



## ★ TREE STRUCTURE AND FUNCTION ★

Trees are living organisms with many specialized structures – leaves, roots, wood, and the living cells that connect them. Understanding how trees are constructed and grow is essential to care for trees and calculate the benefits that trees provide.

### Goal & Objectives

**Goal:** Students will explain the structure and function of tree parts.

**Objectives:** Students will

1. Explain how to estimate tree growth.
2. Differentiate tree structure parts and explain their function.
3. Describe how a tree grows and produces food and distributes it.
4. Demonstrate how trees protect themselves.
5. Evaluate their *Tree Structure and Function* experience.

### Content Area TEKS/STAAR

**Language Arts:** 5.19 (E) summarize and paraphrase texts in ways that maintain meaning and logical order within a text and across texts.

**Mathematics:** 5.11 (B) solve problems involving elapsed time.

**Science:** 5.2 (D) analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence.

5.2 (F) communicate valid conclusions in written and verbal forms.

5.9 (A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements.

5.9 (C) Predict the effects of changes in ecosystems caused by living organisms.

**Social Studies:** 5.25 (B) incorporate main and supporting ideas in verbal and written communication.

**Technology Applications:** b (3) (D) acquire information appropriate to specific tasks.

b (6) (C) navigate systems and applications accessing peripherals both locally and remotely.

### Materials

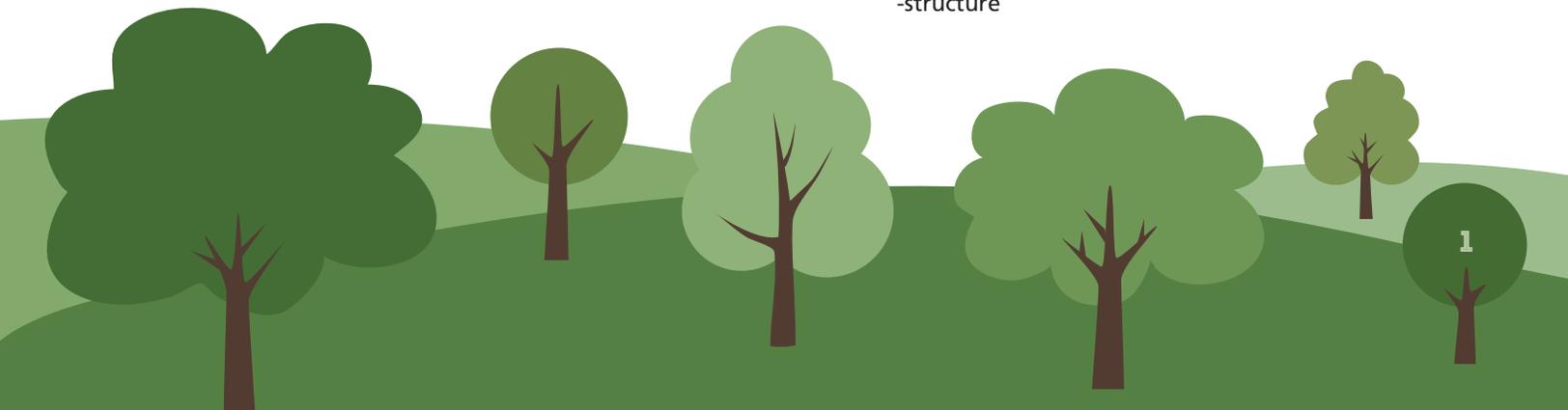
- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Paper Plates for each student (10 -12 in.)
- Bulletin Board paper, construction paper and other paper with different textures and markers for students
- Tree Trails Portfolio, Tree Trails Data Sheet
- (Optional) Small sticky notes
- (Optional) Cameras or camera phones

### Time & Resources

Preparation Time: 2-3 hours

Instructional Time: 2-3 sessions, 45 minutes each

- Tree Parts handout
- Tree Cross Sections handout
- Trees of Texas, How Trees Grow  
<http://texastreeid.tamu.edu/content/howTreesGrow/>
- KidZone Science, Tree outline and tree cross section  
<http://www.kidzone.ws/plants/trees.htm>
- Tree structure and function slide show  
<http://www.slideshare.net/flameboy87/2-tree-growth-structure>



## I. Engage/Excite

- A. Large Group Discussion: Ask the students to imagine their life as a tree. Ask how they think they would grow; e.g., fast some years, slow some years, etc.
- B. Individual Activity: Provide the students with large paper plates and have them start in the center with a small ring for their first year and continue drawing rings around the center ring for each year of their life. They may use post-its and/or markers to identify on an age ring some important events in their lives, such as birth, when they started school, lost their first tooth, first rode their bike, etc. Students may ask their parents to contribute to the events. Display their rings in the classroom.
- C. (Optional) Large Group Discussion continued: Discuss the definition of a tree cross sections. Then, provide pairs of students with Tree Cross Sections resource handout or project it onscreen. Ask them to notice that the cross sections show the different layers of the trunk and they will learn what these parts are and what they do for the tree.

*Teacher Tip: Tree cross sections are also known as tree cookies. These cross sections of a tree trunk show and its tree rings. As a tree grows, it adds growth rings every year. The rings can be seen as layers of light and dark wood. They can be used to study the growth of the tree and its health each year.*

- D. (Optional) Individual Activity: Have students take the *Tree Structure and Function* pretest.

*Teacher Tip: Explain that the test is only to make sure the learning activities are appropriate and not something they already know. The pretest will help them know more about what they will be learning.*

*To administer the tests by paper, copy from the teacher lesson module. To administer the test electronically, recreate the test in an online survey program. Free programs allow the creator to see results from a class set.*

## II. Explore

- A. Large Group Discussion: Ask the students to think about how trees grow. Go online to the Trees of Texas website and open How Trees Grow and project the image. Briefly discuss the underlined words and the definitions. Let students know this website is useful to learn about tree parts and their functions, all of which create the pattern of the tree's growth. They may use this website and others to learn about the parts and how each serves to build the tree and protect it.
- B. Large Group Activity: Draw a large tree outline on bulletin board paper. A good site for an outline of a tree and its sections is the KidZone Science website. Divide the "tree" into sections: 1. Crown, including branches, twigs, and boughs, 2. Leaves including flowers and seeds, 3. Bark, 4. Trunk and its layers, excluding the bark, and 5. Roots including lateral roots and root hairs.
- C. Large Group Discussion continued: Tell students that after they do some research and exploration on their actual trail tree, they will produce a television skit entitled "The Structure and Function of Trees." The class will build a tree and small groups will develop a skit about their part of the tree's structure and demonstrate its functions.



## II. Explore continued

*Teacher Tip: An alternative activity to the skit is for each student group to create a game that tests the vocabulary of the structure and function of trees. Each group will then play the others games and rate them. Avoid assigning the type or style of game so that students will be creative and devise their own interpretation.*

## III. Explain

A. Large Group Discussion: Take students outside to observe the parts of their trail tree. Have students observe the different trees, specifically its trunk, bark, leaves and twigs, roots, etc. They may take pictures and/or make drawings of their tree and label its parts. Return to the class with their notes.

*Teacher Tip: Introduce tree part vocabulary and make a copy for students as deemed appropriate. You may make an analogy of body parts to tree parts as a mnemonic device. A Tree Parts handout that lists parts and their definitions are in the Resource section of the Tree Trails website.*

B. Small Group Activity: Assign or ask students to volunteer for a particular tree part. Move students into small groups of three to find out more about their assigned tree part and its function. They may use the Tree Parts handout and/or go online to research.

## IV. Extend/Elaborate

A. Large Group Directions: Tell students that they will organize into small groups to complete an activity that will help them remember the vocabulary they have learned. (The activities may be either to perform a skit and/or create a gameboard.

1. Game option: Provide materials as needed for the groups to construct a board game which may be original or patterned after games such as Monopoly (Treeopoly, Tree Mania, Tree World, Bugnopilis). Remind students that they should be able to appropriately play the game and that other groups will play their game and critique it.
2. Skit option: Provide directions for the students to follow to develop a skit about their part:
  - a. Make a replica of their section of the tree outline, label it and illustrate its function. They may decorate it with drawings, cutouts and/or real tree material such as bark, leaves, twigs, etc. The group with the trunk should develop a "trunk" from a paper towel roll with five different colors of paper taped or wrapped around to represent the trunk parts: heartwood, sapwood/xylem (mark an arrow showing flow up to the trunk), cambium, inner bark/phloem (mark an arrow showing flow down) and bark. Straws could be used to represent xylem and taped to the paper. The paper towel trunk may be taped to the bark on the tree outline.
  - b. Write the skit and song about what each part does. The skit should be the performance of the part while the students are singing their song. The tune and lyric composition of the song may be determined by the students and a framed paragraph may help students compose the song.



#### IV. Extend/Elaborate continued

For example: A frame modeled after the song, Dem Dry Bones.

First three verses repeat: The (noun/one tree part) is (verb/connected, joined, touches, pushes) to the (noun/another tree part).

Last verse: Now (verb/five senses) the (action) (where).

Example for Leaves:

The leaves are connected to the branches,  
The leaves are connected to the branches,  
The leaves are connected to the branches,  
Now the leaves send food through its branches.

##### B. Small Group Presentations:

Present the game: have each group play the other groups games and take notes on appropriate critiques of each.

Present the skit: place the part replica on the Tree Outline and sing and act out the part to demonstrate the part's function.

##### C. Large Group Action: Ask for volunteers to take pictures or video the skit presentations and play back to the students and/or display the pictures.

#### V. Evaluate

A. Large Group Activity: Have each group ask questions to the rest of the class about their tree's part and its function such as: "Can you name my part that carries water from the roots? Can you tell how I make food?" Other groups can chime in with additional or corrective responses.

B. Individual Activity: Ask students to draw a tree, label the parts and name the function of the different parts. Have students share in pairs or triads and add or correct the drawing. Have students save their drawings and descriptions in their portfolio and/or learning logs.

C. (Optional) Individual Activity: Have students take the *Tree Structure and Function* posttest. Have them compare their results to self-evaluate what they learned and what they did not know.

*Teacher Tip: You may use the results to determine the need for Extra Mileage/Attention.*

#### VI. Extra Mileage/Attention

**Extra Mileage:** Have students draw a tree, label the part they would want to be and write a paragraph about why they want to be the part.

**Extra Attention:** Have students work in small groups to compare a tree to a factory, such as an auto manufacturing facility, and list the likenesses and differences.

Tree Trails curriculum was developed by Texas A&M Forest Service in cooperation with Texas Urban Forestry Council and was supported by a grant from the USDA Forest Service.

# Student Assessment / Pretest and Posttest

## *Tree Structure and Function*

Directions: Answer the following questions by rating your response 1-5, with 5 being the highest.

Key: 1 = Not Sure    2 = Poor    3 = OK    4 = Good    5 = Great

- |    |   |   |   |   |   |   |
|----|---|---|---|---|---|---|
| 1. | I can name the parts of a tree trunk and the function of each part.   | 1 | 2 | 3 | 4 | 5 |
| 2. | I can explain why tree rings are an important resource for foresters. | 1 | 2 | 3 | 4 | 5 |
| 3. | I can describe how a tree grows.                                      | 1 | 2 | 3 | 4 | 5 |
| 4. | I know how to estimate the age of a tree.                             | 1 | 2 | 3 | 4 | 5 |
| 5. | I can tell what a tree needs to grow.                                 | 1 | 2 | 3 | 4 | 5 |
| 6. | I can trace the way food gets to the tree parts.                      | 1 | 2 | 3 | 4 | 5 |
| 7. | I name the parts of a tree that help protect it.                      | 1 | 2 | 3 | 4 | 5 |
| 8. | I can describe how a tree makes its food.                             | 1 | 2 | 3 | 4 | 5 |
| 9. | I am interested in knowing more about a tree structure and function.  | 1 | 2 | 3 | 4 | 5 |

Comments:



# Tree Parts

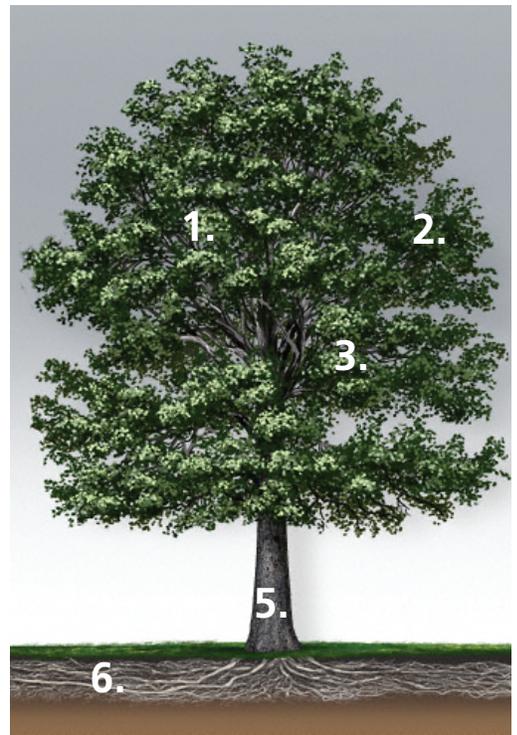
1. **Crown:** (head) part of the tree that consists of the leaves and the branches at the top of a tree.

2. **Leaves:** (fingers) food factories of the tree. The leaves contain chlorophyll which gives leaves their green color and is responsible for photosynthesis. During photosynthesis, leaves use solar energy from the sun to transform carbon dioxide from the atmosphere and water from the soil into sugar and oxygen producing a chemical change. The sugar (which is the tree's food) is either used or stored in the branches, in the trunk, or in the roots. The oxygen is released into the atmosphere. Leaves clean the air and use energy from the sun to produce food for the tree.

3. **Branch, Twigs and Boughs:** (arms) A branch is a woody part of the tree connected to, but not part of the central trunk. Large branches are known as boughs and small branches are known as twigs.

4. **Flowers and Seeds:** Flowers produce seeds. Seeds are the primary way that trees produce new trees. Seeds vary greatly in size and shape.

5. **Trunk:** Provides support and is used as "pipes" to transport nutrients to the leaves and sugar from the leaves to the rest of the tree.



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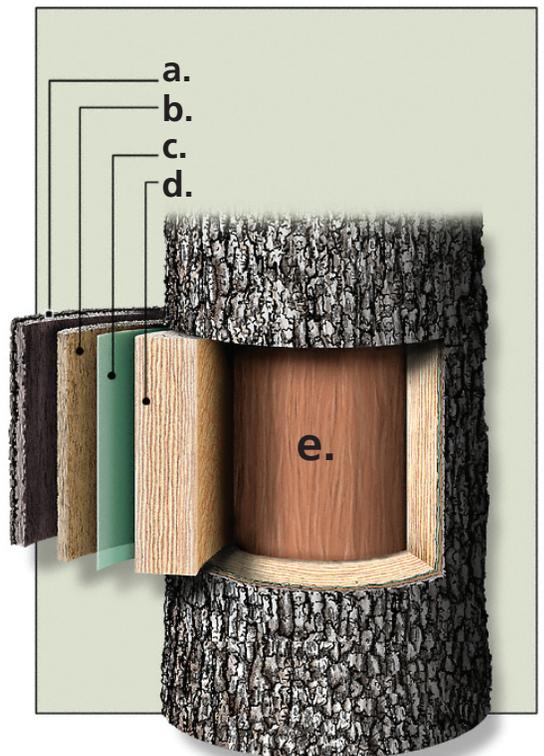


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Parts of the Trunk are

- Bark:** (skin) protects the tree from injury by animals, diseases, fire, etc. and has a variety of characteristics such as thin, thick, spongy, rough, smooth.
- Inner Bark or Phloem:** (arteries) inner bark that carries sap from leaves to rest of tree.
- Cambium:** (veins or artery tissue) a thin layer of growing tissue between the xylem and phloem.
- Sapwood or Xylem:** (veins) brings water and nutrients up from the tree roots.
- Heartwood:** (skeleton) forms the core, is made of deadwood and provides strength.

6. **Roots:** (feet) holds the soil in place, anchor the tree in the ground and absorb water and nutrients from the ground. The roots include lateral roots, rootlets and root hairs.



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# Tree Cross Sections

1.

The study of tree rings is called dendrochronology. Each year, a tree adds a spring and summer ring, a light colored ring in the spring and a dark colored ring in the summer.

The rings can tell dendrochronologists about the growth of that tree. Narrow rings could mean slower growth, possibly from not enough water, sunlight, space or nutrients.



2.

This tree shows scars where branches have died or fallen off and the tree has grown around and over them.



# Tree Cross Sections

3.  
Wide rings could mean the available water, sunlight, space or nutrients allowed the tree to grow vigorously.

Narrower rings toward the outer edge could mean that the younger trees are starting to crowd each other.



4.  
This tree shows the difference in color of the heartwood and sapwood.

Blue stain fungus is also evident in the sapwood. The fungus is carried by bark beetles and quickens the tree's death after attack by the beetles.

