Albino Redwoods, Ghosts of the Forest Educator Guide

A resource for using QUEST video in the classroom

Watch it online http://www.kqed.org/quest/television/science-on-the-spot-albino-redwoods-ghosts-of-the-forest | 6:49 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. (f, g) Plants use carbon dioxide (CO_2) and energy from sunlight to build molecules of sugar and release oxygen; plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide (CO_2) and water (respiration).

Grade 7
Cell Biology (Focus on Life Sciences)
1. (d) Mitochondria liberate energy for the work that cells do and chloroplasts capture sunlight energy for photosynthesis.

Genetics (Focus on Life Sciences)
2. (e) DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

PROGRAM NOTES

Exactly why they survive is a mystery, but hidden among the giant redwoods deep in California's redwood forests are small albino redwoods. Very few of these pale, ghostlike trees exist and none grow very large, yet somehow they continue to survive. Join **QUEST** on a visit to Henry Cowell Redwoods State Park to examine these unusual forest phantoms.

In this segment you'll find…

- an explanation of how albino redwoods differ from regular redwoods.
- information about photosynthesis and genetic diversity among redwood trees.
- that scientists don't yet know why albino redwoods exist.

TOPIC BACKGROUND

As happens in humans or animals, albinism in plants is caused by a lack of pigment. In the case of redwood trees and other plants, the pigment missing in an albino is the green pigment chlorophyll. In a normal plant, chlorophyll is what absorbs sunlight and makes it possible for the plant to convert carbon dioxide and water into oxygen and glucose during the process of photosynthesis. This is how a plant gets the nutrients needed to grow and develop. Because they lack chlorophyll, albino redwoods have creamy white, waxy leaves rather than green ones. The lack of the green pigment also forces these ghostly trees to find a new way to obtain nutrition, as they are unable to convert sunlight into food. Instead, these trees grow naturally grafted onto the roots of other, normal redwood trees. With their roots piggybacked on to those of a normal redwood, they are able to steal some of the green redwood's abundant nutrients. Their ability to survive makes albino redwoods a rarity among conifers, possibly the only exception to the rule. It is thought that other types of conifer trees may produce some albino mutants; however, albino redwoods are the only kind of albino conifer to survive to maturity. In other conifers, these albinos die before they have a chance to develop. Despite this ability to reach maturity, albino redwoods are still a relatively rare sight. Only a few dozen or so are known to exist, and those that have been seen in nature are most often found in the darkest parts of old-growth forest regions.

Redwood trees are typically recognized for their awe-inspiring height. It's common for a normal redwood tree to grow to over 300 feet tall. In fact, the "Hyperion" redwood, recorded as the world's tallest living thing after its discovery in 2006, is a towering 379.1 feet. However, unlike their enormous green cousins, albinos, with their limited food source and lack of chlorophyll, never reach the heights of a regular redwood tree. Of those recorded, none have been taller than 60 feet. Despite their rarity, albino redwoods make appearances in Native American legends and ceremonies. One group that lived in Northern California—the Pomo Indians—is known to have used albino redwoods in their tribal cleansing ceremonies.

VOCABULARY

Albino
a person, plant or animal lacking any pigmentation or coloration

Chlorophyll
any of a group of green pigments found in the chloroplasts of plants and other photosynthetic organisms

Chromosome
a threadlike linear strand of DNA and associated proteins in the nucleus of eukaryotic cells that contains all or most of the genes of an organism

Genetic Mutation
any alteration in the inherited nucleic acid sequence of the genotype of an organism

Germinate
the process by which a plant or fungus emerges from a seed or spore and begins growth

Old Growth
forest or woodland having a mature or overly mature ecosystem more or less uninfluenced by human activity

Regenerate
the regrowth by an animal or plant of an organ, tissue or part that has been lost or destroyed

PRE-VIEWING

- What do you know about albinos and albinism?
- How do you think albino redwood trees differ from other redwood trees?

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.

- How do albino redwoods differ from other redwoods?
- Why is there so much genetic diversity among redwood trees?
- Why is it unusual to find baby redwood trees in a redwood forest? What makes it difficult for them to grow there?
- Think about what you know about redwood trees. Why do you think albino redwoods occur?

For all media see:

- Segment Summary Student Sheet
  http://www.kqed.org/quest/downloads/QUEST_SegSum_StudentSheet.pdf
- Personal Response Student Sheet
  http://www.kqed.org/quest/downloads/QUEST_PersResp_StudentSheet.pdf

LESSON PLANS and RESOURCES from QUEST, PBS and NPR

Redwoods: A Walk Among the Giants NPR
http://www.npr.org/templates/story/story.php?storyId=1529854
This December 3, 2003, story from NPR's **Morning Edition** follows reporter Ketzel Levine as she walks among redwood trees in Humboldt Redwoods State Park and the Avenue of the Giants.

Illuminating Photosynthesis PBS
http://www.pbs.org/wgbh/nova/methuselah/photosynthesis.html
This interactive feature takes a look at the carbon dioxide/oxygen cycle and the process of photosynthesis.

Molecular Level of Genetics Teachers' Domain
http://www.teachersdomain.org/resource/tdc02.sci.life.gen.moleclevgen/
Learn about the molecular processes of DNA replication and protein synthesis in this article written by Dennis O'Neil.

Redwoods at Redwood National Park Teachers' Domain
http://www.teachersdomain.org/resource/etv08.sci.life.oate.redwood/
Take an exploratory journey through the Redwoods at Redwood National Park to learn all about these amazing trees in this video segment from **NatureScene.**

Photosynthesis Teachers' Domain
http://www.teachersdomain.org/resource/tdc02.sci.life.stru.photosynth/
This video segment from **NOVA** offers students a better understanding of photosynthesis, the process by which plants use the sun's energy to create their own food.

Discuss the Albino Redwoods story on the QUEST Blog QUEST
http://www.kqed.org/quest/blog/2010/08/26/producers-notes-for-science-on-the-spot-albino-redwoods-ghosts-of-the-forest/

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www.parksconservancy.org

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

Lawrence Berkeley National Laboratory
www.lbl.gov

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www.lawrencehallofscience.org

Monterey Bay Aquarium
www.mbayaq.org

Monterey Bay Aquarium Research Institute
www.mbari.org

Oakland Zoo
www.oaklandzoo.org

The Tech Museum of Innovation
www.thetech.org

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

U.S. Geological Survey
www.usgs.gov

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

Why Use Multimedia in Science Education?
http://www.kqed.org/quest/downloads/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://www.kqed.org/quest/downloads/QUESTMediaTips.pdf

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

Science Multimedia Analysis
http://www.kqed.org/quest/downloads/QUESTMediaAnalysis.pdf

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

Create Online Science Hikes with Google Maps
http://www.kqed.org/quest/files/download/52/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.

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