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## Trees



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### The tree in relation to other types of plants

What is a tree? How are trees different from grasses, sunflowers, dandelions, and other types of plants? And what do trees have in common with shrubs and woody vines? The answers to these questions seem obvious at first. But unless you are a botanist, you may find that the answers don't come easily. Some common characteristics of trees, shrubs, and woody vines follow.

Trees, shrubs, and vines belong to many different plant families. Some are closely related, like ponderosa pine and limber pine. Others are not closely related at all, like eastern red cedar and silver maple. However, trees, shrubs, and vines all have one thing that separates them from the rest of the plant world: a woody stem that is perennial or lives for many years. Grasses and certain other plants may be perennial, but their tops are regrown year after year from rhizomes, bulbs, or other organs found at or just under the soil surface.

### Characteristics of woody plants

If you could tunnel into a woody plant's stem, whether the trunk of a tree or a twig on a shrub, you would first encounter bark, then cambium, and finally wood or xylem. Bark is the outer covering on the trunk,

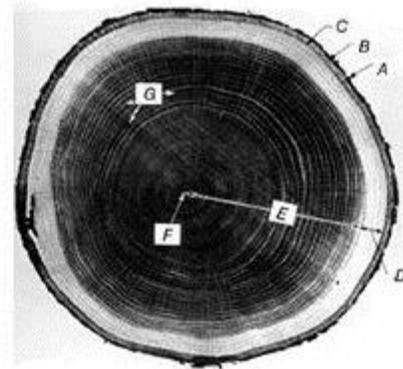
twigs, and woody roots. The familiar outer bark is a layer of dead, corky cells protecting the rest of the stem. The inner bark—or phloem—is a live, spongy layer just inside the outer bark that moves sugars and other substances from the leaves to the stem, roots, and other places where they are needed. Inner bark eventually grows out to form part of the outer bark.

New bark is constantly being made on the inside and pushed out. This is why older trunks usually have rough outer bark that peels or flakes away. Bark is highly variable, though. Young trees of most species have fairly smooth bark. To see what a tree's bark looked like when it was young, look at the young bark on upper branches and twigs.

Just inside the bark, but outside the wood, is a single layer of cells called the cambium. This layer repeatedly divides—first in, then out—to form all of the new wood and bark. Wood—or xylem—makes up everything inside the cambium on tree trunks, branches, twigs, and woody roots. Wood is made up of fibers for strength and hollow tubes of different sizes. These tubes are like straws that conduct water from the roots to the leaves. These tubes and fibers, as well as other types of cells, are packed tightly together to make the wood inside a woody plant. Cross section of a white oak tree

As woody plants grow in diameter, a new layer of wood is produced each year by the cambium. This layer is called an annual ring or growth ring. The rings in the center of a trunk or twig are the oldest and those near the outside are younger. Wide rings usually indicate good growth conditions for that year; narrow rings indicate poor growing conditions.

As a stem ages and grows, eventually some of the wood in the center is not needed for water movement. This wood dies one ring at a time, becoming heartwood. Heartwood often is filled with dark-colored substances that help it resist decay, as in red cedar's red-to-purple heartwood. The active living wood on the outside of the stem, one to many rings wide, is called the sapwood. It is usually lighter in color than heartwood. Sapwood is responsible for all water and mineral movement through the stem.



Cross section of white oak tree trunk:  
(A) outer bark (dry dead tissue), (B) inner bark (living tissue), (C) cambium, (D) sapwood, (E) heartwood, (F) pith, (G) wood rays.

### **Differentiating trees from other woody plants**

So trees, shrubs, and woody vines all have woody, perennial stems. What makes them different from one another? The distinction between trees and shrubs is not always clear. We all know that a large cottonwood is a tree and a creeping juniper is a shrub, but there are many shrub-like trees and tree-like shrubs. Though no scientific definition exists to separate trees and shrubs, a useful definition for a tree is a woody plant having one erect perennial stem (trunk) at least 3 inches in diameter at a point 4-1/2 feet above the ground, a definitely formed crown of foliage, and a mature height of at least 13 feet. This definition works well, though some trees may have more than one stem and young trees obviously don't meet the size criteria. A shrub can then be defined as a woody plant with several perennial stems that may be erect or may lie close to the ground. It will usually have a height less than 13 feet and stems no more than about 3 inches in diameter.

Woody vines are plants that have perennial stems unable to support themselves. Vines use other plants or objects to rise above the ground or they lie along the ground. Vines attach themselves to other objects

with tendrils or by twining. Though woody vines have perennial stems, these stems rarely grow very large in diameter.

Trees, shrubs, and woody vines are classified as deciduous or evergreen. If a plant's leaves stay green and alive through the winter, it is called an evergreen. Interesting examples can be found in the United States in Utah—pines, spruces, and junipers. Plants whose leaves die in autumn and fall off—such as elms, maples, and ashes—are called deciduous. In Utah, nearly all evergreen woody plants have needle-like or scaly leaves, and most deciduous woody plants have broad leaves. All vines commonly found in Utah have broad leaves and are deciduous.