

Tree Guts

Developed by: Rithy Khut

Adapted from: Multnomah Education Service District Outdoor School: Camp Howard MESD Outdoor School Camp Howard. (2006) Tree Parts. .Multnomah Education Service District Outdoor School Camp Howard. Bull Run, Oregon. 2006

Time: 30 minutes

Overview

This activity will introduce students to the structure of the tree and what each of those structural components do by using hands-on activities, various inquiry methods and questions.

Benchmarks Addressed

Life Science – Organisms

CCG: Understand the characteristics, structure, and function of organisms.

Benchmark 3:

SC.08.2.A.1 (3) Describe and explain the structure and functions of an organism in terms of cells, tissues, and organs

Scientific Inquiry

CCG: Use Forming the questions/hypothesis: Formulate & express scientific questions or hypotheses to be investigated.

Benchmark 3:

SC.08.4.A.1 (1) Based on observations and scientific concepts, ask questions or form hypotheses that can be explored through scientific investigations

CIM

SC.CM.SI.01 Based on observations and scientific concepts, ask questions or form hypotheses that can be answered or tested through scientific investigations.

Learning Objectives

By the end of this activity, participants will be able to:

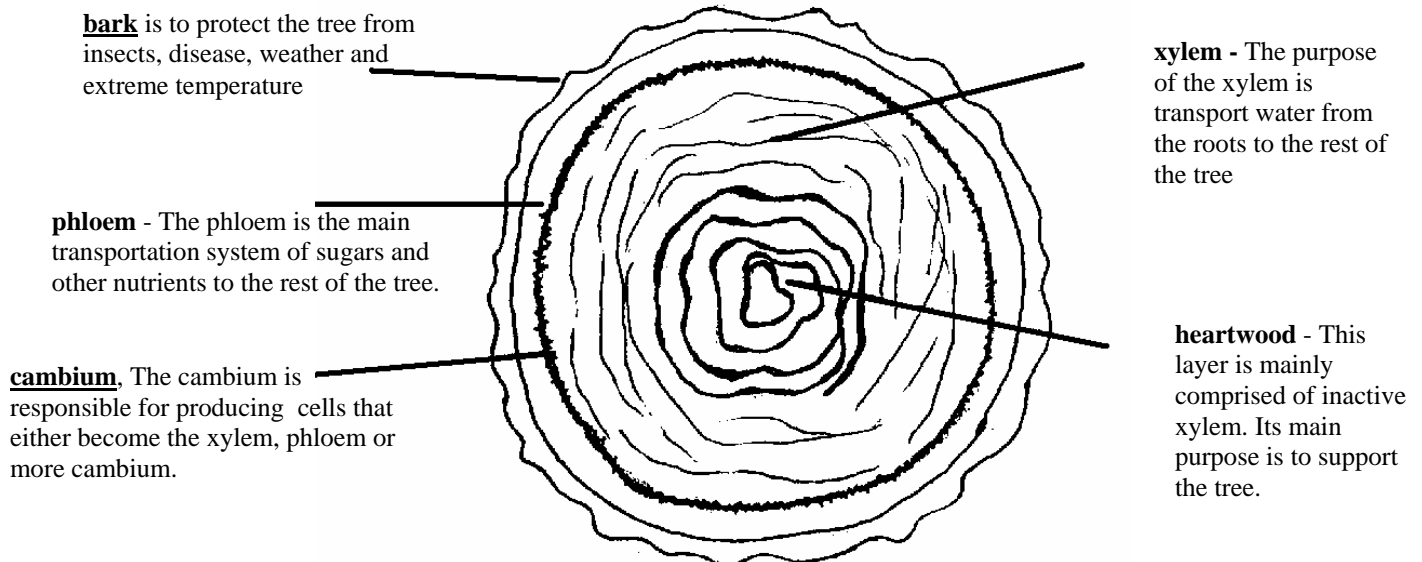
1. recognize the parts that make up the structure of a tree
2. understand the function of each layer of a tree
3. understand the difference between angiosperm and gymnosperms
4. understand why we have gymnosperms in the Pacific NW grow much taller than other trees in the United States.

5. understand why it is important to know the age of a tree and a group of trees

Materials Needed

- ❑ Hand Lens
- ❑ Wood Cookie(s)
- ❑ Pencils
- ❑ Clipboards
- ❑ Straws (large and small)
- ❑ Increment Borer
- ❑ Field Notebook

Background Material



The structure of a tree is broken into five main parts, bark, phloem, cambium, xylem and heartwood.

The purpose of the **bark** is to protect the tree from insects, disease, weather and extreme temperature. It is comprised mainly of phloem cells that have been shed outward.

The second layer would be the **phloem**. The phloem is the main transportation system of sugars and other nutrients to the rest of the tree.

The next layer would be the **cambium**, it is responsible for creating more cells that either become the xylem, phloem or more cambium.

The next layer is the **xylem**. The purpose of the xylem is transport water from the roots to the rest of the tree. Depending on the type of tree, the xylem will be comprised of either tracheids or vessels. Generally, trees that are gymnosperms like the Douglas-fir will have tracheids while trees that are angiosperms like maples will have vessels. The reason behind this is that vessels have a greater

diameter but are less numerous. This allows for a large amount of water to be transported at one time, which is especially important during the spring when angiosperms need lots of water to create leaves for photosynthesis. Conversely, gymnosperms are able to photosynthesize all year long because the large amount of tracheids. It is because there are so many and that their diameters are so small, if some were to freeze, it would not affect the tree. Finally there is the **Heartwood**. This layer is mainly comprised of inactive xylem. Its main purpose is to support the tree.

Activity Description

Step 1. Getting Started: Introductions (1-5 minutes)

If this is the first activity of the day:

1. Describe the hike that the group will be taking.
2. Set-up expectations (from you for the students and from the students about you)

Step 2. Activity 1 (30 minutes)

2.1 – Have students look at the cross section of the down trees. Have them examine the cross section and describe how many different parts (coloration) they see. (5 minutes)

2.2 – After regrouping have each student devise a hypothesis about the function of each section (coloration). After a minute or so of thinking, ask them what their hypotheses are. (One hypothesis might be the bark is on the outside for protection). After which explain any parts of the tree that have not been described accurately. (5 minutes)

2.3 – Next explain that the phloem transports sugars down to the rest of the tree. (Reason: Since photosynthesis occurs in the leaves, that energy in the form of sugar is transported by the phloem, which channels that sugar to the rest of the tree) (5 minutes)

2.4 – To explain the xylem take the straws and give one or two large straws to half of the students. With the other half of students give each student many small straws. After the straws are dispersed, have the students breathe in the straws. This represents the ability to pull water through the trunk

2.4.1 – Discuss how angiosperms generally have larger vessels but a smaller amount in their xylem (or a small amount of straws that have a large diameter) while gymnosperms have smaller tracheids but more ample amount (a large amount of small diameter straws). Why might this be? (Answer – Since it takes more energy to make leaves, the angiosperms need lots of water in the spring however, in the winter it does not photosynthesize. Gymnosperms on the other hand do not lose their leaves so they have many smaller tracheids so if one is plugged up by freezing temperatures then it can use another.) (10 minutes)

2.5 – Next ask the question about what part of the tree do you think is growing. Answer: the cambium layer. The cambium is responsible for the creation of more xylem and phloem as it divides. (5 minutes)

Step 3. Activity 2 (10 minutes)

3.3 – Have each student look at their wood cookie again. Since they now know that, the cambium layer is responsible for creating the xylem and phloem. Ask how they might be able to tell how old the tree is.

3.4 – Next have them count the amount of rings they see in the wood cookie. (5 minutes)

3.5 – Discuss how it might not always be easy to see ring layers, so show them the increment borer and explain how it is used (not on an actual tree)

3.6 – Why might it be useful to use an increment borer? (Answer: Tell the age of a stand; tell the health of a tree, when fires might have gone through, disease, etc) (5 minutes)

Step 4. Gauging Understanding (10 minutes)

To evaluate, have the group break up into groups of four or five. After each question have each group deliberate and pick a spokesperson.

First question: Show a picture of two different forests. One is angiosperm and the other gymnosperms. Ask them which forest they think is older and how they might find out. (Answer: using an increment borer)

Then propose that each forest was planted at the same time, 40 years ago. However, in year 10 and 30 there were stretches where the spring was unseasonably cold. Which trees are bigger and how might the cold spring weather affect the growth of the angiosperm and gymnosperms trees? (Answer: gymnosperms since they are able to photosynthesize all year, they are able to grow taller while the cold springs did not allow the angiosperm trees to grow very well since their main time of growth, the spring, was unseasonably cold and could have frozen their vessels.

Step 5. Wrap Up (5 minutes)

Additional Reading/Resources

Waring, Richard H. 1983. Land of the Giant Conifers. Natural History. October, pp. 55-62