The Life of the Forest

The Living Forest

See what tree rings tell us about the life of a tree.

A Seed Takes Root

Pictorial timeline shows how a pinecone sheds a seed and becomes a tree.

Anatomy of a Tree

See a cross-section of the inside of a tree trunk.

The forest is a complex community where trees and other plants and animals live in delicate balance. As stewards of the earth's trees, it's helpful for us to know about the growth processes of trees, their role in the forest world, and how we can improve their quality.

Trees are a renewable natural resource that can continue to provide beauty and useful products for generations to come. So how does a tree build a trunk that can live for centuries and hold the weight of many tons?

All of a tree trunk's growing is done in a thin layer of living cells the cambium that surrounds the wood. This layer creates new wood on one side of itself, and new bark on the other. This way, in effect, it moves outward, pushing the bark before it, leaving wood behind. Over the years the trunk of the tree becomes bigger and thicker as this process repeats itself each growing season.

The marvelous chemistry of life tells this layer just how many wood cells will be needed to support the leafy crown, and how much bark to build in order to protect the wood beneath it. This process, infinitely repeated, has given the world its forests. See our picture of the inside of a tree trunk to discover the functions of each layer of a tree's trunk.

You'll see how a tree ring can tell you if the tree has lived through fires, lack of rain or too much rain, and much more.

When you visit "The Living Forest" page, you'll see how the effects of the environment actually make a difference in the way the rings of a tree appear. You'll see how a tree ring can tell you if the tree has lived through fires, lack of rain or too much rain, and much more.

Graphics courtesy of International Paper

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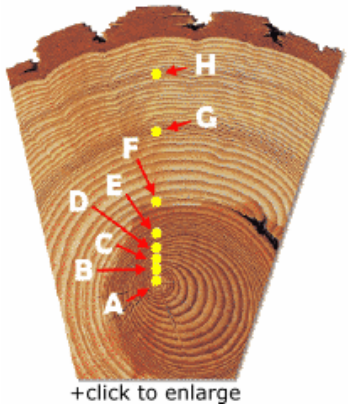

+click to enlarge

This tree is 62 years old. It's been through fire and drought, plague and plenty. And all of this is recorded in its rings.

Each spring and summer a tree adds new layers of wood to its trunk. The wood formed in spring grows fast, and is lighter because it consists of large cells.

In summer, growth is slower; the wood has smaller cells and is darker. So when the tree is cut, the layers appear as alternating rings of light and dark wood.

Click the cross section of the tree ring above to view the whole ring as it came from the tree.

Count the dark rings, and you know the tree's age. Study the rings, and you can learn much more. Many things affect the way the tree grows, and thus alter the shape, thickness, color and uniformity of the rings.

1920

A 

The tree a loblolly pine is born.

(The tiny ring at letter “A” in the tree ring section above shows us how small the seedling was when it started to grow.)

1925

B 

The tree grows rapidly with no disturbance. There is abundant rainfall and sunshine in spring and summer. The rings are relatively broad, and are evenly spaced.

1930

C 

When the tree was 6 years old, something pushed against it, making it lean. The rings are now wider on the lower side as the tree builds “reaction wood” to help support it.

1940

D 

The tree is growing straight again. But its neighbors are growing too, and their crowns and root systems take much of the water and sunshine the tree needs.

1943

E 

The surrounding trees are harvested. The larger trees are removed and there is once again ample nourishment and sunlight. The tree can now grow rapidly again.

1946

F 

A fire sweeps through the forest. Fortunately, the tree is only scarred, and year by year, more and more of the scar is covered over by newly formed wood. (Locate the black fire scar to the ring that is marked by the letter “F”.)

1958

G 

These narrow rings (at letter “G” on the tree ring above) may have been caused by a prolonged dry spell. One or two dry summers

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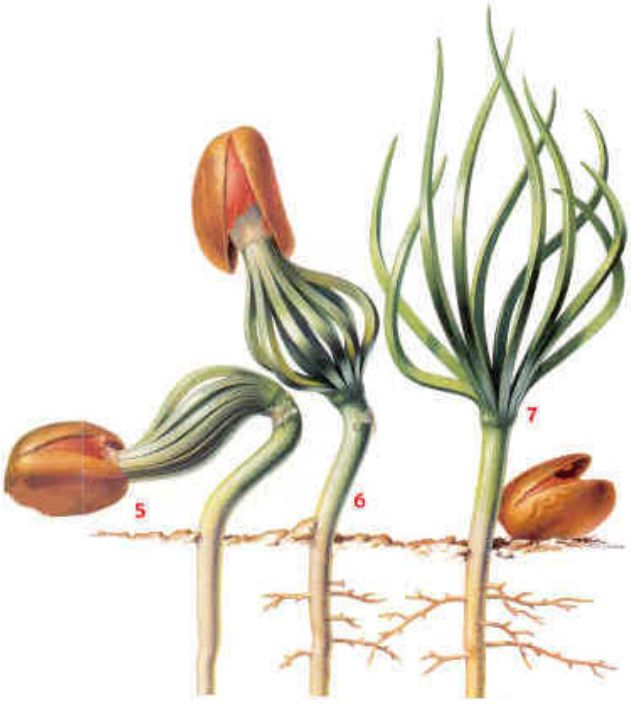
1. The embryo tree inside the seed.
2. Complete with tiny leaves, stem, and a point that will become a root, the tiny embryo tree is embedded in a food supply called “endosperm”.
3. The growing embryo splits the shell of the seed.
4. Responding to gravity —whichever way the seed lies—the root probes its way toward the ground.
5. As soon as the tiny root tip penetrates the soil, the tree is not only fixed in the ground, but is capable of absorbing water and mineral nutrients.



6. The leaves emerge from the shell and create a supply of chlorophyll. Now the tree can manufacture its own food from water in the soil and carbon dioxide in the air.
7. Hidden at the base of the leaves is the “terminal bud.” Within this cluster of actively dividing cells, all upward growth takes place.

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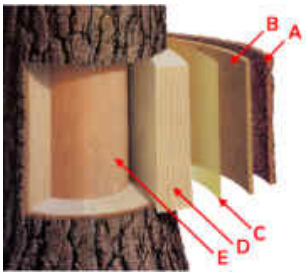
The Inside Story



A. The **outer bark** is the tree's protection from the outside world. Continually renewed from within, it helps keep out moisture in the rain, and prevents the tree from losing moisture when the air is dry. It insulates against cold and heat and wards off insect enemies.
B. The **inner bark,** or "phloem", is pipeline through which food is passed to the rest of the tree. It lives for only a short time, then dies and turns to cork to become part of the protective outer bark.
C. The **cambium cell layer** is the growing part of the trunk. It annually produces new bark and new wood in response to hormones that pass down through the phloem with food from the leaves. These hormones, called "auxins", stimulate growth in cells. Auxins are produced by leaf buds at the ends of branches as soon as they start growing in spring.
D. **Sapwood** is the tree's pipeline for water moving up to the leaves. Sapwood is new wood. As newer rings of sapwood are laid down, inner cells lose their vitality and turn to heartwood.
E. **Heartwood** is the central, supporting pillar of the tree. Although dead, it will not decay or lose strength while the outer layers are intact. A composite of hollow, needlelike cellulose fibers bound together by a chemical glue called lignin, it is in many ways as strong as steel. A piece 12" long and 1" by 2" in cross section set vertically can support a weight of twenty tons!

Leaves Make Food For the Tree

And this tells us much about their shapes. For example, the narrow needles of a Douglasfir can expose as much as three acres of chlorophyll surface to the sun.

The lobes, leaflets and jagged edges of many broad leaves have their uses, too. They help evaporate the water used in food-building, reduce wind resistance—even provide "drip tips" to shed rain that, left standing, could decay the leaf.