

LESSON 3



THE CALIFORNIA FOREST
FOUNDATION

Wonderful Wood: Nature's Most Adaptable Renewable Resource

This lesson can be completed in the classroom or at home. Your teacher will explain to you how to participate in assignments and group discussions if you are completing the lesson at home.

Today's Topic: Wood and What It's Used For

Introduction to California's Wood

Watch the video, [Wonderful Wood: Nature's Most Adaptable Renewable Resource](#), to start your exploration of wood and the things that are made from it. As you watch, pay attention to all the different kinds of things that can be made from wood. Also take note of how harvesting and thinning of trees creates a healthier forest. Discuss with your class ways to protect the forests and their wood supplies, while still making the products people need.

Read and Respond

Read the passages below about the aspects of wood, then discuss with your group what you learned. Follow your teacher's instructions about how to be part of these group discussions.

Things Made of Wood

Wood is an important resource. Take a look around you. How many things do you see that are made from wood?

Your list might include chairs, tables, paper, or even a bookshelf. Wood is so common that you probably do not think about it much, but wood is an amazing material! People have been using wood to build things for thousands of years. Wood is a **renewable resource**. A renewable

resource is a resource that remains available for use in the future and at levels not lessened by how it is used in the present. As long as forests are managed properly, wood will be available to use.

Wood comes from trees. Many parts of California are covered with dense forests. These forests have many kinds of trees, most of which can be harvested to produce wood and wood products. Wood is the part of the tree under the bark. Wood has many uses. Removing some of these trees for products we use is a sustainable way of managing the forests. This is different from the products used to make plastics because the forests regrow.

Most houses in California are made of wood. Have you ever seen a new house being built? The first step is to pour a foundation for the house. Next, the basic frame of the house is put up. This frame is made of wooden beams. These beams form the shape of the house. Once the frame is built, it is covered with flat sheets of wood. These sheets make up the outside walls. Since wood is a natural substance, it can be damaged by the weather. To protect it, the house will be covered with other materials, like vinyl siding, stones, bricks, or wood shingles.



A Wooden Building Under Construction

Image Credit: paulbr75

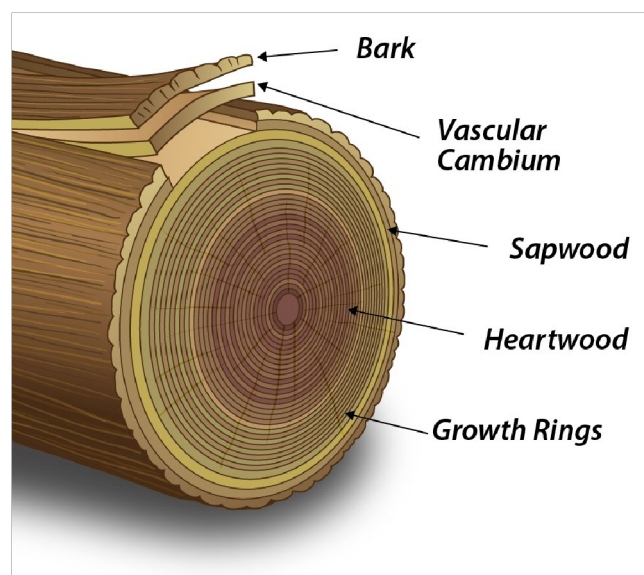
Wood is used to build more than just buildings. Furniture is made from wood. Decorative pieces, picture frames, instruments, toys, and many other things are also made from wood. Wood has been used for a very long time, but we are still finding new ways to use and improve

wood! Science is working on ways of improving wood. **Nanotechnology** is a part of science and technology that focuses on very small particles to see how they can be combined to do new and helpful things. Many areas of science like chemistry, biology, physics, and engineering are using nanotechnology to make improvements to common items—even wood! One of the ways science is using nanotechnology to improve wood products is to make it lighter and stronger at the same time. This could help by making things like paper and lumber less expensive to produce. **Lumber** is a type of wood that has been processed into beams or planks to make it ready to use for building. Technology could also increase or change the ways in which wood can be used.

Nanotechnology is also being used by scientists to study the parts of tree and plant cells that make them strong. Plant cells have a rigid structure that surrounds the cell called a **cell wall**. These cell walls are made of a sugar called **cellulose**. Cellulose gives plant cells strength and is often the part of wood that is used to make paper products. Scientists are now researching how these tiny cellulose particles can be added to wood products to make them even stronger. They are adding them to fabrics and plastics too. This opens up whole new ways of using wood. In addition to lumber used to build houses, it can be applied to electronics, sensors, and even some medicines.

Anatomy of Wood

Have you ever taken a close look at the trunk of a tree? You may have noticed the rough bark that covers the trunk. But have you ever looked beneath the bark?



Parts of a Tree trunk

Image Credit: USDA

If you look inside the tree you will see many different structures. Each of the structures you see has a purpose.

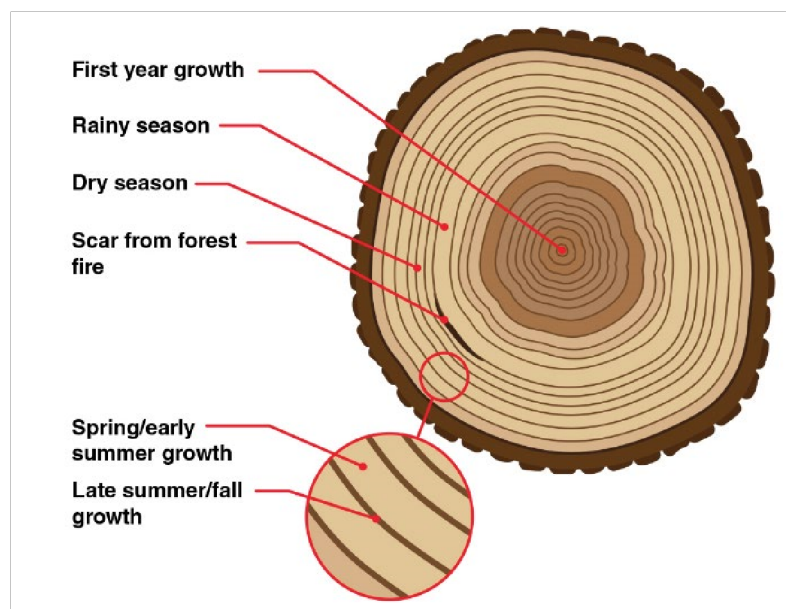
Bark - It has an outer layer of dead cells. It also has an inner layer of living ones that are dividing. Bark protects the tree. It works to keep insects out. It also helps to stop the inside of the trunk from drying out.

Vascular Cambium - This layer lies beneath the tree bark. It is responsible for making the woody tissue that forms in branches, stems, and roots.

Sapwood - This is the living, outermost part of the woody stem. This part of the tree is usually lighter in color and brings water up the tree and sugars down from leaves to the roots.

Heartwood - This is the dead, inner part of a woody stem. It makes up most of the wood seen in a cross-section and is generally darker in color.

Growth Rings - It looks like the wood has rings to it. Each of these rings shows one year of the tree's growth. Each ring has thin-walled cells (the paler wood) and thick-walled cells (the dark circular lines). A new layer of wood is added each year in a very thin region between the inner bark and the sapwood.



Growth Rings in a Tree

Image Credit: NASA

The rings of a tree trunk can be used to determine the age of the tree. The rings also show what the weather was like over the years the tree was growing. Trees add new rings every year. Counting them can tell you how old the tree is. The thickness of each ring tells what the weather was like. Thin rings suggest there was not a lot of water or nutrients in the soil available for the tree to grow, or that the forest was too dense for trees to grow rapidly. Thick rings show the tree had access to a lot of water and nutrients in the soil, perhaps by being spaced far apart to permit rapid growth. The rings also provide clues as to what the climate was like during the life of the tree. You can learn more about forests and climate in our lesson “Climate and the Forest.”

Wood and Management of the Forests

There are a lot of trees in California's forests. Trees are a valuable resource. It is important that people carefully manage the forests and their resources that come from forests. Sometimes forests have so many trees that they become unhealthy and more susceptible to wildfire. Sometimes trees are harvested from forests to help manage them. The wood from the trees that are cut down is not wasted. Some parts are left to serve as habitats for wildlife, while others help to promote soil health. The large trunks can be used for making lumber or other wood products. The smaller branches are turned into wood chips for landscaping or production of biomass energy.

Forests are also affected by fires. When forest fires happen, the flames can spread easily when trees are too close together. To try to stop the forests from being destroyed this way, forest managers take down certain trees on purpose. This process is called **forest thinning**. Managers remove dead trees that can burn very easily. They also try to thin out the forests by making more space between groups of trees. This way, should one tree catch on fire, the flames will not spread as easily to the other trees. This way of managing the forests works well to protect them. You can learn more about how fires affect forests in our lesson “Fire and California Forests.”

Forest thinning is not an excuse to cut down more trees. It serves a very important purpose in protecting the forests and their valuable resources, including wood and wildlife habitat. You can learn more about managing forests in our lesson “Healthy Forests, Healthy Planet.”

Using Wood Can Help the Environment

Wood is used for many things. What's amazing is that using wood can help the environment.



- **Wood is better for the environment.** Burning it releases less greenhouse gases than other sources of fuel. And, using wood instead of steel and aluminum for buildings uses less energy and produces less greenhouse gases.
- **Wood improves how energy efficient a building is.** Wood is an **insulator**. This means it traps heat. The cells that make up wood tissue have tiny pockets around them that trap heat. This keeps structures made of wood warmer during the winter months and cooler during summer months.
- **Wood is a great storer of carbon.** Wood helps to reduce the impacts of carbon in the atmosphere. Trees take carbon dioxide (a greenhouse gas) out of the air. Trees use carbon dioxide to make food for themselves. Wood is also a natural resource.
- **Using wood helps keep forests healthy.** When we properly manage forests and replant trees to replace trees that get cut down, forests remain a renewable resource.
- **New sources of wood can always be grown.** This makes using wood a sustainable and dependable source of material.
- **The removal of mature trees in timber production areas makes space for new trees to grow.** Some mature trees are kept to serve as homes for wildlife and to help protect nearby streams. This helps to stabilize the ecosystem.

Research

Who Owns and Manages California’s Forests?

More than 30% of California’s land is forested. California forests may be managed by the federal government, like Sequoia National Park, but they may also be run by the state, other public entities, or private organizations. There are many forests in California owned by Native American tribes. Some forests are even owned by individual people. Use the data or websites provided by your teacher to fill in how much of California’s forests are owned by each group.

- _____ % of California forests are national forests.
- _____ % of California forests belong to the State of California.
- _____ % of California forests belong to Native American Tribes.
- _____ % of California forests belong to industry (businesses).
- _____ % of California forests belong to individual people.

National forests belong to everyone—including you! People most often use these areas for recreational activities. Hunting, hiking, fishing, and camping are all activities that people can enjoy in national forests. One-third of the national forests are designated as timberland

available for harvesting. Harvesting can improve the health and resiliency of our watersheds. We remove some trees so the ones we leave can thrive. The types and number of trees that can be removed at one time is something that is controlled by the federal government. National forests are managed by the laws and practices set by Congress to “provide the greatest good, for the greatest number (of people), for the long run.”¹

California state-owned forests belong to the State of California. As with national forests, the state uses its forests to provide recreational activities like hunting, hiking, bird watching, camping, fishing, and canoeing. Harvesting can also happen in state-owned forests.

There are several Native American tribes that own and manage California forests. Some of these include the Klamath, Yurok, Karuk, and Hoopa. The ancestors of these indigenous peoples used forests as a source of food and shelter. They would also work to manage the forests to keep them healthy. They would set fires on purpose to promote new shoots on shrubs. This also kept the forest floor clear to reduce surprise attacks from other tribes. The forests remain an important part of Native American tribal heritage and culture. Today, Native American tribes continue to manage the forests using controlled burning.

Some California forests are owned by large companies. The management of these areas is up to the company. Most of the time, management of the forests is done by the owner or a board of directors. A board of directors is a group of people who help make decisions for a company. The company still has to follow rules about how they can use a forest. The California State Board of Forestry sets the rules. These rules state that companies using their forests must have a plan to make sure they do not overuse the forest resources. There are other groups that decide whether or not companies are using their forests responsibly. Companies that own forests usually manage their land for wood products, habitat conservation, water quality, and other activities.

Lastly, some of California's forests are owned by individual people. These people own the land that has the forest on it and may even choose to build their homes there. Many people use their forests for hunting, hiking, camping, and other recreational activities. Forest owners must be aware of local and state laws that say how the land can be used. Because these areas are privately owned, they are not under the same rules as those owned by large companies.

Design Something Out of Wood

Make a list of items in your house that are made from wood or contain wood products. These can be things you use every day, or things you have seen or read about in books.

Many objects are made from wood or have been made from wood in the past. Think about the objects that you use every day. How many are made of wood or could be made from wood?

1. Choose an object. Everyday objects work best, like cups, silverware, shoes, toothbrushes, etc.
2. Draw a new design for the object where wood or wood products are used to make it.
3. Use the websites provided by your teacher to research to find out if your object was ever made of wood in the past and if anyone is trying to make your object out of wood in the present!

Create a Food Web

The trees found in California's forests are an important part of the environment. Trees provide the wood necessary for many products used by humans and also provide shelter and food for many creatures that call California's forests home.

In order to grow, trees need energy. The primary source of all energy in an environment is the sun. Trees take in sunlight through their leaves to make sugar. This sugar is their food. This ability to make their own food using the energy from the sun makes trees **producers**. Trees also take in nutrients from the soil and soak up water with their roots to help them grow. As the tree grows taller and taller it is able to provide more wood for wood products. In addition to providing wood for harvesting, trees also provide shelter and food for the animals of the forest.

All of these living things need energy to grow and survive. Animals like deer and mice eat parts of the trees. This makes these animals **consumers**. They are specifically **primary consumers** because they are directly eating plants.

Other animals like snakes, wolves, or foxes might eat primary consumers. They are also consumers, but in this case, they are **secondary consumers**. If an owl eats a snake, the owl would be a **tertiary consumer**.

All living things eventually die and break down into nutrients found in the soil. **Decomposers** are organisms that break down dead matter. Dead matter can include dead trees, fallen leaves, and animals that have died. Decomposers help supply the soil with nutrients that help trees grow!

As one living thing eats another, energy and other matter get passed on. This passing of materials in a specific environment is called a **food web**. A forest food web relies on trees as one of its producers. Typically, energy and matter are cycled through a food web because as a living organism dies, decomposers break down the matter and supply the soil with nutrients. If a tree is harvested for its wood, usually only the stem is removed from this cycle, while the branches, leaves, and roots remain. Managing forests helps ensure that the first food web is healthy while also providing the wood necessary to make wood products.

Think about a local forest ecosystem and build a food web to represent it! First you will need to do some research on the types of trees, plants, and animals that live in California's forests. Your teacher will provide you with some websites to help you learn more.

When you are ready to begin your forest ecosystem follow these steps:

1. Get a large piece of paper and draw the sun in the upper corner. Then draw a large tree with roots in the center of the paper.
2. On the left side of the tree, draw an example of a forest food web. Include each type of consumer and decomposers in your model. Draw arrows to show how the matter and energy cycle from the Sun and through all the living organisms in the food web.
3. On the right side of the tree, draw examples of wood products that might be built using trees. Draw a single-sided arrow going from the tree to the wood products to indicate that once these products are made, the tree is removed from the food web.
4. Either on the back of your drawing or on a separate sheet of paper, write 3 to 4 sentences about how the tree fits into the forest ecosystem. In your description, include how animals, humans, and other plants might interact with the tree.

Some organisms you might include are: plants, foxes, owls, rabbits, mice, seed-eating birds, insects, spiders, toads, and snakes.

What Did You Learn?

Answer the following questions to test your knowledge.

1. Describe one advantage of using wood over using steel as a building material.
2. Which gas do forests help to remove from the air?
 - a. Nitrogen
 - b. Carbon dioxide
 - c. Oxygen
 - d. Methane
3. Fill in the blank: The _____ is the outermost layer of the tree trunk.
4. Why is wood considered a renewable resource?
 - a. It stores a lot of energy.
 - b. It breaks down very easily.
 - c. It gets used up quickly.
 - d. It can replace itself as it is used.
5. Fill in the blank: _____ is one of the ways science is improving wood products to make them lighter and stronger at the same time.

Apply to Real World

Group Activity: Discussion

Your teacher will assign you to a group to work on your activity.

¹ <https://www.fs.fed.us/greatestgood/press/mediakit/facts/pinchot.shtml>