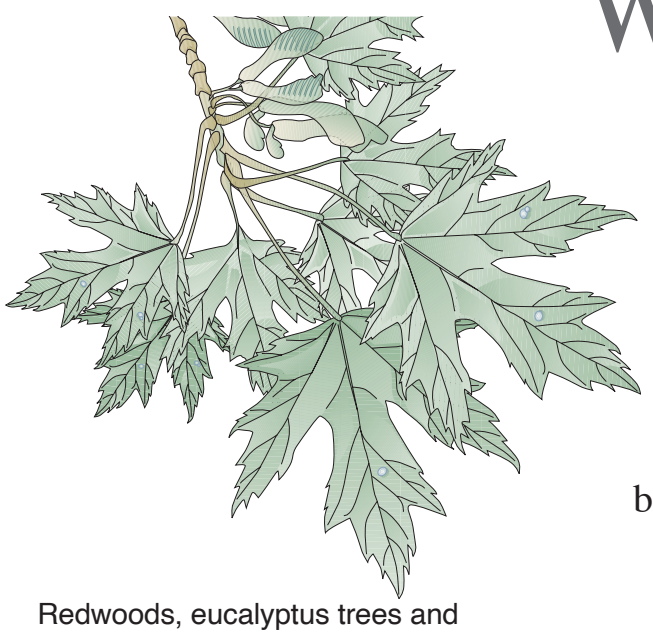
SUNDAY, NOVEMBER 3, 2024

WORLD OF WONDER
Exploring the realms of history, science, nature and technology

TREES

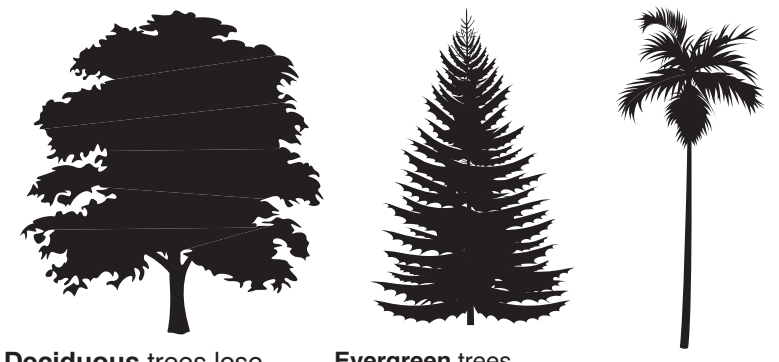


Redwoods, eucalyptus trees and sequoias can grow to be huge. The tallest tree ever recorded was a eucalyptus tree more than 430 feet (130 m) tall.

Trees are the largest plants on Earth and some of the oldest living things. Trees provide many benefits, such as helping clean the air, filtering water and providing habitats for the world's creatures. Five thousand years ago, trees covered more than three-fourths of the world's land. It is estimated that 90% of the world's original forests are gone.

Types of trees

There are several different ways to categorize trees. **Needleleaf** trees, such as pines and firs, contrast with **broad-leaved** trees like oak, maple, eucalyptus and palm. A **conifer** is any tree that produces cones, but conifers may be broad-leaved or needleleaf, deciduous or evergreen.



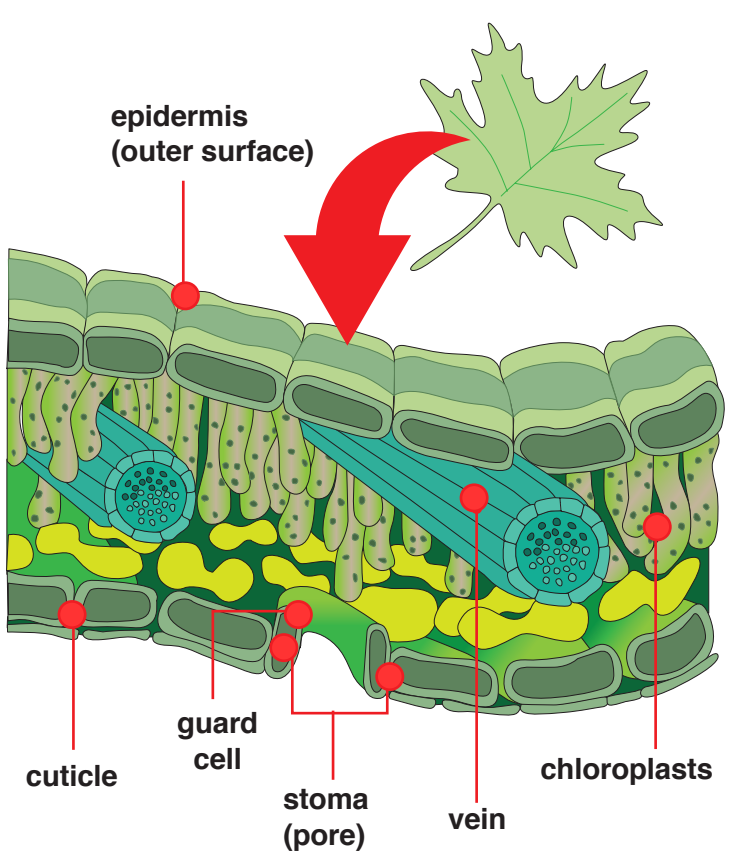
Deciduous trees lose their leaves every autumn. They are usually broad-leaved, but some have needles.

Evergreen trees keep their leaves all year round.

Tropical trees like the palm are broad-leaved evergreens.

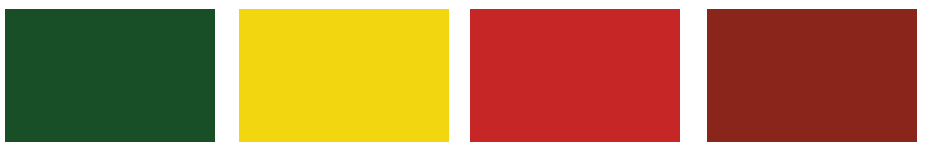
Leaves

Leaves contain many different kinds of cells. **Stomata** (the plural of **stoma**) are tiny pores on the outer surface of the leaf that take in air and release moisture. **Guard cells** protect and surround each stoma. They expand and contract to adjust the amount of carbon dioxide and water that enter and exit the leaf. Inside the spongy tissue cell layers of the leaf are small bodies called **chloroplasts**. They contain **chlorophyll**, which uses the sun's energy to split water molecules into hydrogen and oxygen, combining the hydrogen with carbon dioxide to produce simple sugars for the tree to use as food. This process, called **photosynthesis**, leaves oxygen as a biproduct, which escapes back into the air through the stomata.



The chemistry of deciduous leaf colors

Leaves change color in the fall due to changes in temperature and the length of daylight, which cause leaves to stop their food-making process. The chlorophyll breaks down, the green color disappears and the yellow and orange colors become visible, giving the leaves part of their fall splendor. The scientific word for this process is called **photoperiodism.**



Chlorophyll
Leaves produce green chlorophyll to take advantage of ample sunlight during summer.

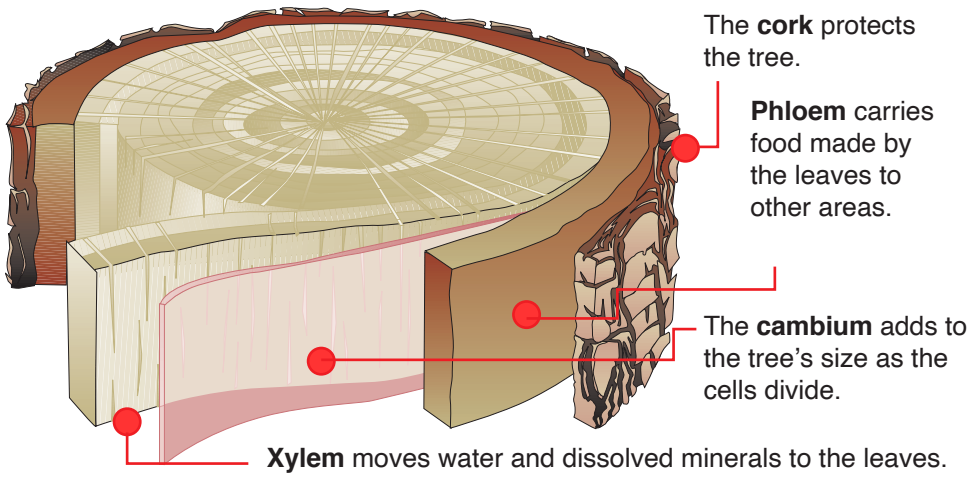
Carotenoids & flavonoids
As the chlorophyll breaks down, carotenoids and flavonoids become visible.

Anthocyanins
Some leaves contain a red or purplish pigment, anthocyanin, that becomes visible in the fall.

Tannins
Once chlorophyll and carotenoids disappear, brownish tannins (a bitter waste product) become visible.

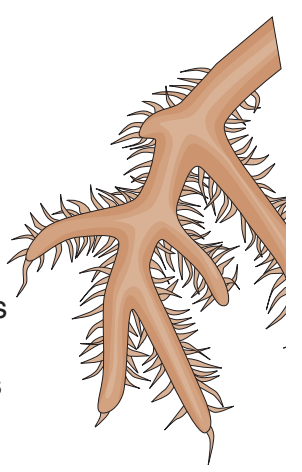
The trunk

A tree's trunk consists mostly of dead wood, but it does contain layers that form a vital life-support system. Water and minerals are carried from the roots up to the leaves through the **xylem**, a system of small tubes. The leaves then make nutrients such as sugars and starches, which travel back to the rest of the tree through the **phloem**.



Roots matter

Roots are long, underground branches that serve as a tree's anchor, keeping it standing upright. Thousands of smaller, hairlike secondary roots develop off of the larger roots, absorbing the surrounding soil's water and nutrients, which are then carried to the tree's leaves via the xylem layer of the roots, trunk and branches.

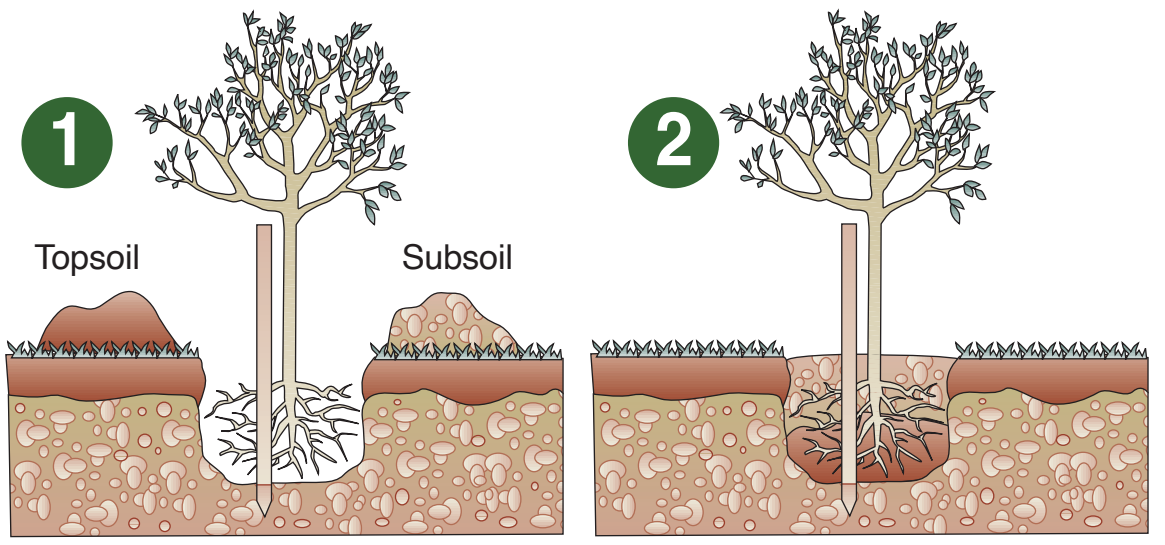


How to plant a tree

Trees are fun to plant and good for the environment. Just be sure you have permission before you plant — you don't want the roots or limbs of the growing tree to cause any property damage.

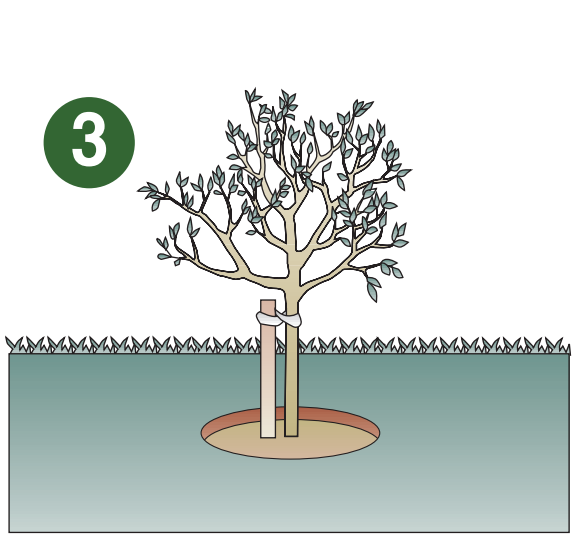
The best time to plant a tree or shrub is in the fall. This helps the root systems grow before the heat of summer returns.

Before planting, consider what types of trees will be able to thrive in the area where you want to plant. Is there enough sunlight, water and room for your tree to become full-grown? Until you are ready to plant, keep the roots moist and store your tree out of the sun so it doesn't dry out.



Carry the tree by the container (around the root ball), and not the tree trunk. Dig a hole as deep as the container and twice as wide (so that the roots can easily be spread out). It is a good idea to put topsoil and subsoil into separate piles.

Use a stake to help keep the tree straight while planting and during the tree's early growth period. Remove the container or burlap around the root ball and carefully spread the roots in the hole.



Fill the hole, first with topsoil, which is more fertile, and then add the subsoil. Pack the soil tightly and add a protective layer of mulch. Water the area around the tree right after you plant it and every day for the first few weeks.

SOURCES: World Book Encyclopedia, World Book Inc.; https://en.wikipedia.org; https://onetreeplanted.org; https://www.nationalforests.org; https://www.arborday.org; https://csfs.colostate.edu

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