



Towering Trees

Grade: 1

Subject Areas:

Life Science, Mathematics,
Physical Science

Skills: classifying,
sorting, observing,
predicting, counting,
reading

Duration: 1-2 hours

Connections:
habitat, life cycles, volume,
plants science, wildlife

Vocabulary

habitat

resprout

canopy

upper canopy

mid-canopy

piggy-back plants

fern mats

sword fern

frond

fern mat

clear cut

Objective:

Students will be introduced to an old growth redwood forest ecosystem and the animals and plants that live there.

Materials

- The book: Tell Me Tree
- a large quilt depicting the redwood forest canopy
- objects found in the redwood forest
- dozens of fern fronds
- clay or floral foam blocks
- wax paper or cookie sheets for "fern mats"
- popsicle sticks
- pictures of worms, salamanders, voles, etc.
- toy worms, beetles, spiders, etc.
- potting soil
- scissors and glue
- newspaper or other table coverings
- paper and pencils

Standards

Strands: Excellence in Environmental Education Guidelines

Strand 1 — Questioning and Analysis: F) Working with Models and Simulations: Learners understand that relationships, patterns, and processes can be represented by models.

Strand 2 — Knowledge of Environmental Processes and Systems Strand 2.2

The Living Environment: A) Organisms, populations, and communities:

Learners understand basic similarities and differences among a wide variety of living organisms. They understand the concept of habitat. **C) Systems and connections:** Learners understand basic ways in which organisms are related to their environments and to other organisms.

Strand 2.4 Environment and Society: A) Human/environment interactions:

Learners understand that people depend on, change, and are affected by the environment.

California State Educational Standards:

Life Science: 2a: Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.

2b: Students know both plants and animals need water, animals need food, and plants need light.

2c: Students know animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting.

2e: Students know roots are associated with the intake of water and soil nutrients and green leaves are associated with making food from sunlight.

Background

Meet the Giants

When it comes to tall trees, one species outreaches them all, the coast redwood. Coast redwoods (*Sequoia sempervirens*) are the tallest trees on earth. These trees are related to the big trees or giant Sequoia (*Sequoiadendron*) of the Sierra Nevada. The giant Sequoia are the largest trees by volume compared to anywhere else on Earth. Although they don't grow as tall as coast redwood, they have enormous branches and trunks. Both types of redwood trees can live over 2,000 years. As a matter of fact, *sempervirens*, the second part of the species name for redwood, means "ever-green".

Large trees are very important to forest ecosystems. They are often the dominant plant species. Their large size and variation in structure provide sources of water, nutrients and places to hide for many different organisms. Fissures, or deep grooves in their bark, cavities in their trunks, and wide strong branches can provide different habitats for different species. Simply stated, a **habitat** is a home. Even when these large trees fall over, they continue to provide places of protection, as well as sources of food and water for plants and animals for years to come. This lesson will focus on the redwood species closest to the King Range National Conservation Area (NCA), the coast redwood. Fossils of redwoods show that they were once more widespread than they are today. Millions of years ago, they used to inhabit places in Europe, Asia and Canada. Now, due mostly to climatic changes, they are confined to a narrow coastal strip located from central California to southern Oregon.

Proximity to the ocean is important for these trees because they depend on coastal summer fog as a water supply. (Redwoods can absorb water directly through their leaves).

Other features of redwoods include thick fibrous bark and the ability to resprout. Most redwoods don't reproduce easily from seeds; instead they commonly regenerate through resprouts. If they fall, get injured, or lose branches, they can resprout. (For reasons still unknown, some large tree won't resprout, however, especially after cut with a saw). Vertical resprouts of trunks or limbs are called reiterations and create complex structures unique to these forests. The thickness of redwood bark makes

them resistant to forest fires which is one of the reasons why they can live so long. Their leaves and bark are high in tannins or tannic acid. Tannins are very bitter and create acidic soils. The tannic acid makes them resistant to rot as well.

Tall forests can be broken up into three layers: the upper canopy, the mid-canopy, and the forest floor. The **canopy** of a forest is the portion above ground. The **upper canopy** refers to the upper reaches where light is more constant and temperature is greatest. Here the leaves of old growth redwoods are short and condensed in order to conserve moisture. In the **mid-canopy**, large branches reach for sunlight. Here the leaves are

Local Connection

Save the Redwoods League

The first private donation to Save the Redwoods League happened in 1918. During this time, word got out that redwoods were falling at an alarming rate. Much attention was brought to the felling of these ancient trees during the construction of the redwood highway. A few forward thinking naturalists were alarmed by the fact that not a single tree was being put aside for public enjoyment. After being completely awed by the ancient trees, they began a campaign to protect some of the most magnificent yet threatened redwood groves. The result was the establishment of Save the Redwoods League (SRL). The first dedicated grove was Bolling Grove which marked the beginning of Humboldt Redwoods State Park. Most redwood groves in Southern Humboldt were acquired in a similar fashion using private and public donations.

Today, SRL has assisted in the purchase of over 177,000 acres of redwood and redwood related lands. Over its 90 year history, it has supported restoration, scientific research, and education of redwoods. Many of the local schools have benefited by the educational outreach and support SRL offers. For more information of how to receive a grant go to: savetheredwoods.org

flat. Large branches can accumulate significant amounts of moisture and canopy soil. **Canopy soils** are formed through repeated build up of decaying leaves. The process of breaking down leaf litter is possible with the help of fungi. Build up can occur especially where there are crotches, areas where branches meet the trunk. Canopy soils, like many other soils, act like sponges. High up in the canopy, epiphytic plants, mosses, and lichens, take advantage of the increased light and moisture that occur here making a unique ecosystem.

Plants that live on top of other plants are called epiphytes or “**piggy-back**” **plants**. Two of the most common epiphytes found in redwood canopies are black huckleberry (*Vaccinium*) and leather leaf fern (*Polypodium*). The leather leaf fern forms clumps that can get quite large called fern mats. Within these mats, many animals have been found including wandering salamanders, mites, spiders, and tree voles.

Also perched in the wide fat branches of these towering giants one can find the nests of a rare and endangered bird called the marbled murrelet. This bird doesn't build much of a nest because it doesn't have to. The wide branches suffice. They are so big and wide that they supply room enough that the egg won't fall to the ground. Plus, this bird exerts a lot of energy getting food. During chick rearing, adult murrelets may travel 200 miles a day going back and forth between their nest and their food source, which is ocean fish. Other birds like Steller's jays, common ravens, western spotted owls and Vaux's swifts use redwoods for nesting as well.

The bottom layer of the forest or the forest floor receives very little light because large redwood trees shade out other plants. Plants that grow under redwoods have to find ways of living with low light levels. **Sword fern** (*Polystichum*) is usually the most abundant plant living on the

forest floor. Sword ferns can grow in large clumps. The leaflets of this fern look like miniature swords, hence the name. Many leaflets together on a fern make a true leaf called a **frond**. Other plants of the forest floor include redwood sorrel, wild ginger, salal, and huckleberry.

Movies to Science

Redwoods have been prized by people for centuries. First of all their beauty is unrivaled. Many movie sets have used the redwood forest as a place depicting pristine beauty. Portions of Star Wars, Jurassic Park and Walking with Dinosaurs! were filmed in these primordial forests. For over one hundred years, redwood has been highly prized as lumber. Large trees from old growth forests have high quality, straight grained wood which is resistant to rot and bug infestations. Much of San Francisco and other towns like Eureka were built from redwood. Local Indian tribes used many parts of the redwood trees for things such as clothing, shoes, and shelter.

Today, less than 5% of the original redwood forests remain and 1% is privately owned. This drastic reduction in habitat can be attributed mostly to logging. The frenetic period of the California gold rush brought hordes of people to the redwood region near San Francisco. Logs were used for bridges, dams and buildings. After the modernization of the twentieth century, felling trees became easier and hard to reach trees became more accessible. A housing boom following World War II accelerated the demand for redwood. Relentless logging practices continued well into the 1980's including a heavy-handed practice called clear cutting. A **clear cut** is a type of forestry practice where all trees are removed from a logged area. Fortunately, because of the far sightedness of a few dedicated people, many of the last remnants

of old growth redwood forests were preserved in parks from Santa Cruz northward.

The park with the largest area of protected redwoods joins the King Range NCA north of Redway — Humboldt-Redwoods State Park. This park got started by Save-the-Redwoods League. It has many nice hiking trails through ancient redwood forests. Here one can find the tallest grove of trees in the world. Within this tallest grove, stands the third tallest tree on Earth and the tallest in Southern Humboldt. It reaches a little over 369 feet or 120 meters high; taller than a 35 story building!

Because the old growth redwood canopy ecosystem is so unique, scientific research is conducted here. Stephen Sillett, a Humboldt State professor and his fellow scientists, are discovering many unique things up in the forest canopy. The huge volume of wood, along with fibrous bark and high amounts of dead wood, allow these trees to absorb so much moisture that water can be observed flowing from them days after rain has ended. Sizable hemlock, bay and Douglas fir, take root and become epiphytes on large branches sometimes over one hundred feet up making a unique ecosystem. The mid canopy with its reiterated branches, epiphytic plant communities, and accumulation of canopy soils, begin to take on characteristics of the forest floor. Salamanders can be found 250 feet up in this canopy!

It is usually from the forest floor where people experience these massive trees. Seeing the canopy is difficult from the ground. High up, however, a new world is beginning to be revealed. With modern technology, such as strong ropes, climbing equipment, and digital cameras, scientists and cinematographers are now able to share a unique bird's eye view of these towering trees with the rest of us.

Activity 1: Exploring the Canopy

Procedure

1. Lay the decorated quilt down on the classroom floor. Have the students sit on it forming a circle around the central part of it. Read the book: *Tell Me Tree* by Gail Gibbons. Once the book is done, bring the students attention to the quilt. Begin asking questions about trees, especially old growth redwood trees. Explain to the students that they are going to learn about a special place—the canopy. The canopy is the top of a forest. It is where a lot of different plants and animals live.

2. Explain what kinds of things can be found in a redwood forest canopy ecosystem. Show them puppets of forests critters and have them place them in the appropriate place. End by talking about the large branches in the canopy and

Materials

- **The book: *Tell Me Tree* by Gail Gibbons**
- **a large quilt depicting the redwood forest canopy that can be laid down on the classroom floor or large picture**
- **objects found in the redwood forest (lichen, redwood needles, redwood cones, fern fronds from sword fern and leather leaf fern, bark, puppets of animals, etc.)**

how the can collect canopy soil. Describe to them what a fern mat is and tell them that they are going to make a model of a fern mat as a class in the next activity. Once they explore the canopy, reinforce the fact that redwood trees are very very tall and can grow to be very very old. (Give the students a break while Activity 2 is being set up)

- *Where is the trunk of the tree?*
- *What do we see when we look at the trunk of a tree? (show some bark)*
- *How can we describe the texture of redwood tree bark?*
- *Where is a branch?*
- *Do you think the branches of old redwood trees are large?*
- *Would the branch be large enough for you to stand on?*
- *Would the branch be large enough for you to stretch out on?*
- *What types of things grow on the branches of large redwood trees?*
- *Where are the seeds of a redwood tree found? (show a cone)*
- *What does a seed need to grow?*
- *Do all plants need these things?*
- *Where do you think there is more sunlight: at the top of trees or at the bottom of trees?*



Activity 2: Canopy Soils and Fern Mats

Preparation

For fern mats: Roll out clay to make about 4 fern mats depending on the size of the class. Each clay layer should be about 2 inches thick and the size of a paper plate.

Procedure

1. Divide the students up into groups of 3-6 people. Because the glued animal pictures need to dry for a few minutes, start with these. Have the students cut out pictures of voles, salamanders, squirrels and other forest animals. Next have them glue their pictures onto a popsicle stick and set them aside. While the glue is drying, separate the fern fronds out so that each student can have several. Begin by spreading potting soil onto the clay. Next, press several fronds

Materials

- dozens of fern fronds
- clay or floral foam blocks
- wax paper or cookie sheets for “fern mats”
- popsicle sticks or other thin sticks
- pictures of worms, salamanders, voles, etc.
- toy worms, beetles, spiders, etc.
- potting soil
- scissors and glue
- newspaper or other table coverings
- paper and pencils

into the clay tightly together so they are clustered to make a model of a fern mat. Once the “mats” are made, have the students add their pictures and toy animals to it.

2. After both activities have

been performed, have the students share what they have learned during today’s activities. Many good extensions can be performed during the following days to reinforce various components of a redwood forest. (see the list below)

Extensions

- Model epiphytes by playing piggy back.
- Using chalk, measure out 370 feet. This is the height of the tallest trees. Have the students find out how many “kids” it takes to reach this height by laying head to toe. Students can also count this distance using number of steps.
- Draw a large branch on the playground. Have a contest to see how many students can fit on the branch before some fall off.
- Sing songs about trees and the forests in which they live.
- Take a field trip to a redwood forest exploring the many fascinating features they have to offer.

References

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- Bourne, Joel. K., Forests in the Air, National Geographic Magazine, pg. 54-55, October 2009
- Coast Redwood: The Tallest Trees in the World, <http://www.savetheredwoods.org>, 2010
- Dewitt, John B. California Redwood Parks and Preserves, Save-the-Redwoods League, 1985.
- Gibbons, Gail, Tell Me, Tree, All About Trees for Kids, 1st edition, 2002
- Sillett, S., Van Pelt, B., Trunk Reiteration Promotes Epiphytes and Water Storage....., Ecological Monographs, 2007, pg. 335-359

FOSS Connection

Grades 1-2

Life Science: New Plants

Alternative Module: Plants and Animals





<http://www.humboldt.edu/redwoods/photos/redwood.php>