

Article

## White Wonders

Albino redwood trees survive with unique adaptations

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A walk through Felton, California’s Henry Cowell Redwoods State Park reveals many wonders. On the Redwood Loop Trail, moss clings to the trunks of Douglas fir trees like green leggings, while a mushroom fills a crack in a tree like caulking.

But it’s a bushy, mostly brown tree with snow-white needles that draws the attention and fascination of scientists.

The [shrub-like vegetation](#) is actually an [albino](#) coast redwood tree. At some times of the year, albino redwoods have distinct white needles. During the winter, they have a good amount of brown foliage.

While looking at an albino redwood, University of California at Santa Cruz plant [physiology](#) professor Jarmila Pittermann points out a thin, healthy-looking [coast redwood](#) nearby. Pittermann is researching the structure and function of albino redwoods.

“The albino plant behaves a lot like a [parasite](#), because it’s dependent on the parent plant for everything,” she says.

The healthy parent tree towers high above the albino redwood, which is just about a meter (3 feet) tall. The albino tree is attached to the parent tree at the [roots](#). It gains all its [nutrients](#) from the parent tree, even though the parent tree uses most nutrients itself.

“They [albino redwoods] definitely have much slower growth rates,” Pittermann says. “It appears they just eke out a living.”

It’s not just the color of the albino redwood’s needles that are different from their green counterparts. “I would say the leaves are softer, thinner, less waxy, a little more bendable,” Pittermann says.

Albino redwoods lack [chlorophyll](#), the green [pigment](#) in plants. Without chlorophyll, albino redwoods are unable to engage in [photosynthesis](#). Photosynthesis is the conversion of light into chemical energy that is the basis of a plant’s life. Most plants are [producers](#), meaning they produce their own food. Albino redwoods, which cannot produce nutrients, are parasites, depending on the parent tree for life.

Pittermann finds it amazing that the albino trees have adapted to survive without chlorophyll and photosynthesis.

“We are trying to understand ‘What does this mean for the function of the plant?’,” she says.

## Counting the Albinos

Joining us on our walk is Henry Cowell Redwoods State Park docent Dave Kutty, who is attempting to locate all of the albino redwoods in the nearly 7,689-hectare (19,000-acre) park. As we wander towards the next albino redwood, Kutty says that he has discovered eight specimens within the park during the last five years.

Approximately 60 albino redwoods exist in California, from Humboldt in the north to Big Sur in the south. However, new specimens are still being discovered.

“We just don’t know the extent of albinism in California redwoods,” Kutty says.

“I would say dozens [of albino redwoods exist] conservatively,” Pittermann says.

The next albino redwood we arrive at is much taller, almost four meters (12 feet) high. It also has more white leaves, which makes it look a bit like an artificial white Christmas tree.

“It’s the biggest pure albino here,” Kutty announces.

Staring at the unique tree, Pittermann recalls the first time she came across an albino redwood. “I was really amazed,” she says. “I didn’t know they would be as vigorous as they were. To see something like this was a bit of a revelation.”

Kutty also remembers his first sighting of an albino redwood within a section of the park [adjacent](#) to Roaring Camp Railroads, a tourist train that winds through the redwood forest to Santa Cruz’s Beach Boardwalk.

He thought the trees had been unnaturally colored. “I thought, ‘Wow, they sprayed it with something’,” Kutty says.

## Valuable Mutations

A year and a half ago, Pittermann began her research on albino redwoods. The [initial](#) phase of her work with albino redwoods will conclude in the summer of 2011. “We want to learn how well they transport water and if they transport water faster than green ones,” she says.

Pittermann is not the only scientist trying to untangle the mysteries of the ghostly trees. Over at Stanford University’s School of Medicine in Palo Alto, California, the director of the DNA Sequencing Program, Ghia Euskirchen, is comparing samples of albino redwoods and regular green redwoods.

Like Pittermann, Euskirchen believes the albino redwoods, which she says are mutants, are at a disadvantage because they lack chlorophyll.

“One reason that the albinos can survive at all is that they are attached to the green tree and receive support from the green parent tree,” she says.

While Euskirchen is intrigued by albino redwoods, she hopes to use the mutants to learn more about the [genes](#) of regular redwood trees. “Although we are interested in the albino plants, the bigger picture is really looking at the redwood and their [genome](#) and [inventorying](#) its genes,” she says. “Because although there is a certain amount that is known about the [redwood ecologically](#), precious little is known about the trees on a molecular and genetic basis.”

As I wander back towards the parking lot with Kuty and Pittermann, Kuty explains how having a variety of redwoods in the park—including albinos—could help the plant’s ultimate survival in the region.

“[A variety of trees] means a simple **virus** coming through here wouldn’t kill them all,” Kuty says.

Kuty admits that an even bigger threat to albino redwoods in the park could be the park’s human visitors, who might want to collect an albino redwood branch as a **souvenir** or conversation-starter.

“All it takes is one visitor in 1,000,” Kuty says, “and we have no albino redwoods at all.”

## VOCABULARY

| Term                  | Part of Speech   | Definition   |
|-----------------------|------------------|--|
| <b>adjacent</b>       | <i>adjective</i> | next to.   |
| <b>albino</b>         | <i>noun</i>      | an organism with little or no pigmentation.  |
| <b>chlorophyll</b>    | <i>noun</i>      | plants' green pigment that is essential to photosynthesis.   |
| <b>coast redwood</b>  | <i>noun</i>      | tallest tree species on Earth.   |
| <b>DNA</b>            | <i>noun</i>      | (deoxyribonucleic acid) molecule in every living organism that contains specific genetic information on that organism. |
| <b>docent</b>         | <i>noun</i>      | knowledgeable guide.   |
| <b>ecology</b>        | <i>noun</i>      | branch of biology that studies the relationship between living organisms and their environment.                        |
| <b>energy</b>         | <i>noun</i>      | capacity to do work.   |
| <b>foliage</b>        | <i>noun</i>      | leaves of a plant, or the leaves and branches of a tree or shrub.  |
| <b>forest</b>         | <i>noun</i>      | ecosystem filled with trees and underbrush.  |
| <b>gene</b>           | <i>noun</i>      | part of DNA that is the basic unit of heredity.  |
| <b>genome</b>         | <i>noun</i>      | set of genes, or chromosomes, that hold all the inherited characteristics of an organism.                              |
| <b>initial</b>        | <i>adjective</i> | first.   |
| <b>intrigue</b>       | <i>verb</i>      | to inspire interest or curiosity.  |
| <b>inventory</b>      | <i>verb</i>      | to list or evaluate.   |
| <b>moss</b>           | <i>noun</i>      | tiny plant usually found in moist, shady areas.  |
| <b>needle</b>         | <i>noun</i>      | long, thin, pointed leaf.  |
| <b>nutrient</b>       | <i>noun</i>      | substance an organism needs for energy, growth, and life.  |
| <b>parasite</b>       | <i>noun</i>      | organism that lives and feeds on another organism.   |
| <b>photosynthesis</b> | <i>noun</i>      | process by which plants turn water, sunlight, and carbon dioxide into water, oxygen, and simple sugars.                |
| <b>physiology</b>     | <i>noun</i>      | study of activity in living organisms, including physical and chemical processes.                                      |
| <b>pigment</b>        | <i>noun</i>      | color.   |

|                   |                  |   |
|-------------------|------------------|---|
| <b>producer</b>   | <i>noun</i>      | organism on the food chain that can produce its own energy and nutrients. Also called an autotroph.             |
| <b>reveal</b>     | <i>noun</i>      | to make known or uncover.   |
| <b>root</b>       | <i>noun</i>      | part of a plant that secures it in the soil, obtains water and nutrients, and often stores food made by leaves. |
| <b>shrub</b>      | <i>noun</i>      | type of plant, smaller than a tree but having woody branches.   |
| <b>souvenir</b>   | <i>noun</i>      | object kept to remind someone of an event.  |
| <b>vegetation</b> | <i>noun</i>      | all the plant life of a specific place.   |
| <b>vigorous</b>   | <i>adjective</i> | active or energetic.  |
| <b>virus</b>      | <i>noun</i>      | tiny organism that lives and multiplies in a living cell.   |

## For Further Exploration

### Articles & Profiles

- National Geographic Magazine: The Super Trees

### Websites

- National Geographic Projects: Redwood Transect
- Henry Cowell State Park
- Pittermann Lab



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