

# Teacher's Guide

## Activity 2 – Grades 6<sup>th</sup> – 8<sup>th</sup>

### GOAL:

To understand tree growth

### VOCABULARY:

pith, heartwood, sapwood or xylem, cambium, inner bark or phloem, outer bark, annual growth rings

---

### BACKGROUND:

A tree is a living organism made up of cells. The roots transport water and nutrients from the soil up the tree. When the nutrient rich water reaches the leaves, the tree photosynthesizes using Carbon Dioxide and energy from the sun. The tree manufactures its food (sugar or sap) in its leaves and the sap travels back down the tree.

The **outer bark** protects the interior layers of the tree from insects, diseases, injuries, excess heat and cold and in some cases, fire.

Next to the outer bark is the **inner bark** or **phloem**. The inner bark moves the sap down the tree. It lives for only a short time and then becomes part of the outer bark.

The next layer is a living layer of cells called the **cambium**. These cells make new bark on the outside and new wood on the inside of the tree. Every year cambium adds a new layer of cells, thickening the tree.

The new wood is called **sapwood** or **xylem**. The sapwood moves the water, nutrients and nitrogen from the roots to the leaves. Each year new sapwood is made. In time, the older layers of sapwood become **heartwood**.

Heartwood is the oldest part of the tree. It is often darker than the softwood, as it has stiffened and dried out. It is the most desirable wood for lumber. The heartwood gives the tree strength. As trees age, the heartwood can lose its strength, as the tree becomes more susceptible to insect damage and disease.

At the center of the heartwood, is the **pith**. The pith is where the tree started to grow.

Inside the sapwood and heartwood are the **annual growth rings**. One light and one dark-colored ring show one year's growth. Wider, light colored rings are called springwood. Narrow, dark rings are called summerwood. Trees grow faster in the spring, when there is adequate water and slower in the summer.

The tree rings tell us about environmental changes. For example, a tree growing on a steep slope has wider spaced rings on the side facing down the slope. Narrow rings indicate drought. Wide rings indicate good growing conditions. In stands of trees that have been thinned, a group of narrow rings will be followed by wider growth rings. Thinning allows the tree to grow faster because it has more space and has to compete with few trees for sun, water and nutrients.

### STUDENT ACTIVITIES:

Review photosynthesis. Explain that each tree, through the process of photosynthesis takes in carbon dioxide and releases oxygen. This process can be scientifically states as:



Carbon Dioxide + Water ---- Sugar + Oxygen

Discuss the equation. Ask the students to hypothesize what would happen to the equation if there were a lack of light, water, space, etc. What if there was too much carbon dioxide? Could there be too much oxygen? Who else uses the oxygen? What living things need carbon dioxide?

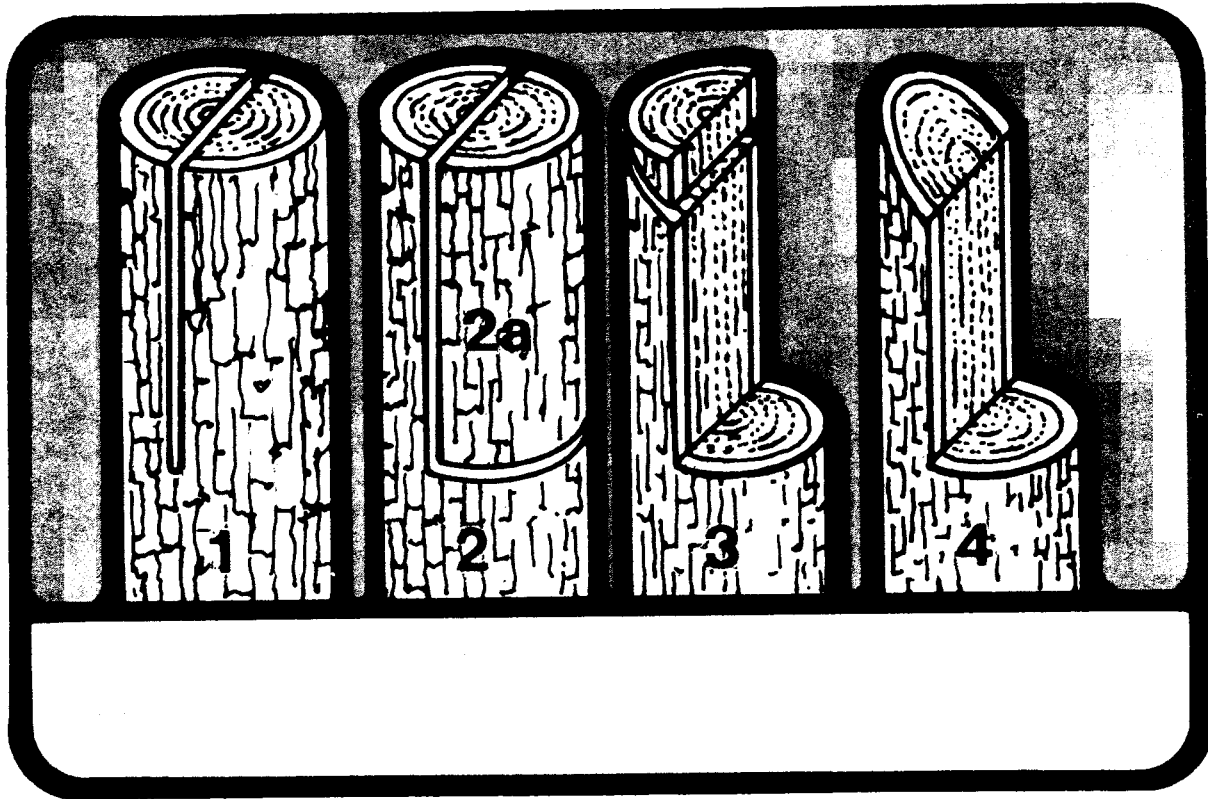
Ask the students: Do older trees or younger trees produce more oxygen? (Younger trees produce more oxygen because of their rapid growth. Christmas tree farms are an excellent source of oxygen!)

Test for carbon dioxide in exhaled breath. Limewater will turn from clear to milky when it encounters carbon dioxide. Fill one balloon with air from a pump. Have a student blow up a second balloon with air from his/her lungs. Discharge the air from the balloons into two separate containers of limewater. Note which one turns milky.

If possible, obtain a fireplace log (See MS #4). Saw down the center of the wood. Saw across the wood to the center. Saw diagonally across the upper end and remove the sawn piece of wood. This will expose the parts of the tree. Define the vocabulary using the log. Look for growth indicators. Was this tree crowded? Are the rings widely spaced or close together?

## EXTENDED ACTIVITIES:

- Test for gases given off by green plants by using elodea plants in an aquarium. Put the aquarium in the sunlight and notice the bubbles forming on the plant. What happens when the plant is cut off from sunshine? Are there bubbles then? Why not? (The plant can't photosynthesize.)
- As a group act out the parts of a tree, using Ranger Rick's, Nature Scope, Trees are Terrific activity, "Build a Tree".
- Conduct an experiment to demonstrate that trees lose water through transpiration, using Ranger Rick's, Nature Scope, Trees are Terrific activity, "Tell -Tale Transpiration".
- Match tree ring patterns using Ranger Rick's, Nature Scope, Trees are Terrific activity, "Reading the Rings".
- Demonstrate the condition needed for trees to live and grow, using Project Learning Tree's activity, "Every Tree For Itself".
- If possible, observe a fallen stump. Identify the parts of the tree.



MS #4