

They're round. They're full of fiber. But unless you're a termite, you can't eat **tree cookies!**

Tree cookies are cross sections of tree trunks that foresters and teachers use to illustrate how trees grow. Tree cookies reveal the many different layers that make up a tree. And each layer can tell us something about the tree's life and the climate in which it grew.

Item 1 is called the **cambium**. It is a layer or zone of cells, just one cell thick, inside the inner bark. The cambium produces both the **xylem** and **phloem** cells. This is where diameter growth occurs, and where rings and inner bark are formed.

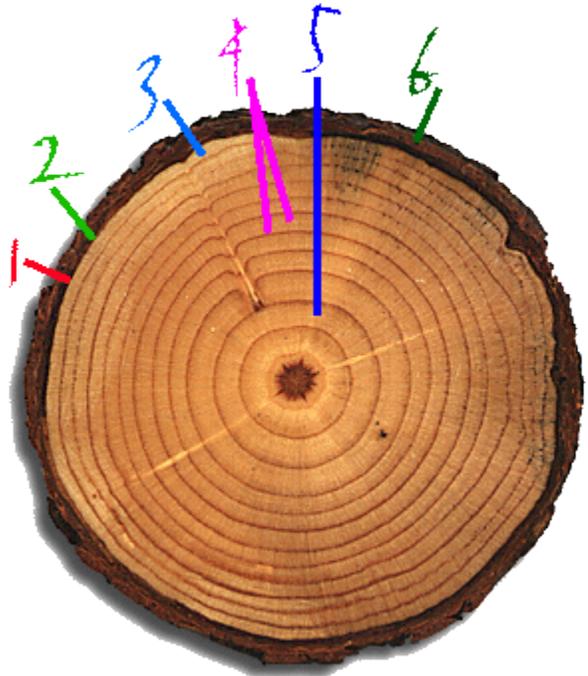
Item 2 is the **phloem** or inner bark. This layer carries sugar made in the leaves or needles down to the branches trunks and roots, where it is converted into the food the tree needs for growth.

Item 3 is the **xylem** or sapwood. This layer carries the sap (water plus nitrogen and mineral nutrients) back up from the roots to the leaves. Sapwood gives a tree its strength.

Item 4 is a **growth ring**. The lighter portion is called the "early wood" (because it grows in the spring), and the darker portion the "late wood" (which grows in the summer). Together, they represent one year of growth. (You can count the rings to see how old a tree is!)

Item 5 is the **heartwood**. Heartwood develops as a tree gets older. It is old sapwood that no longer carries sap, and gives the trunk support and stiffness. In many kinds of trees, heartwood is a darker color than sapwood, since its water-carrying tubes get clogged up. The tree cookie at right, like many of its fellow young pines, has not developed heartwood yet.

Layer 6 is the **outer bark**. This layer protects a tree from insects and disease, excessive heat and cold, and other injuries.



The rings of a tree give us a lot of information about the age of the tree, its health, and the climate conditions during each year of its growth. Just for fun, predict the number of rings on each of the tree cookies on this page. They are about the same size, but are they of the same age? Count the rings and find out. Hmmmm. How might you account for the differences? (HINT: Think about all the things a tree needs in order to grow.)

Stumped (tee hee)? Here are some explanations to help you think about it: The first tree cookie shown has a small number of wide

rings, indicating that it came from a young tree that grew in an area where it had little competition for the things a tree needs to grow -- such as sunlight, water, and nutrients.

The second cookie (below) has many tight rings. It is from an older tree that grew with more competition. The fact that the center rings are offset indicates that the tree either grew on a slope or had to grow around some sort of obstruction.

If you were a forest manager, how could you use your knowledge about tree growth to manage a forest for wood production? For wildlife habitat? For water quality? Or for all three?

(Most forest managers manage for all these benefits -- and more! What an interesting and challenging job!)