

Grade: 6-8

How do trees function as part of a forest system?

Lesson #A1: To Be a Tree

Time: 1-3 class periods

Overview:

Students make models showing the structure of a tree.

Essential Questions:

How does a tree's structure help it to make food, grow, reproduce, and survive?

How do physical conditions affect a tree's ability to survive?

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Source: AMEREF Forestry Module ftil To Be a Tree

To Be a Tree

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Overview:

Students make models showing the structure of a tree.

Essential Questions:

How does a tree's structure help it to make food, grow, reproduce, and survive?

How do physical conditions affect a tree's ability to survive?

Assessment

Can students:
build a model of a tree.

- list and describe the structures of a tree and their function.
- describe how a tree is distinct type of plant.

Vocabulary

- Leaf
- needles
- crown
- trunk
- stem
- bark
- cambium
- xylem
- phloem
- trachieds
- medullary rays
- sapwood
- heartwood
- roots
- photosynthesis
- amino acids

Alaska Standards

Addressed:

Science GLEs

The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by: [6] SC2.2 identifying basic behaviors (e.g., migration, communication, hibernation) used by organisms to meet the requirements of life. **that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by:** [6] SC3.1 recognizing that organisms can cause physical and chemical changes (e.g., digestion, growth, respiration, photosynthesis) to matter and recognizing or [7] explaining the importance of energy transfer in these changes.

Teacher information and Procedure

Prior knowledge for students: none

Materials needed:

- tree cross section(s)
- magnifying glasses or hand lenses

Students will determine the additional materials they would like to use for this activity.

What to do in advance:

Find one or more diagrams that show trees structures.

What to do during the lesson:

- ***Gear up:***

Play a Bingo-type vocabulary game to introduce the terms for tree structures that will be used in the lesson. Have students make a 4x4 grid on their paper and write one of the words in each square of the grid, mixing up the order. Randomly choose words from the list and read their definition from the Background or the Glossary. Students cross off each word as they match it to its definition. If a student gets 4 in a row, they win the game, and another round begins. If you have a diagram, allow students to look at it while they play.

- ***Explore:***

1. Share the Background with students. They should have a clear understanding of the different tree structures and their functions. Draw a diagram on the board and/or find a diagram in a textbook. Examine tree cross sections with a hand lens or magnifying glass as you discuss the structures.

2. You may choose to have the students work in pairs, teams, or independently.

3. Assign each team to build a three dimensional design of a tree's structures. This could be in vertical form or one that looks more like a cross section. Students may choose to put objects such as beads, buttons, and beans on play dough in a flat shape like a cross section. They may choose to make a "tree cross section" cookie using candies and

chocolate chips as their tree parts. They may choose to build a tree using a paper towel tube as the bark, straws as the phloem, a piece of wood as the hardwood, etc. It is the choice of each student or pair.

4. Within each model there must be bark, leaves, roots, phloem including the sieves to carry sugar from the leaves down, xylem including trachieds and medullary rays to carry water and nutrients up and out, and hardwood.

- **Generalize:**

When students have finished, ask each team to present their tree, describing the different tree structures and their functions. Ask students specifically what they think would happen to a given tree if it were missing one of its structures. If they say, "It would die", ask why. Discuss the energy changes that take place as trees use their structures to make food.

- **Assess:**

Use the rubric to assess students' work as they present their trees.

Related Resources in the AMEREF Kit

AMEREF Interactive CD

Alaska Habitat Cards

Links to Geology, Mining, Energy, and Forestry Related Websites

Specimens

Spruce Tree Cross Section: AMEREF Courtesy of Sealaska

Books

Alaska's Forest Resources: Alaska Geographic

Extensions, adaptations, and more resources:

Take a field trip to look at types of trees in your area and the characteristics of their bark, leaves, trunks, and other structures.

Find trees that have been damaged and try to determine which parts of the tree were affected.

Adapt the activity by assigning some teams to make cross sections and others to make linear models, or by choosing and providing materials for the class.

Background

A tree is a unique plant due to its woody stem. A tree has leaves (sometimes called needles), branches, a trunk and roots.

The **leaves**, also known as the **crown**, use a process called **photosynthesis** to combine sunlight with air and the water from the roots to make food, or sugar, for the tree. The **roots** of the tree are often as large as the trunk and not only serve to absorb nutrients and water from the soil, but also to provide an anchoring system to hold the tree steady. The roots of Alaska's trees typically grow out rather than down to maximize access to water, stability, and warmth. In some of Alaska's trees, the roots reach as far on the ground as the tree reaches towards the sky.

A tree is a unique plant due to its woody stem, or trunk. Within this trunk there are numerous layers with differing jobs to help provide the tree water, nutrients, food, protection, and stability. Going from outside to inside, a tree has the following layers: bark, outer cambium producing the phloem, inner cambium producing the xylem or sapwood, and the center of the trunk known as the hardwood.

Under the bark is a thin layer called the **cambium**. This layer is the living and growing layer that produces both the bark and the wood. Bark and wood are dead cambium cells and are important to the tree for structure and protection, but are no longer living cells. The exterior side of the cambium is called the inner bark or **phloem**. This section contains tiny sieve like tubes which carry sugar and amino acids produced by the leaves in photosynthesis downward toward the roots.

When the cells of the phloem are crushed by the inner growth of the tree those cells die and become the **bark**. The bark provides protection from insects, diseases, and sometimes fire. It also provides a coating which helps prevent water loss.

The inner layer of the cambium produces the **xylem**, also known as the **sapwood**. The xylem contains three structural components: 1) the **tracheids** which transport water upward to the leaves; 2) **medullary rays** which extend radially from the center of the trunk to

provide nutrients across the layers of the tree, 3) and resin ducts which carry the various resins produced by the tree such as turpentine. If looking at a cross section of a tree with a magnifying glass, one can see the trachieds as dots and the medullary rays as small lines radiating out from the center of the trunk.

The xylem layer eventually dies to create the **heartwood**, or the center of the trunk. This layer becomes rigid and very strong, giving the tree its structure. Every time a layer of xylem dies, the cambium produces another, thus allowing the tree to continue to grow in girth and height. The cambium will produce more cells in times of increased water and sunlight (usually spring and summer) while slowing down in times of drought, cold weather or little sunlight (usually winter). The fast growing times will appear as light rings on a cross section, while the slower times of growth appear as dark rings. Thus you can generally count the age of the tree by counting the dark rings, representing each winter in a tree's life.

What is a Tree RUBRIC

Concepts and Skills	Excellent	Satisfactory	Needs Improvement
Following directions	Goes above and beyond the requirements. (3 points)	Tree model includes leaves, bark, roots, xylem with sieve tubes, phloem with tracheids, medullary rays, and heartwood. (2 points)	Model does not include all of the structural components requested. (1 point)
Describing structures	Can describe each structure and why a given object represents that structure well. (3 points)	Can describe each structure. (2 points)	Can not describe each structure. (1 point)
Describe the function of each structure	Can describe the function of each structure with great detail. (3 points)	Can describe the function of each structure. (2 points)	Can not describe the function of each structure. (1 point)