cutting, they must carefully recreate the necessary environment that will ensure the new plant's regeneration. They often use plant hormones to promote healthy growth. Scientists must also replicate favorable abiotic factors, such as climate and soil type, in order to increase the success of propagation. Scientists have identified the relationship between manzanitas and a special kind of rock common to the Bay Area. It is known as serpentinite, or serpentine rock, and is found in earthquake fault zones. Serpentine rock is toxic to most plants, but the manzanita thrives on it. Understanding such relationships enables botanists to give endangered plants a chance to succeed.

VOCABULARY

Botany

a branch of biology that involves the scientific study of plant life

Cutting

the technique of removing a piece of a plant -- also called the cutting -- to grow into a new plant

Diversity

when a species has many genetically different organisms in its population

Ecology

a system of relationships among organisms and the environments in which they live

Hormone

a chemical released by a cell that travels through an organism's body and affects cells in other parts of that organism

Serpentine

the California state rock, formed by physical and chemical changes to rock from Earth's mantle; toxic to most plants

PRE-VIEWING

- Why might a particular plant thrive in San Francisco?
- What could cause a plant species to go extinct?
- How can scientists rescue a plant species from extinction if they find one in the wild?

VIEWING FOCUS

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

- How is the Franciscana manzanita similar to and different from other manzanitas?
- How did scientists use cuttings to propagate a wild manzanita that was discovered in the middle of a construction project?
- How will botanists try to achieve the ultimate goal of restoring breeding populations of manzanitas in the wild?
- Should scientists try to rescue species that are on the verge of extinction? Why or why not?

For all media see:

- Segment Summary Student Sheet
http://science.kqed.org/quest/files/imp/QUEST_SegSum_StudentSheet.pdf
- Personal Response Student Sheet
http://science.kqed.org/quest/files/imp/QUEST_PersResp_StudentSheet.pdf

LESSON PLANS and RESOURCES from QUEST, PBS and NPR

Living Life as a Plant PBS LearningMedia

<http://www.pbslearningmedia.org/content/lpsps07.sci.life.oate.lplifeasplant/>

In this media-rich lesson, students investigate how plants respond to their environment. They also explore adaptations, such as how some plants are adapted to life in the desert and why some plants trap and digest insects.

Plant Structure and Function PBS LearningMedia

http://www.pbslearningmedia.org/content/tdc02.sci.life.stru.lp_plants/

In this lesson, students take part in multiple activities to learn how the structure of different plant parts relates to their function. They explore how plants rely on seed shape, flower structure and leaf shape to help the plant survive and thrive.

Nanotech Will Teach Us Plants' Secrets PBS LearningMedia

<http://www.pbslearningmedia.org/content/f8cbbd83-7402-42bb-93df-383b55443d89/>

Listen as Harvard chemist George Whitesides explains how nanotechnology can teach us about plants. Whitesides says that to understand a plant, you have to look inside its cells.

Discuss the Lost Manzanita story on the QUEST blog QUEST

<http://science.kqed.org/quest/2011/01/19/15-months-later-rediscovered-san-francisco-plant-thrives/>

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The Bay Institute
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California Academy of Sciences
www.calacademy.org

Chabot Space and Science Center
www.chabotspace.org

East Bay Regional Park District
www.ebparks.org

Exploratorium
www.exploratorium.edu

Girl Scouts of Northern California
www.girlscoutsnorcal.org

Golden Gate National Parks Conservancy
www.parksconservancy.org

The J. David Gladstone Institutes
www.gladstone.ucsf.edu

Lawrence Berkeley National Laboratory
www.lbl.gov

Lawrence Hall of Science
www.lawrencehallofscience.org

Monterey Bay Aquarium
www.mbayaq.org

Monterey Bay Aquarium Research Institute
www.mbari.org

Oakland Zoo
www.oaklandzoo.org

Stanford University's Woods Institute for the Environment
<http://woods.stanford.edu>

The Tech Museum of Innovation
www.thetech.org

UC Berkeley Natural History Museums
<http://bnhm.berkeley.edu/>

MORE EDUCATIONAL RESOURCES FOR USING QUEST MULTIMEDIA TO ENHANCE 21st CENTURY SKILLS IN TEACHING AND LEARNING

Why Use Multimedia in Science Education?

<http://science.kqed.org/quest/files/downloads/2011/06/QUESTWhyMedia.pdf>

- Read about the importance of using multimedia in the 21st century science classroom.

How to Use Science Media for Teaching and Learning

<http://science.kqed.org/quest/files/downloads/2011/06/QUESTMediaTips.pdf>

- A collection of tips, activities and handouts to actively engage students with multimedia.

Science Multimedia Analysis

<http://science.kqed.org/quest/files/downloads/2011/06/QUESTMediaAnalysis.pdf>

- Give your students the tools to recognize the purposes and messages of science multimedia.

Create Online Science Hikes with Google Maps

http://science.kqed.org/quest/files/downloads/2011/06/QUEST_ExplorationCreation.pdf

- Do you like the science hike Explorations on the QUEST site? Use this place-based educational guide to create similar science-based maps with youth.

Media-Making Toolkit for Science Education

<http://science.kqed.org/quest/education/media-making-toolkit/>

- Are you interested in integrating media making into your classroom or science education program? Find instructions, worksheets and rubrics for implementing simple media-making projects with students.

OTHER WAYS TO PARTICIPATE IN QUEST

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KQED Channel 9

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