

FOREST FACTS - TREE BASICS

Trees are plants with leaves, a tremendous underground root system, and stems and branches. Each part of the tree has a separate and important function.

PARTS OF TREES

Roots – The roots anchor the tree to the ground and absorb water and minerals from the soil. In a majority of Alaska trees, the roots spread horizontally rather than vertically, often reaching outward as far as the trunk reaches skyward.

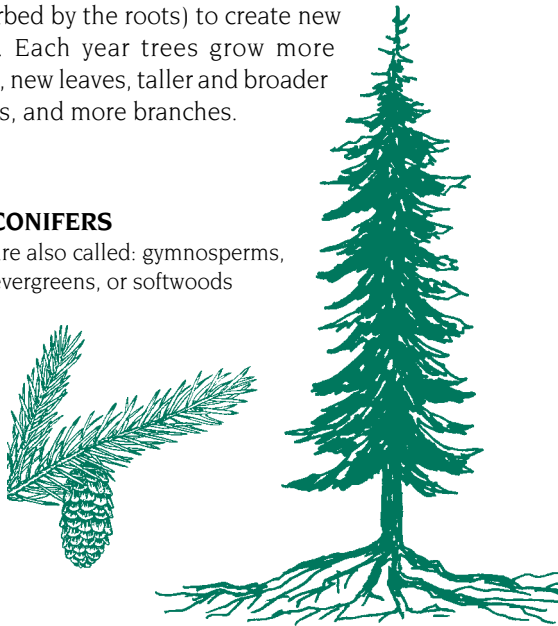
Trunk – The trunk of a tree and its branches connect the roots with the leaves. The trunk and branches are made of special cells that form long tubes for carrying water, minerals, and food between the tree's parts. Those cells also give the tree structural support.

Leaves – The leaves of a tree, like those of all plants, are chemical laboratories. They manufacture their own food by capturing light energy and combining it with air and the water pumped from the roots. This process of making food is called **photosynthesis**.

Trees use this food (along with minerals absorbed by the roots) to create new cells. Each year trees grow more roots, new leaves, taller and broader trunks, and more branches.

CONIFERS

are also called: gymnosperms, evergreens, or softwoods



TWO KINDS OF TREES

You can easily separate the two major kinds of trees by looking at their leaves.

→ If they have broad, flat leaves – the kind that press nicely for fall classroom decorations – the tree is called a **broadleaf**, **angiosperm**, and **hardwood** (although some have soft wood).

→ If the leaves look like needles – just picture a Christmas tree – the tree is called a **conifer**, **gymnosperm**, and **softwood** (although some have wood that is quite hard).

Broadleaves – Broadleaf trees have flowers as well as broad, flat leaves. Flowers on a majority of Alaska's broadleaf trees are small and green and do not look like a typical flower petal.

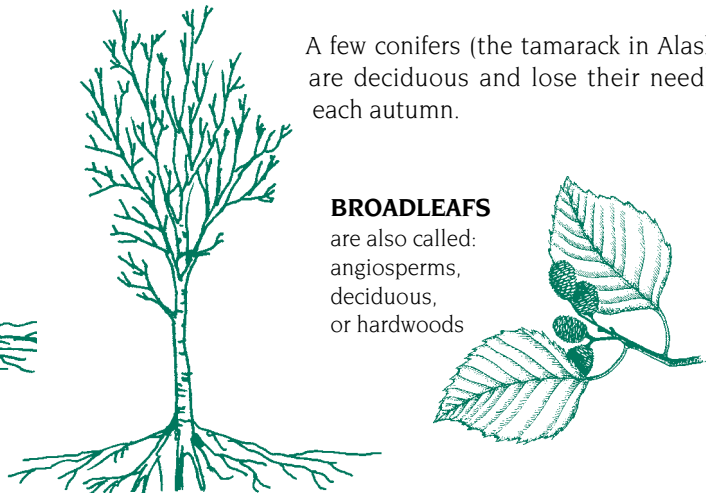
Broadleaf trees in Alaska are **deciduous**, losing their leaves in the fall. They become **dormant** as an **adaptation** to the cold and reduced daylight. (Some broadleaf trees in tropical areas keep their leaves all winter.)

Conifers – Conifer seeds grow inside **cones** rather than flowers and sometimes hang on the tree for several years. The tree's **crown** looks like a cone as well. Since conifers typically keep their narrow, needle leaves all winter they are also called **evergreens**.

A few conifers (the tamarack in Alaska) are deciduous and lose their needles each autumn.

BROADLEAFS

are also called: angiosperms, deciduous, or hardwoods



NAMING A FOREST

If a forest is mostly conifers, it is called coniferous. If broadleaves dominate, the forest may be described as hardwood. Some forests are called "mixed" when neither category of trees seems to be more abundant.



TREE TRUNKS

Trees are plants with a single large stem called a **trunk**. The trunk of a tree and its branches connect the roots with the leaves. The trunk and branches are made of special cells that form long tubes for carrying water, minerals, and food. Those cells also give the tree support.

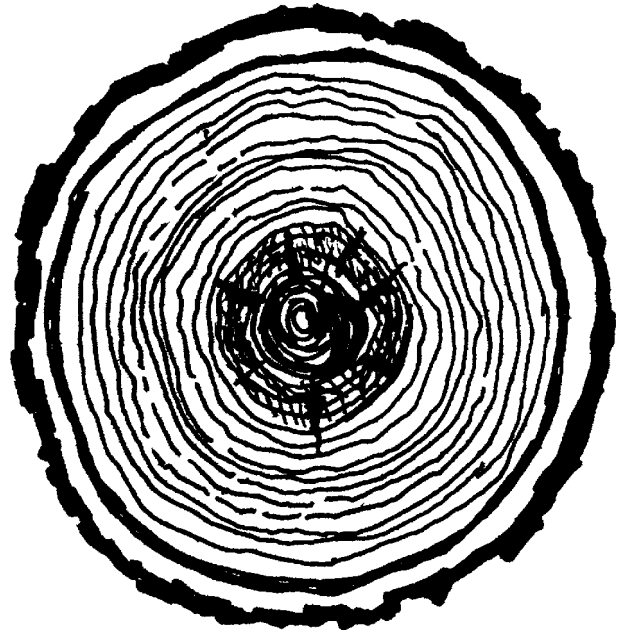
Look at a Cross-Section

A **cross-section** of a tree trunk shows multiple rings of cells. Each has a special function. The outer layer of **bark** protects the inner parts from invasion by insects and diseases, and prevents loss of water. Just inside the bark is a ring of cells called the **phloem**. Channels in the new phloem cells carry dissolved sugars and nutrients made in the leaves *down* to other parts of the tree, including the roots.

Beneath the phloem is the only growing layer of the trunk, the **cambium**. The cambium produces both the phloem cells and the next inner ring of cells called the **xylem**. New xylem cells carry water and dissolved minerals from the roots *up* to the leaves and other parts of the tree. Sometimes these cells are also called **sapwood**.

Special cells connect across the tree as well. They are called **parenchyma cells**, and their job is to carry food and water across the width of the tree.

As a tree grows, the cambium produces new rings of cells. The cells added in spring are light in color (*when more water is usually available*) and those added in summer are dark. This produces the easily visible rings in a tree trunk. One can discover the age of a tree by counting either the dark or light



rings. When we count tree rings, we are counting the year's xylem growth. New cells are produced with the food made in the leaves and with minerals absorbed by the roots.

Trees grow taller only at the tips of their trunk and branches. The region where new growth occurs is called **meristematic tissue**. Each year trees grow more roots, new leaves, more branches, and broader trunks and stems.

As a tree trunk grows, part of its cells die. The old phloem cells form bark, and the old xylem cells become **heartwood** – the center of the tree trunk. Even though its cells are dead, heartwood is rigid and strong and supports the branches, leaves, and **crown** of a tree. Most of the trunk of a mature tree is heartwood. Loggers utilize the heartwood when they cut trees for timber.

TREE LEAVES

Leaves are the food factories of trees. Leaves capture light energy from the sun and gases from the atmosphere. They combine those with water pumped from the roots to make the sugars the tree uses for food. This process of making food is called **photosynthesis**. Skinny spruce needles and broad cottonwood leaves all work as food factories.

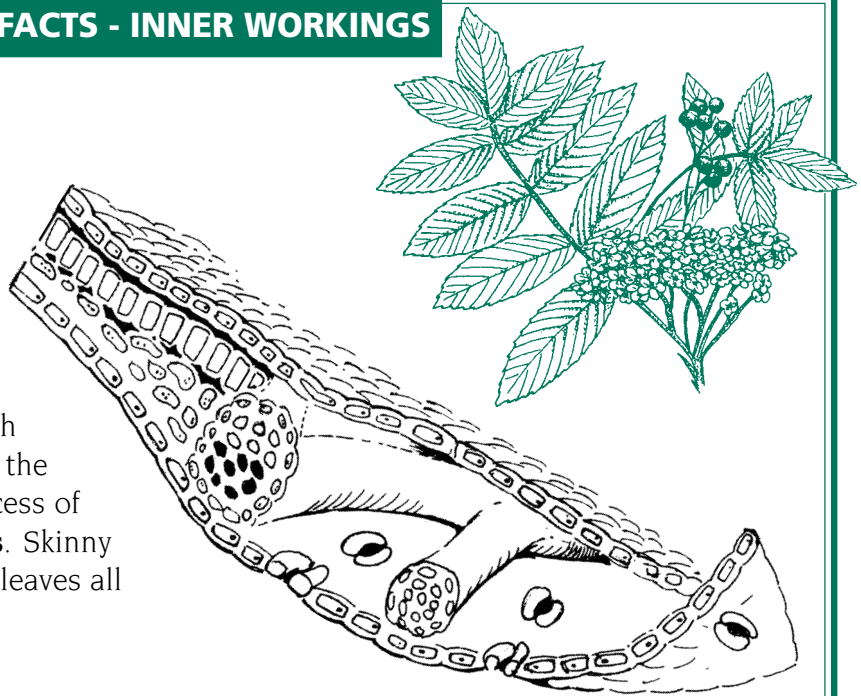
Look at a Cross-Section

A cross-section of a leaf shows several layers of cells that are organized in three systems: (1) protective, (2) food producing, and (3) transporting.

1. Protective

A protective “skin” covers the entire leaf. It has two layers: the **epidermis** and the **cuticle**. The cuticle is a waxy layer that is usually thickest in plants growing in windy or hot, dry regions. The skin lets in light, but blocks the movement of water and gases.

Little “mouths” or **stomata** in the skin on the under-side of the leaf open and close to let in carbon dioxide, release oxygen, and control the loss of water. A single leaf has many thousands of these little mouths. In most plants, the stomata open in the day for gas exchange during photosynthesis and close at night to prevent water loss.



2. Food Producing

The producing system of a leaf, the **mesophyll**, has several layers. The **palisade layer** has thin-walled cylindrical cells called **chloroplasts**. These close-packed cells contain **chlorophyll**, the pigment that absorbs light energy in photosynthesis.

Beneath the palisade is the **spongy layer** which has loose-packed, irregularly shaped cells that form large air spaces. Most gas exchange – oxygen (O₂) and carbon dioxide (CO₂) – occurs in this area.

3. Transporting

Veins transport materials to and from the leaf. The veins are tubes divided into the **xylem** and the **phloem**. The xylem carries water and minerals *up* from the roots. The phloem transports food produced by the leaf *down* to the rest of the tree.