TREE TRAILS

A conservation education project to enhance outdoor classrooms at schools, nature centers, and parks.

TEXAS A&M FOREST SERVICE

ELEMENTARY

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.

★ Tree Trails Curriculum ★

Tree Trails is a conservation education project to enhance outdoor classrooms at schools, nature centers and public parks. The project creates an education trail focused on trees. Students actively participate in selecting trees, mapping and identifying those trees, and then immersing themselves in related topics like tree structure and function, benefits of trees, tree health, history of famous trees, and ultimately producing and participating in a service learning experience.

Tree Trails serves schools in the digital age with a high-tech online, easy-to-use, educationally sound project that gets kids outside and active in the environment. Tree Trails includes lesson modules for elementary and secondary audiences and provides a research-based instructional approach that integrates language arts, mathematics, science, social studies, technology and state testing measures, with online and outdoor activities to create learning forests at schools.

Texas A&M Forest Service, Texas Urban Forestry Council and Keep America Beautiful are excited to expand their educational role directly into K-12 school classrooms with this program. These organizations believe that environmental awareness is a critical component of youth education that leads to improved stewardship of our natural resources.

Lesson Modules

Tree Trails lesson modules are free and accessible online for elementary and secondary levels. An online user-generated GIS mapping system allows you to enter the tree trail data and displays the trails.

The topics included in the modules are:

- Mapping a Tree Trail
- Identifying a Tree
- Measuring a Tree
- Tree Structure and Function
- Benefits and Values of Trees
- Diversity of Species and Ecosystems
- Tree and Forest Health
- Tree History
- Urban Forestry Careers
- Completing a Student Service Leader Project

Lesson Format

Lesson modules are formatted in an easy to use, student-centered, instructional approach that is based on best practices and strategies. The instructional procedures follow the 5 E's learning cycle (R.W. Bybee). The 5 E's are excite, explore, explain, elaborate and evaluate.

The curriculum is aligned to fifth-grade Texas Essential Knowledge and Skills in reading, mathematics, science, social studies and technology application and to the State of Texas Assessments of Academic Readiness tests of science, mathematics and reading.

Mapping Application www.treetrails.org

Teacher Lessons and Resources http://tfsweb.tamu.edu/treetrails

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

★ Elementary Lesson Modules ★

One: Map a Tree Trail

By understanding maps, students get a sense of where they are in relation to their home, school and neighborhood. Trees are often important landmarks along the way.

Goal: Students will select a minimum of three trees for the Tree Trail.

Two: Tree Identification

Tree identification is a critical first step towards an understanding of 'diversity.' By learning the names of trees, we come to appreciate them.

Goal: Students will identify their Trail Trees and explain how identification relates to tree knowledge.

Three: Tree Measurement

Tree measurement is fundamental to the practice of forestry. Foresters count trees and measure trees. With just a few basic measurements, we can assign values to trees and compare them to each other.

Goal: Students will measure trees and explain how measurement is used to place value on trees and forests.

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

Five: Benefits and Values of Trees

Advances in the science of urban forestry allow us to assign monetary values to a wide range of benefits that trees in urban areas provide. As trees grow, these values rise – the only part of the built environment of our cities that does so!

Goal: Students will determine the benefits of trees and calculate their value.

Six: Diversity of Species and Ecosystems

Promoting 'diversity' is a basic principle of urban forestry. A diverse forest implies a more resilient forest, since disease or insect outbreaks likely won't affect every tree all at once.

Goal: Students will evaluate how the diversity of species affects the ecosystem.

Seven: Tree and Forest Health

History has shown us the risk of planting too many of the same species in the urban forest. Cities and forests have lost many millions of trees to foreign or species-specific diseases and insect pests. Exotic tree species can sometimes invade our forest landscapes and crowd out native species.

Goal: Students will demonstrate ways to keep trees and forests healthy.

Eight: Tree History

Trees fascinate us because the oldest among them span many human generations. Trees can be a living link to our past, or may be planted by the current generation as memorials to important events or people in the community.

Goal: Students will research the history of a tree(s) and make connections to the past.

Nine: Urban Forestry

The trees around us – those that make up the 'urban forest' – are a reflection of the community itself. Cities often organize the protection, planting and care of trees in public spaces, through a Tree Board or other volunteer group. Tree City USA is one symbol of a community that cares about its trees.

Goal: Students will create a Campus Tree Trail Care Plan.

Ten: Student Service Leader

Arbor Day is the celebration of trees where we live, work, learn and play. Communities set aside one day each year to plant and care for trees, usually on public property, such as a school or park. Students can provide the leadership for a project to plant or care for trees – either on school grounds or in the surrounding community.

Goal: Students will design and conduct a service learning project.

Texas A&M Forest Service | Texas Urban Forestry Council | Keep America Beautiful

Internet Links

Tree Trails: http://tfsweb.tamu.edu/TreeTrails/
Tree Trails Map Application: www.treetrails.org
Texas A&M Forest Service: http://tfsweb.tamu.edu

Module One - Map a Tree Trail

- Getting Started: http://tfsweb.tamu.edu/treetrails/
- Instructional Strategies, KWL graphic organizer: http://schools.spsd.sk.ca/curriculum/instructionalstrategies/
- Map My Property: http://tfsfrd.tamu.edu/MapMyProperty/
- Texas Forest Information Portal: http://texasforestinfo.tamu.edu/
- Sample Tree Trail: http://texasforestinfo.tamu.edu/treetrails/
  Search By, Trail Name, enter: Heights HCBTR Trail

Module Two - Tree Identification

- Instructional Strategies, Think,Pair,Share Groups: http://schools.spsd.sk.ca/curriculum/instructionalstrategies/
- Poems about Trees
  Learning the Trees by Howard Nemerov: http://www.poetryfoundation.org/poetrymagazine/poem/22392#poem
  Trees by Joyce Kilmer: http://www.poetryfoundation.org/poetrymagazine/poem/1947
  Native Trees by W. E. Merwin: http://www.poetryfoundation.org/poem/171876
  Winter Trees by William Carlos Williams: http://www.poetryfoundation.org/poem/174773
  Banana Trees by Joseph Stanton: http://www.poetryfoundation.org/poem/179889
  [little tree] by E. E. Cummings: http://www.poetryfoundation.org/poem/176724
  where you are planted by Evie Shockley: http://www.poetryfoundation.org/poem/244260
- Trees of Texas: http://texastreeid.tamu.edu/
- Trees of Texas, How To ID section: http://texastreeid.tamu.edu/content/howToID/
- Trees of Texas, ID by Leaf section: http://texastreeid.tamu.edu/content/idByLeaf/
- Trees of Texas, Leaf Collecting and Safety section: http://texastreeid.tamu.edu/content/leafCollectingSafety/
- Sample Leaf Cards:
  http://tfsweb.tamu.edu/uploadedFiles/TFSMain/Learn_and_Explore/Conservation_Education_Resources/Sample%20Cards.pdf

Module Three - Tree Measurement

- Big Tree Registry: http://tfsweb.tamu.edu/texasbigtreeregistry
- Instructional Strategies: http://schools.spsd.sk.ca/curriculum/instructionalstrategies/

Module Four - Tree Structure and Function

- 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

Internet Links

Module Five - Benefits and Values of Trees

- National Tree Benefit Calculator: http://treebenefits.com/calculator/
- Texas A&M Forest Service, Urban Forestry: http://tfsweb.tamu.edu/abouturbanandcommunity forestry/urbanforestryinformationsheets/
- Arbor Day Foundation, Benefits of Trees: https://www.arborday.org/trees/index-benefits.cfm

Module Six - Diversity of Species and Ecosystem

- Instructional Strategies, Graphic Organizers: http://schools.spsd.sk.ca/curriculum/instructionalstrategies/
- Fire is Nature's Housekeeper: http://smokeybear.com/natures-housekeeper.asp
- Fire Adaptations - Nowhere to Run: http://www.nps.gov/fire/wildland-fire/learning-center/educator-resources/lesson-plans/fire-adaptation.cfm
- History and Human Use of Fire: http://www.nps.gov/fire/wildland-fire/learning-center/fire-in-depth/human-use.cfm

Module Seven - Tree and Forest Health

- Texas A&M Forest Service, Forest Health: http://tfsweb.tamu.edu/foresthealth/
- Texas Chapter International Society of Arboriculture: http://isatexas.com/
- The Benefits of Prescribed Fire Video: http://www.nature.org/ourinitiatives/habitats/forests/howwework/maintaining-fires-natural-role.xml
- Fighting Fire with Fire: http://goodfires.org/fire

Module Eight - Tree History

- Famous Trees of Texas: http://famoustreesoftexas.tamu.edu
- Texas History: http://www.history.com/topics/us-states/texas http://www.tshaonline.org/handbook/online
- How to Create a Timeline in Microsoft Office: http://office.microsoft.com/en-us/excel-help/create-a-timeline-HA010354853.aspx?CTT=1

Module Nine: Urban Forestry

- Texas A&M Forest Service, Urban Forestry: http://tfsweb.tamu.edu/urbanforestry/
- Texas Chapter International Society of Arboriculture: http://isatexas.com/
- Natural Inquirer Scientist Cards: http://www.naturalinquirer.org/Scientist-Card-Series-v-168.html

Module Ten - Student Service Leader

- Arbor Day Foundation: http://www.arborday.org/
- Texas A&M Forest Service, Urban Forestry: tfsweb.tamu.edu/urbanforestry
- Texas Tree Planting Guide: http://texastreeplanting.tamu.edu/
- Getting Started in Service Learning: https://gsn.nylc.org/topics/all

Tree Trails

1

ELEMENTARY

★ Map a Tree Trail ★

By understanding maps, students get a sense of where they are in relation to their home, school and neighborhood. Trees are often other important landmarks along the way.

Goal and Objectives

Goal: Students will select a minimum of three trees for the Tree Trail.

Objectives: Students will

1. Select a variety of trees for their class Tree Trail.
2. Order and chart the selected trees and name their class Tree Trail.
3. Explain why trees are important landmarks that help them know the relation to their school and neighborhood environment.
4. Mark their trees on the Tree Trails online map.
5. Evaluate their *Map a Tree Trail* experience.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- White board or chart paper and markers
- Tree Trails Portfolio, Student Learning Log/Journal

Handouts

- Tree Trails Data Sheet

Activity Materials

- Map of school, from either Map My Property or student created

Time and Internet Links

Preparation Time: 2 hours
Instructional Time: 2-3 sessions, 45 minutes each

- Tree Trails
  www.treetrails.org
- Instructional Strategies, KWL graphic organizer
  http://schools.spsd.sk.ca/curriculum/instructionalstrategies/
- Getting Started
  http://tfsweb.tamu.edu/treetrails/
- Map My Property
  http://tfsfrd.tamu.edu/MapMyProperty/
- Texas Forest Information Portal
  http://texasforestinfo.tamu.edu/
- Sample Tree Trail
  www.treetrails.org
  Search By, Trail Name, enter: Heights HCBTR Trail

Instructional Procedures

I. Engage/Excite

A. Large Group Discussion: Conduct a discussion about what it was like to discover America; i.e., did the early pioneers have a plan to explore the new land? Did they have a map? Did they create a map? How did they map their new discoveries? Talk about the significance of being the first to map a country, an ocean, an island, etc. and how it helped those explorers who followed.

B. Large Group Discussion continued: Connect to students' prior knowledge by asking what they know about maps. Ask students what is the purpose of maps. Ask students to name different kinds of maps. Ask how are maps used. List their responses on a chart. If students do not name a school or campus map, ask if they know what tells us about our school and its landscape?

C. Large Group Discussion continued: Develop a KWL Chart and include their responses on the "What we *Know*" portion of the chart.

II. Explore

A. Large Group Discussion: Lead a discussion about the kind of map that would help us relate more to the landscape and school environment. Discuss how and why a map of trees on the school landscape could be important in understanding our relationship to our community, its resources and landmarks. Record the responses. Tell students that some trees have been mapped like the Texas A&M Forest Service office in Houston and other trails on the online application for Tree Trails.

B. Large Group Discussion continued: Prompt students to describe what they need to know and do to develop a Tree Trail map. Continue the KWL chart by adding the "What we *Want* to Know and Do" on a chart/whiteboard. Encourage them to include: work in small groups, explore the trees on their school landscape, use technology to map the trail, select a variety of trees and work cooperatively. List their responses and keep the chart available for additions and future reference.

Teacher Tip: If there are not enough trees on campus, adopt another landscape in close proximity and gain necessary permission to use the area.

III. Explain

A. Small Group Activity: Have students move into groups of three to give them greater interaction with their tree. (More students in a group would not be conducive to activities.) Tell students that each group will adopt one tree for the class Tree Trail. Students may give their tree group a name, such as the Investigators. Once each group has selected their name, have them share their names with the class.

Teacher Tip: Ideally these groups should stay the same throughout the modules. However, if it becomes necessary to change the composition of group members, the group's name should stay the same.

B. Large Group Discussion: Ask students to start thinking of a name for their class Tree Trail which will

III. Explain continued

be a name for the trail of all the trees. For example: Investigator group + the Explorer Group + all the other groups = the class Tree Trail. Encourage the students to select a name that represents this new learning adventure of creating a Tree Trail. The class Tree Trail name will be published on the Tree Trails website.

C. Large Group Discussion: Prompt a discussion about how technology is used to make maps. Project the Texas Forest Information Portal website on a screen. Have students follow along. Open Tree Trails. Let them know this is the website where they will create their Tree Trail.

Teacher Tip: If not conducting the following Small Group Activity, open some of the other applications on the site and explore together as a group.

D. (Optional) Small Group Activity: Regroup students into their Tree Trail groups of three. Provide each group with computer(s). Provide time for students to get acquainted with the Texas Forest Information Portal website. Let them explore the other different applications on this website too, such as Forest Ecosystem Values, Forest Distribution, etc. Invite them to investigate the Tree Trails application and its different tabs and sections. Conduct a discussion about what they found and enjoyed.

E. (Optional) Individual Activity: Have the students take the *Map A Tree Trail* 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.

IV. Extend/Elaborate

A. Large Group Discussion: Explain the next steps to map or locate trees and tell them how they will use technology to help them create their maps.

Teacher Tip: Select a method to locate and mark selected trees. This could be a printed map/chart of the school or student generated.

To make a printed map of the school or another selected location, open the Map My Property website, then enter the address and different information you want to put on the map. If using this method, print a copy of the map for each group.

Another option is to allow your students to create a map themselves and mark significant landmarks and trees.

Note: A Tree Trails phone or tablet stand-alone application is available on Apple iTunes applications. However, it requires the user to enter all data for each tree when the tree is marked on the map. It does not allow the user to enter partial data as these first three modules are written. Note, though, that it is the only option for adding a photo of a tree into the online trail. It is recommended to use the Apple iTunes application after the entire trail and each tree's data is collected, after Module Three.

IV. Extend/Elaborate continued

B. Large Group Discussion continued: Ask each group to select a different tree or, if there are not enough varieties of trees and it is necessary to select the same type of tree more than once, choose a different size, condition, etc. Discuss how the groups will select their trees. Discuss the need to cooperate in the selection of each tree.

Teacher Tip: You may need to devise a method to select which group will explore each tree (draw numbers, let students choose, etc.).

C. Small Group Activities: Take students outside to select trees for their class Tree Trail. Next, have each group find or plot all the trees on their map. Now, as a class, number the trees in the order (1, 2, 3, 4, etc.) that each tree will be visited on the trail. After the trees are located and numbered, assign each tree to a Tree Trail group.

D. Large Group Discussion: Return to the classroom and decide on a name for the class Tree Trail. The class name will be the name published online and available for other users to see. Encourage the students to select a name that represents their school and classroom.

E. Large Group Discussion continued: Now is the time that the class Tree Trail will be entered into the online application. Have the students follow the computer projection of the Texas Forest Information Portal website. Open Tree Trails, zoom to the trail location on the map, choose Add Trail and follow the onscreen instructions. Begin marking the trees by asking the group with the first tree to provide the location of their tree. Select that location on the map to add the tree. Continue until all trees are entered in numerical order. After entering the last tree, double tap to end the trail. Then, select the green trail line to enter the name of the class Tree Trail and choose the type as School Trails. Once these steps are completed, you can save the trail.

F. Individual Activity: Provide each student with a Tree Trails Data Sheet. Have them complete their Name, Group Name, School/Organization, Type, Tree Order #, and start a tally of Hours Involved. Tell them they will complete each section on the data sheet during the next two modules. When their chart is finished and the information is entered on the Tree Trails website, their class Tree Trail will be complete for all to see. They can keep the data sheets in a Tree Trails Portfolio.

G. Large Group Discussion: Conclude the Tree Trail mapping activity by reviewing the discussion about their Tree Trail as part of the landscape. Make a chart entitled “Trees in Relation to our Landscape and Environment.” Ask how their trees form a reference point and help us relate to our landscape. Record their responses.

H. (Optional) Individual Activity: Students may enter these responses in their Learning Log.

V. Evaluate

A. Small Group Activity: Move students into small groups and ask them to reflect over their learning experience. Assign a secretary/recorder for each group to generate the steps they used in the development of their Tree Trail.

B. Large Group Activity: Have each group post their charts and share. Ask the students to analyze each group’s synopsis. Then conduct a "Challenge" session by offering each group a chance to respond about any steps left out or any that need further explanation.

V. Evaluate continued

C. Large Group Activity continued: After the class has concluded their challenges, combine all the steps taken in the process of selecting, charting and pinpointing on the website, and use their information to complete the KWL chart for "What we *Learned*."

D. (Optional) Individual Activity: Have students take the *Map A Tree Trail* 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.

E. (Optional) Individual Activity: Have students use their Learning Log to enter their individual learning phrases or sentences and reflect on Module One: Map a Tree Trail.

VI. Extra Mileage/Attention

Extra Mileage: Regroup students using the expert model; i.e. allow leader to extend a discussion about how Tree Trail projects across the state could help increase awareness about the value of our trees and how they contribute to the landscape. They may post their ideas in their Learning Logs labeled Module One: Map a Tree Trail.

Extra Attention: Have students work in pairs to retell the process of developing their class Tree Trail. Discuss what was easy and what was more difficult. Regroup students according to the different things they found difficult. Have students enter their solutions for making the task easier and post solutions in their Learning Logs.

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

Map A Tree Trail

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 know how to develop a tree trail.	1	2	3	4	5
2.	I know how to map trees on a tree trail.	1	2	3	4	5
3.	I like to work in small groups to learn.	1	2	3	4	5
4.	Learning logs help me use what I learn.	1	2	3	4	5
5.	I like learning activities that are outside.	1	2	3	4	5
6.	I can use technology to learn about trees.	1	2	3	4	5
7.	I know how maps tell us about our land.	1	2	3	4	5
8.	I can find my school online on the Texas Forest Information Portal website.	1	2	3	4	5
9.	I am interested in knowing more about trees.	1	2	3	4	5

Learning Log

Use this Learning Log to write about your reflections, concerns, questions, responses, and just to add notes about your module experience. Each time you sign into your Learning Log, record the date and the Module number you are responding. If you have more than one entry for the same module, sign in again with a different time.

TREE TRAILS

Tree Trails Data Sheet

Name ____

Group ____

School / Organization ____

Trail Name ____

Trail Type ☐ School ☐ Nature Center ☐ Park ☐ Other

Hours Involved ____

Tree Order #	Latitude (decimal degrees)	Longitude (decimal degrees)	Tree Species	Circumference (inches)	Diameter (inches)	Height (feet)

Crown Spread (feet)	Condition Rating (Good Fair Poor)	Comments

Tree Order #	Latitude (decimal degrees)	Longitude (decimal degrees)	Tree Species	Circumference (inches)	Diameter (inches)	Height (feet)

Crown Spread (feet)	Condition Rating (Good Fair Poor)	Comments

Tree Order #	Latitude (decimal degrees)	Longitude (decimal degrees)	Tree Species	Circumference (inches)	Diameter (inches)	Height (feet)

Crown Spread (feet)	Condition Rating (Good Fair Poor)	Comments

Tree Order #	Latitude (decimal degrees)	Longitude (decimal degrees)	Tree Species	Circumference (inches)	Diameter (inches)	Height (feet)

Crown Spread (feet)	Condition Rating (Good Fair Poor)	Comments

Tree Order #	Latitude (decimal degrees)	Longitude (decimal degrees)	Tree Species	Circumference (inches)	Diameter (inches)	Height (feet)

Crown Spread (feet)	Condition Rating (Good Fair Poor)	Comments

Tree Order #	Latitude (decimal degrees)	Longitude (decimal degrees)	Tree Species	Circumference (inches)	Diameter (inches)	Height (feet)

Crown Spread (feet)	Condition Rating (Good Fair Poor)	Comments

Tree Order #	Latitude (decimal degrees)	Longitude (decimal degrees)	Tree Species	Circumference (inches)	Diameter (inches)	Height (feet)

Crown Spread (feet)	Condition Rating (Good Fair Poor)	Comments

Tree Trails

2 ELEMENTARY

★ Tree Identification ★

Tree identification is a critical first step towards an understanding of 'diversity.' By learning the names of trees, we come to appreciate them.

Goal and Objectives

Goal: Students will identify their trail trees and explain how identification relates to tree knowledge.

Objectives: Students will

1. Demonstrate how to use the internet to identify trees.
2. Apply a method to identify a tree.
3. Identify their trail tree on the Tree Trail website.
4. Describe how the tree identification process develops observation skills basic to the scientific process.
5. Explain how tree identification is important to acquisition of tree knowledge.
6. Evaluate their *Tree Identification* experience.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- White board or chart paper and markers for small groups
- Tree Trails Portfolio, Student Learning Log/Journal

Handouts

- Poems
- Getting Started with Leaf Characteristics
- Tree Trails Data Sheet
- (Optional) Sample Leaf Cards

Activity Materials

- (Optional) Paper and crayons for leaf rubbings
- (Optional) Cameras or camera phones

Time and Internet Links

Preparation Time: 2 hours
Instructional Time: 2-3 sessions, 45 minutes each

- Tree Trails
  www.treetrails.org
- Instructional Strategies
  http://schools.spsd.sk.ca/curriculum/instructionalstrategies/
- Sample Leaf Cards:
  http://tfsweb.tamu.edu/uploadedFiles/TFSMain/Learn_and_Explore/Conservation_Education_Resources/Sample%20Cards.pdf
- Trees of Texas
  http://texastreeid.tamu.edu

Instructional Procedures

I. Engage/Excite

A. Large Group Discussion: Lead a discussion about what students will learn in Module Two, i.e. tree identification and knowledge. They will be learning why identification is an important skill and how the process increases their knowledge about trees. Explain that before they begin the identification process, they will learn vocabulary words that tell others about trees. Select a poem or poems about trees from the Poems handout of links.

Teacher Tip: "Learning the Trees" by Howard Nemerov contains some of the vocabulary they will use in the tree identification process. You may want to read this one first and/or read other poems also.

B. Large Group Discussion continued: Develop a KWL with the word "Imagery." Ask students what this word means to them. Compile their responses on the chart/whiteboard. Ask students to think of ways words create pictures in our minds. Add to the list of their responses. Explain that poems about trees can create images in our minds about tree characteristics. Ask students to close their eyes and listen to a poem about trees. Ask them to visualize or imagine the descriptions and characteristics of trees as the poem is read. Have students write words that describe what they hear in the poem and/or draw a picture of what they hear in the poem.

C. Large Group Discussion continued: After listening to the poem, ask students what they visualized from words in the poem. Ask them to analyze their list and add additional responses. Keep their responses visible. Ask "What do we *Know*" about why descriptive words are important for identifying trees. Then ask why they think it is important to know how to identify trees. List these responses under the *Know* portion of the KWL chart.

E. (Optional) Individual Activity: Have the students take the *Tree Identification* 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: Brainstorm why it is important for the vocabulary used to identify trees to be descriptive and specific. Guide them to conclude that trees can be distinguished by observing their characteristics. Make a list of what we need to observe about trees to identify them: size, shape, color, bark, leaves, etc. Ask them to consider other traits their tree might have such as whether it looked healthy or old. Keep the list visible to use later in the evaluation section. Remind students that all these attributes help in the identification of trees which helps us know more about tree growth, tree health, tree environments, etc.

B. Large Group Discussion continued: Lead a question and answer discussion about how and why scientists must use very accurate, specific words and pictures to identify all living and non-living

II. Explore continued

things. Discuss how the observation skills used to identify trees applies to other scientific investigations. Encourage students to conclude that identification is a first step for discussing and learning about and protecting our world. List responses.

C. (Optional) Small Group Activity: Write "Tree" on a chart or white board and let students move into small groups and decide on a tree to describe from a photo or campus tree, but not the one selected as their trail tree. Provide chart paper and markers for each group to write a tree description. Have each group trade their chart with another group. The groups use the chart traded to draw a picture of the tree as it was described. Then each group returns the chart with their drawing to the original group.

D. (Optional continued) Large Group Discussion: Have each group share their charts and discuss what words contributed to make the drawing look like the tree that was described and what they would change to make the description more accurate.

E. Large Group Discussion continued: Return to the KWL chart and ask students "What we *Want* to Know." Record responses on the chart/whiteboard.

III. Explain

A. Large Group Discussion: Project the Trees of Texas website for students. Choose How to ID and have the students look at the different identification techniques listed. Ask them to observe the information available to learn more about trees. Ask them to notice the section on leaves and to observe the different leaf characteristics important to the identification process. Let students know that in the process of identification, they will learn more about trees than just the name. This site is a good source for gaining important knowledge about all trees.

Teacher Tip: This site is useful in assisting students with terminology and tree identification.

B. Large Group Discussion continued: Next, choose ID by Leaf. Let students know this is their primary tree identification site. Choose Leaf Collecting and Safety. Have students read the safety section. Discuss what cautions they must take when they collect any leaves. Develop a safety plan before going outside to collect, photograph or make rubbings of leaves. Post the Safety Plan.

IV. Extend/Elaborate

A. Large Group Discussion: Lead a large group discussion about collecting their leaves. List the steps they will take.

B. Small Group Activity: Move the students into their small groups. Provide each group with a plastic closure bag to collect leaves from their tree. Have the group label the bag with their Group Name and Tree Number. Example: The Investigators, Tree #, Tree ID_____ (fill in ID when name of the tree is identified.) Take the groups outside with their collection tools to collect leaves and/or photograph them. Remind the students to collect leaves from the ground and on a small branch if possible.

Teacher Tip: As necessary, get permission to collect samples from the trees.

IV. Extend/Elaborate continued

C. Large Group Discussion: Return to the classroom with each group's collection. Conduct a discussion about why the tree identification site lists common and scientific names. Common names are often used for multiple species but scientific names refer to only one species. Example: A live oak's common name may be applied to a number of different kinds of oaks. However, the scientific names for a live oak applies only to one species.

D. Large Group Discussion continued: Have students follow a projection of the resource handout Getting Started on Leaf Characteristics or project the How to ID section of the Trees of Texas website and demonstrate leaf characteristics by showing a leaf sample.

Teacher Tip: You may provide students with a handout of the characteristics and have them watch as you project it or you may want to have them follow with their tablets/laptops.

Ask students to observe the characteristics of leaves: leaf tips and bases (heart shaped, rounded, tapered), leaf margins (serrated & lobed), leaf textures (hairy, smooth, thick, thin, rough or waxy), leaf structure (simple and compound) and leaf arrangements (opposite, alternate and whorled).

E. (Optional) Small Group Activity: Provide the students with one or more leaf samples from trees that are not part of the tree trail to practice identification. You can gather leaves from other trees on campus or use the Sample Leaf Cards. Have each group draw (or use a leaf rubbing) of their practice leaf and write a short description of the practice leaf and its characteristics next to the drawing. Then go to the Trees of Texas website's ID by Leaf section to find the tree that matches their practice leaf characteristics and description. Repeat as needed or wanted with other practice leaves.

Teacher Tip: Students will need to understand the vocabulary for leaf characteristics to use the key. Drawings are shown in each step of the key to illustrate the characteristics. A dictionary is also available on the Trees of Texas website.

F. Small Group Activity: Have each group draw (or use a leaf rubbing) of their trail tree leaf and write a short description of the leaf and its characteristics next to the drawing. Then go to the Trees of Texas website then ID by Leaf to find the tree that matches their leaf characteristics and its description. If needed, the students may want to refer to their leaf and make needed changes in their description.

G. Small Group Activity continued: Have each group write the scientific and common name for their leaf. Once the group has determined their tree's identification and moved to the end of the key, their specific tree information will be shown. Have them review the tree information and description to verify their tree identification. They should write the common and scientific name on the collection bag.

H. Large Group Discussion: Allow each group to present and display their leaves, and/or rubbings and photos with their collection bag to the whole class. Each group should share how they came to the conclusion they made to identify their tree (common and scientific name) and why they are sure of their decision. (Optional) Encourage all students to be careful listeners so they may challenge a group's identification. Provide time to have a "Challenge" session and debate.

I. Small Group Activity: Project the Tree Trails mapping application and demonstrate how to enter the tree name. Provide the small groups with a computer and have them follow along as each step is

IV. Extend/Elaborate continued

demonstrated. Open Tree Trails, then choose Search By, choose Trail Name, then type the class trail name in the search box. Once they see the trail onscreen, find their tree and select it. Ask each group to provide the common name of their tree by using the arrow and drop down box. Have them search for their tree name in the list. Tell them that if the name of the tree cannot be found, select "Other Coniferous" or "Other Broadleaf" and type their species name into the Comment box. Save the tree information. At any time, you may go back to a tree you have saved and edit it.

Teacher Tip: Coniferous trees have needles or scales instead of leaves and are usually evergreen. Broadleaf trees have wide flat leaves rather than needlelike or scalelike leaves.

J. Large Group Discussion continued: Discuss how listening to each group's identification helped other students know more about different trees. Their learning becomes expanded when they are involved in the identification of more than one tree. The group discussion helps everyone become more comfortable and confident with the identification task. Lead the students to conclude that repeating their research with other groups and with other trees is an important process for any scientific investigation. Include in the conclusion a discussion about the observation process used to identify the different kinds of trees. Ask how they can use this process for other scientific tasks and how the knowledge acquired will be useful to them in other tasks. List their responses.

V. Evaluate

A. Individual Activity: Have students write a short list of ways: a) identification is an important scientific process and b) how the identification process contributes to their overall knowledge. Let students share in Think, Pair, Share groups of four. They may add ideas to their lists. Have students label their list as Module Two and place in their Portfolios.

B. Have the students fill in their Tree Trails Data Sheet with the common and scientific name of their tree. They can keep it in their Tree Trails Portfolio. They will use it again in the next module to enter the tree measurements and condition.

C. (Optional) Individual Activity: Have students take the *Tree Identification* 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.

D. Large Group: Ask the students to contribute to the KWL chart and record on White Board or class chart to complete with "What we *Learned*."

VI. Extra Mileage/Attention

Extra Mileage: Have students compose simple poems about their tree of choice, preferrably sitting outside under a tree. This may be a group or individual project. Encourage them to use words that create imagery, feelings and distinguish their tree. They may use different techniques like alliteration, onomatopoeia, Haiku, free verse, etc.

VI. Extra Mileage/Attention continued

Extra Attention: Have students revisit the website to discover additional important characteristics of their class Tree Trails. Have students make a compare and contrast Venn diagram (two circles overlapping in the middle) to compare two different leaves they collected. List like attributes in the overlapping section of the diagram and the different attributes for each leaf in circle one and two.

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 Identification

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

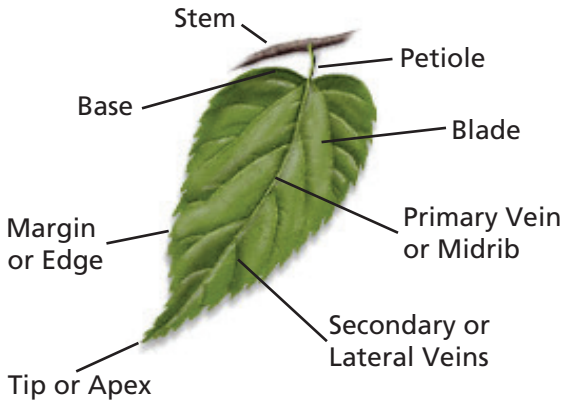
1.	I can name four steps to identify my trail tree.	1	2	3	4	5
2.	I can name three ways to be safe when I collect leaves.	1	2	3	4	5
3.	I can use five vocabulary words to describe leaves.	1	2	3	4	5
4.	I can find the common and scientific name of trees.	1	2	3	4	5
5.	The process of identifying different trees helps me become a better scientist.	1	2	3	4	5
6.	I know how to use the internet to identify trees.	1	2	3	4	5
7.	I can identify three different trees.	1	2	3	4	5
8.	I enjoy writing about the trees.	1	2	3	4	5
9.	I am interested in learning more about different trees.	1	2	3	4	5

Getting Started on Leaf Characteristics

Tree Type

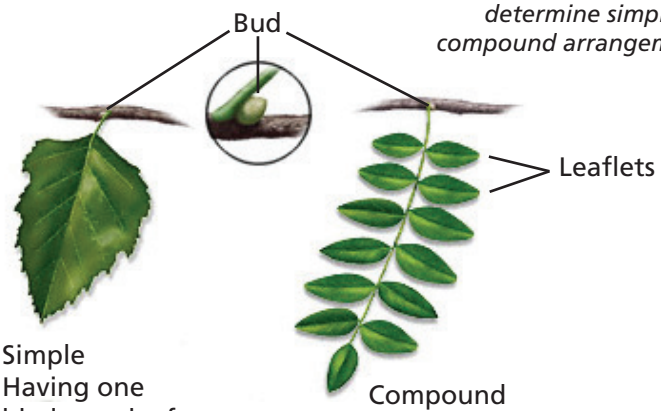
Coniferous - a tree with needles or scales instead of leaves, bearing cones
Broadleaf - a tree with wide flat leaves

Parts of a Leaf



Simple & Compound Leaf

Finding the bud will help determine simple or compound arrangement



Simple
Having one blade per leaf

Compound
Having more than one leaflet per leaf

Leaf Arrangement

Opposite
Leaves are attached opposite each other on the stem

Alternate
Leaves are attached alternately along the stem

Whorled
3 or more leaves are attached at the same point on the stem

Leaf Shapes

Lanceolate | Deltoid | Oval | Star

Leaf Margins

Entire
Having a smooth edge

Lobed
Rounded segment not divided all the way to the midrib

Dentate
Having triangular, tooth-like teeth

Serrated/Toothed
Having sharp, saw-like teeth

Leaf Apexes and Bases

Acuminate
Long tapered point

Bristle

Rounded

Acute

Rounded

Cuneate
Wedge-shaped

Inequalateral
Not same on both sides

Truncate
Squared off

To find more Leaf Characteristics,
visit the Trees of Texas website's How to ID section:
http://texastreeid.tamu.edu/content/howToID/

TREE TRAILS

Poem Links

Learning the Trees
By Howard Nemerov
http://www.poetryfoundation.org/poetrymagazine/poem/22392

Trees
By Joyce Kilmer
http://www.poetryfoundation.org/poetrymagazine/poem/1947

Native Trees
By W. S. Merwin
http://www.poetryfoundation.org/poem/171876

Winter Trees
By William Carlos Williams
http://www.poetryfoundation.org/poem/174773

Banana Trees
By Joseph Stanton
http://www.poetryfoundation.org/poem/179889

[little tree]
By E. E. Cummings
http://www.poetryfoundation.org/poem/176724

where you are planted
By Evie Shockley
http://www.poetryfoundation.org/poem/244260

LIFE
by Misty Woods

Little baby leaf, green and new
Coming into the world with millions of others
Warm sunshine gently urging the little leaf to grow
New life, so happy and joyous you are
Sweet little leaf still growing strong
Sun still gentle as a robin makes her nest
Little leaf reaching up for joy.
Still young, Still new.
Green leaf, young you are no more
Proudly taking care of your mother tree
The sun grows harsher as the days grow longer
Still you stand tall with your siblings.
Old leaf, your time has come
Cold winds raise from the north
Tugged and pulled but still you are stubborn
Finally, as death slowly comes, you fall into the oblivion.

Misty Woods wrote this poem at age 13. She is enrolled at First Baptist Christian Academy in Pasadena, Texas. She has provided permission to use her poem in Tree Trails.

Tree Trails

3 ELEMENTARY

★ Tree Measurement ★

Tree measurement is fundamental to the practice of forestry. Foresters count trees and measure trees. With just a few basic measurements, we can assign values to trees and compare them to each other.

Goal and Objectives

Goal: Students will measure trees and explain how measurement is used to place value on trees and forests.

Objectives: Students will

1. Apply the tree measurement process to measure a tree.
2. Explain why tree measurement is important for knowing about a tree's health and value.
3. Determine the measurements and condition of their trail tree and enter on the Tree Trails website.
4. Explain the purposes of the Big Tree Registry.
5. Evaluate their *Tree Measurement* experience.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Tree Trails Portfolio, Student Learning Log/Journal

Handouts

- Tree Measurement Guidelines
- Tree Trails Data Sheet

Activity Materials

- A variety of measuring tools: rulers, tape measures, scales, cups, spoons, yarn, etc.
- Tree measurement tools: 12" ruler, flexible tape measure
- (Optional) Chart paper and markers for small groups
- (Optional) Cameras or camera phones

Time and Internet Links

Preparation Time: 2 hours
Instructional Time: 2-3 sessions, 45 minutes each

- Big Tree Registry
  http://tfsweb.tamu.edu/texasbigtreeregistry
- Instructional Strategies
  http://schools.spsd.sk.ca/curriculum/instructionalstrategies/
- Tree Trails
  www.treetrails.org

Instructional Procedures

I. Engage/Excite

A. Large Group Discussion: Exhibit a variety of measurement instruments such as rulers, yard sticks, tape measures, measuring spoons and cups, liquid containers, yarn, scales, etc. Ask students to name various professions that might use these and other measurement tools. For example, their parents, relatives, friends and/or neighbors may use these for work to build homes, design clothes, operate a restaurant, etc. List the professions and their tools.

B. Large Group Discussion continued: Lead a discussion about standard units of measure. Point out that not all of the display measuring instruments have the same measurement standard such as rulers (standard & metric), cups and spoons (ounces, teaspoon), etc. Lead students to generalize that each measurement instrument is designed for a certain task. Generate a conversation about what it would be like if people use a non-standard tool for their work. Example: what if one house builder used a tree limb to measure his lumber needs and another builder used cardboard. Record students' responses on the list created.

Teacher Tip: You may want to share with students how people once used their bodies (hand and/or arm spans, body height) to measure such things as horse height in terms of hands. Students may have heard that horses may be measured by hand span.

C. (Optional) Small Group Activity: In small groups of three, have students choose a profession from the list or choose another not listed. Tell them to keep their profession a secret to present later. Have the "secretary" record on a small chart or paper the Profession, Measurement Tools and Reason. Have each group act out their profession by "pretending" to use the measurement tools required by a specific profession. Have the other groups guess the profession, the measurement tools and the reason. Allow the "pretend" group to reveal their Profession, Tools and Reason chart after at least three guesses are made. Continue until all groups have presented.

D. Large Group Activity: Begin a KWL chart and allow students to tell "What they think they *Know*" about measuring a tree. List their responses. Next ask why they think it is important to know how to measure trees. List their responses.

E. (Optional) Individual Activity: Have students take the *Tree Measurement* 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.

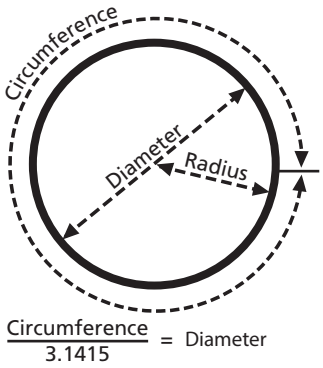
II. Explore

A. Large Group Discussion: Write "Why Foresters Measure Trees" on a whiteboard/chart and ask why they think foresters measure trees. List their responses. Lead the discussion to focus on how measurement is a first and very important step in determining trees size and value. Explain that foresters record a tree's measurements and its condition over time. The tree's condition and rate of growth are indicators of the tree's response to its environment, and are key factors that

II. Explore continued

foresters consider when calculating a tree's value. Foresters measure trees to plan harvesting, make management decisions and calculate timber yield. Include all the reasons on the chart and save for later. Let students know they will learn more about tree health, benefits and value in future modules.

B. Large Group Discussion continued: Write "How Foresters Measure Trees" on a whiteboard/chart. Inform students that foresters measure trees using a standard process and they will learn to measure their trail trees the way foresters do. They will measure their trail tree's circumference and convert it to diameter. They will measure its crown spread, its height, determine its condition and enter the information on the Tree Trails website. This will be the last step to complete their trail tree online.



C. Large Group Discussion continued: Discuss the definition of circumference and demonstrate how to measure, record the circumference and convert it to diameter. Demonstrate in the class with circular objects (a column) or with student's body, head, etc.

Teacher Tip: Circumference is the linear distance around the outside of a closed curve or circular object. The circumference of a circle is the length around it.

Teacher Tip: Demonstrate the math vocabulary term, circumference using a cylindrical object. Using the same object, demonstrate the term, diameter and describe how the two measurements are related by the constant, pi.

D. Complete the "*Want* to Know" section of the KWL chart.

III. Explain

A. Large Group Discussion: Have students follow a projection of the Tree Measurement Guidelines and explain the process of how trees are measured.

Teacher Tip: You will probably want to practice measuring a tree, circumference, diameter, height and crown spread, before presenting the guidelines to students.

Teacher Tip: You may provide students with a handout of the measurement guidelines and have them watch as you also project the guidelines or you may want to have them follow with their tablets/laptops. The guidelines handout is in the resources section of the Tree Trails website.

Teacher Tip: Foresters round down in tree measurements instead of rounding up, because the tree has not yet reached the higher measurement. They keep to whole numbers because of the relative accuracy of repeatability – roughed up bark and even relative humidity can make small differences, as can having the tape measure less than perfectly perpendicular to the centerline of the trunk.

III. Explain continued

B. Small Group Activity: After presenting the measurement guidelines, move students into their Tree Trail groups and ask students to consider which measurement technique they might use for their trail tree (general, leaning, multi-branch, etc.).

C. Individual Activity: Have each student retrieve their Tree Trails Data Sheet from their Portfolio. Instruct them to locate the Circumference and Diameter box, Crown Spread, Height, and Condition Rating boxes. Inform the students that this is where they record their tree's measurements in either inches or feet and condition. Optional: use metric measurement and convert to US Standard Units.

D. Small Group Activity: Provide each group with measurement tools. Take the students outside to locate their tree. Have each group measure their trail tree: determine where to measure the circumference (see the Tree Measurement Guidelines reference handout), then measure the circumference, measure the crown spread, it's height and determine its condition using their best judgement. Record the information on their Tree Trails Data Sheet. Have students return to the classroom.

E. Small Group Activity continued: Have the group use the formula for diameter and calculate the diameter of their tree. Record the information on the Tree Trails Data Sheet.

F. Small Group Activity continued: Project the Tree Trails online application and demonstrate how to enter the tree measurements. Provide the small groups with a laptop/tablet and have them follow along as each step is demonstrated. Choose Search By, choose Trail Name, then type the class trail name in the search box. Once they see the trail onscreen, find their tree according to the order of their tree in the trail and select it. Then, for each measurement box, ask another person from the group to contribute their measurement and enter it on the website. Ask another student to provide the condition, Good, Fair, or Poor, and choose it in the appropriate drop down box. Continue until all information is entered. At any time, you may close to save and go back to a tree you have saved and edit it.

IV. Extend/Elaborate

A. Large Group Discussion: Tell students about a related site that uses measurement to register Big and Champion Trees. Project the Big Tree Registry website. Ask students to locate the purposes of the program and invite three students to read one of the three purposes.

B. Small Group Activity: Move students into their Tree Trail groups and go online to the Big Tree Registry website and then open How to Measure a Big Tree. Ask each group to compare their measurement techniques with those used for Big Trees. Let each group report their findings.

C. Small Group Activity continued: Next ask students to select the Registry of Champion Trees - Native and Naturalized species. They will notice that the trees are registered by common and scientific (Latin) names. Remind students how these names were important to identification of their tree. Now ask students to locate a Big Tree of the same species as their trail tree. Ask each group to report their findings: where the tree is located (county), what is the circumference, height, and when was it last measured.

D. (Optional) Small Group Activity: Students might want to review some of the virtual tours with a volunteer who hunts for and measures champion trees found on the Big Tree Registry website.

V. Evaluate

A. Individual Activity: Ask students to write: 1) List the steps they took to measure their tree, 2) Tell how they determined it's condition, 3) Tell why measurement is important to knowing about the tree's value, 4) Tell a purpose for registering Big Trees.

B. Small Group Activity: Ask students to share their lists in Think, Pair, Share groups. After sharing, students may want to enter more information in their writing. Have them label their work as Module Three and keep their work in their Portfolios.

C. (Optional) Individual Activity: Have students take the *Tree Measurement* 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.

D. Large Group: Ask student to contribute to the KWL chart and record on whiteboard or class chart to complete with "What we *Learned*."

VI. Extra Mileage/Attention

Extra Mileage: Have students work in pairs to write a mathematical word problem related to two or three dimensions of their trail tree and give to another pair to solve. Ask student pairs to analyze how they answered the problem, what helped and what deterred them from getting the answer.

Extra Attention: Appoint peer students to accompany students while they take measurements of their trees with their hands and/or arms and let these students present their new measurements in terms of hand span and arm span measurements.

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 Measurement

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 measure my trail tree the forester's way.	1	2	3	4	5
2.	I know how to determine which technique to use to measure my trail tree.	1	2	3	4	5
3.	I can determine the condition of a trail tree.	1	2	3	4	5
4.	I know how big trees are measured.	1	2	3	4	5
5.	I can name three reasons why foresters measure trees.	1	2	3	4	5
6.	I can locate a Champion Tree in Texas.	1	2	3	4	5
7.	I know how tree measurement data is entered on the Tree Trail website.	1	2	3	4	5
8.	Measuring trees is an important step in conserving our forests.	1	2	3	4	5
9.	I am interested in knowing more about what I can do to keep my trail tree in the best condition.	1	2	3	4	5

Tree Measurement Guidelines

Getting Started

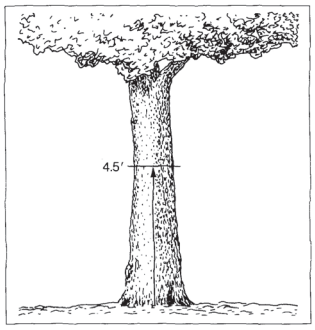
Rounding Recorded Values

All recorded measurements should be rounded down to the nearest whole number. Rounding a number for tree measurement means to remove the decimal places or fractions of a number and only record the whole number.
Examples: 48.9 feet is recorded as 48 feet, 132 3/4 inches is recorded as 132 inches

Foresters round down in tree measurements instead of rounding up, because the tree *has not yet* reached the higher measurement. They keep to whole numbers because of the relative accuracy of repeatability – roughed up bark and even relative humidity can make small differences, as can having the tape measure less than perfectly perpendicular to the centerline of the trunk.

Is It One Tree or Two (or More?)

Determine whether a tree has a single trunk or whether it represents two or more stems growing very close to one another. Trunks that have clear separation or include bark at or near the ground line should be considered separate trees; trunks of different species should also be considered separate trees, no matter how close together. When following the circumference rules below, if the point below the lowest fork places the measurement at the ground line, the stems should be considered separate.



A

Circumference

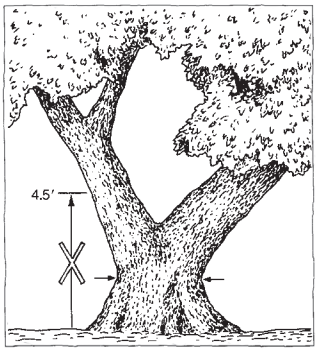
General Rule

Diameter at Breast Height (DBH) point is 4.5 feet up from the ground. (Example A)

First, find the DBH point. Then, find the smallest trunk circumference between the DBH point and the ground.

Measure and record, in inches, that smallest trunk circumference. If the tree forks, measure below the lowest fork. (Example B)

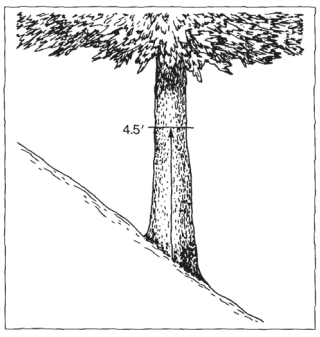
Also record the height above the ground, in inches, where the measurement was taken for your records.



B

Considerations for Determining DBH Point

Tree on Slope: Measure up 4.5 feet along the axis of the trunk on high and low sides; DBH point is midway between these two planes. (Example C)

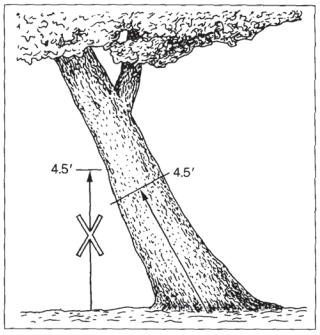


C

Leaning Tree: Measure 4.5 feet along both the top and undersides of the trunk; DBH point is midway between these two planes. (Example D)

Low Branches: When determining where on the trunk to measure circumference, ignore portions that do not form part of the tree's crown, such as dead branches or forks, and epicormic sprouts, which are ones that grow from the trunk or branches.

Obstruction at DBH: If there is a bump, burl, branch, or other obstruction at the DBH point, measure the circumference above and below the obstruction and record the smaller value. A buttress that forms between the trunk and root system as a natural feature of the species (e.g. baldcypress, water tupelo) should not be considered an obstruction.



D

Tree Measurement Guidelines

Height

General Rule

Find the vertical distance between the ground line and the tallest part of the live crown. Record the measurement in feet. Also record the method used to determine this value.

Choices include: direct measurement [telescoping pole, climbing], clinometer, hypsometer, relascope, laser rangefinder [w/ or w/o internal clinometer], stick method, pencil method, comparison, or wild guess.

Pencil Method to Measure Height

One person stands near the trunk of the tree and the second person stands at a distance where both Person 1 and the top of the tree are visible.

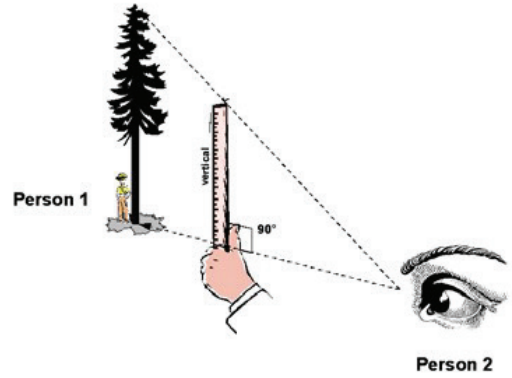
Person 2 holds a ruler (or pencil) upright at arm's length and (carefully!) walks forward or backward until the entire length of their ruler covers the tree from base to top. (Example E)

Still holding the ruler at arm's length, Person 2 turns their wrist right or left so that the ruler is now horizontal, with one end even with the base of the tree.

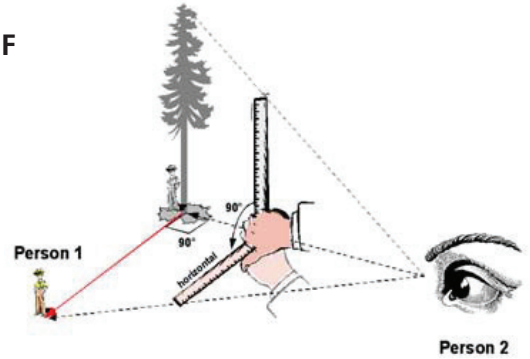
Now Person 2 instructs Person1 to move away from the trunk in the direction the ruler is pointed (at a 90 degree angle) until they are standing where the end of the ruler points. (Example F)

Person 1 is now standing roughly the same distance from the trunk as the tree is tall. Use a tape measure to record this distance, in feet.

E



F



Crown Spread

General Rule

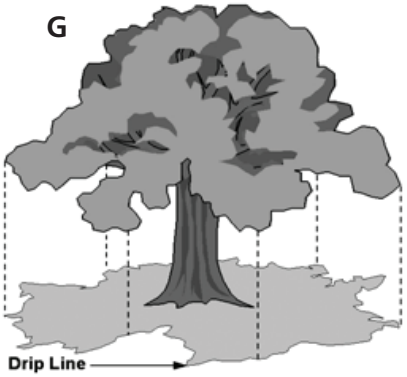
Along the drip line of the tree, take two measurements of the crown width, in feet, at right angles, or perpendicular, to one another. Then, average the two perpendicular crown spread measurements.

Drip Line (Example G): the outline on the ground of the outermost leaves of the crown. Include only live portions of the crown.

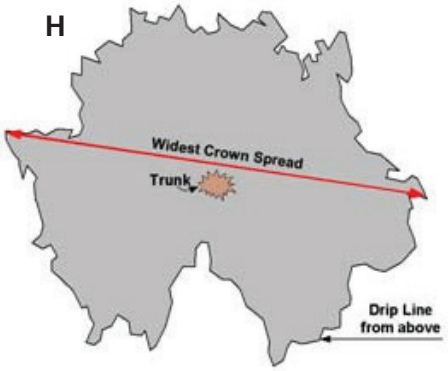
Measurement 1 (Example H): find the widest crown spread, which is the greatest distance between any two points along the drip line and measure the length, in feet.

Measurement 2 (Example I): turn the measurement line 90 degrees, or perpendicular, from Measurement 1's line, find the widest crown spread along this plane and measure the length, in feet.

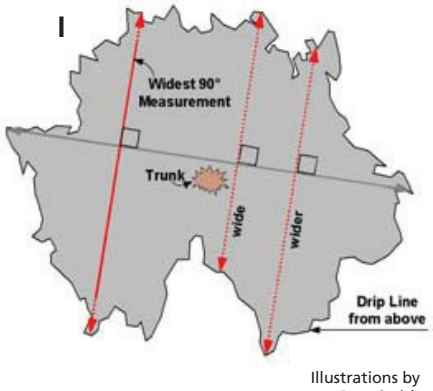
G



H



I



Illustrations by
Pete Smith

Tree Trails

4 ★ELEMENTARY★

★ 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 and 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, produces food and distributes it.
4. Demonstrate how trees protect themselves.
5. Evaluate their *Tree Structure and Function* experience.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Tree Trails Portfolio, Student Learning Log/Journal

Handouts

- Tree Trails Data Sheet
- Tree Parts
- Tree Cross Sections

Activity Materials

- Paper Plates for each student (10 -12 in.)
- Bulletin Board paper, construction paper and other paper with different textures and markers for students
- (Optional) Small sticky notes
- (Optional) Cameras or camera phones

Time and Internet Links

Preparation Time: 2-3 hours
Instructional Time: 2-3 sessions, 45 minutes each

- 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
- Tree Trails
  www.treetrails.org

Instructional Procedures

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 sticky notes 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 section, also called Tree Cookies. Then, provide pairs of students with Tree Cross Sections resource handout or project it onscreen. Ask them to notice that the cros 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; 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 vocablualy they have learned. (The activities may be either to perform a skit and/or create a game.)

1. Game option: Provide materials as needed for the groups to construct a 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 in developing 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.

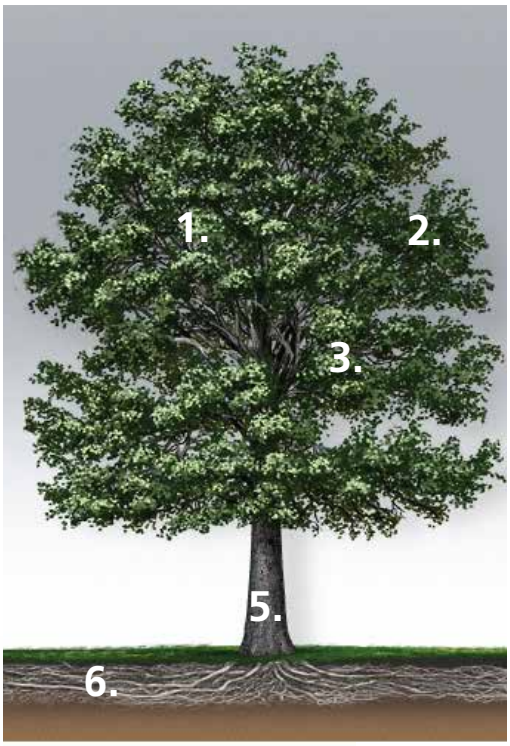
Key: 1 = Not Sure 2 = Poor 3 = OK 4 = Good 5 = Great

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

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.



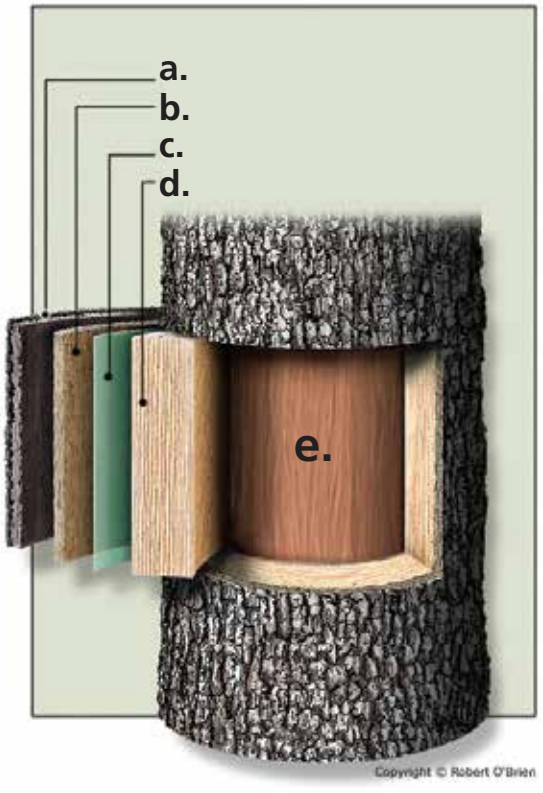
3. Branch, Twigs and Boughs: (arms) A branch is a woody part of the tree connected to, but not part of the central trunk. Large branches are known as boughs and small branches are known as twigs.

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.

Parts of the Trunk are

- **a. 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.
- **b. Inner Bark or Phloem:** (arteries) inner bark that carries sap from leaves to rest of tree.
- **c. Cambium:** (veins or artery tissue) a thin layer of growing tissue between the xylem and phloem.
- **d. Sapwood or Xylem:** (veins) brings water and nutrients up from the tree roots.
- **e. 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.

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.

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.

Tree Trails

5 ELEMENTARY

★ Benefits and Values of Trees ★

Advances in the science of urban forestry allow us to assign monetary values to a wide range of benefits that trees in urban areas provide. As trees grow, these values rise – the only part of the built environment of our cities that does so!

Goal and Objectives

Goal: Students will determine the benefits of trees and calculate their value.

Objectives: Students will

1. Use technology to calculate the value of their trail trees.
2. Analyze a wide range of benefits that trees provide.
3. Evaluate which trail tree(s) offers the most benefits and dollar value.
4. Develop a plan to maintain and improve the value of trees on their Tree Trail.
5. Evaluate their *Benefits and Value of Trees* experience.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers for students
- Card stock paper for each tree trail group
- Tree Trails Portfolio, Learning Log/Journal

Handouts

- Tree Scavenger Hunt
- Annual Benefits Breakdown

Activity Materials

- Card stock paper for each tree trail group

Time and Internet Links

Preparation Time: 2 hours
Instructional Time: 2 sessions, 45 minutes each

- National Tree Benefit Calculator
  http://treebenefits.com/calculator/
- Texas A&M Forest Service, Urban Forestry
  http://tfsweb.tamu.edu/abouturbanandcommunityforestry/urbanforestryinformationsheets/
- Arbor Day Foundation, Benefits of Trees
  https://www.arborday.org/trees/index-benefits.cfm
- Tree Trails
  www.treetrails.org

Instructional Procedures

I. Engage/Excite

A. Large Group Discussion: Let students know that they will be learning about the benefits and values of trees. They will start by going on a Tree Scavenger Hunt.

B. Small Group Activity: Divide the class into four groups and give them the list of items (that are in three levels of difficulty) to find the item or a picture of it. Give each team approximately 10 minutes to find the items. Suggest the teams assign different members to find different levels of difficulty and appoint a score keeper. Points are earned on three levels of difficulty as follows:

1. Easy Items: each team earns one point for finding the item and two for describing what part of the tree the item comes from.
2. Difficult Items: two points for finding and three points for naming where it is from.
3. Expert Items: three points for finding and four for naming where it is from.

C. Large Group Discussion: Students report their findings and scores. The items and scores are checked and a winner is declared.

D. (Optional) Individual Activity: Have students take the *Benefits and Values of Trees* 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: Take the students outside to visit their Tree Trail. Ask students how we benefit from these trees. Ask students to record their findings in their learning logs or on chart paper. When the benefit comes from a specific part of the tree, ask students to indicate this in their notes. When the students return, have them share their findings.

B. Large Group Discussion continued: Lead the students to conclude that each tree contributes benefits to us and as the tree grows and stays healthy it will provide even more benefits and increase in value. Compare a tree's growth and maturity to the students. For example, just as the students grow and stay healthy, they are enabled to contribute and be more beneficial to their family, friends and community. In addition, as they grow they can do more to earn money and become more valuable monetarily too.

III. Explain

A. Large Group Discussion: Write "Growth ► Benefits ► Value" on a chart or whiteboard. Use a Graphic Organizer to illustrate how each word affects the next word.

III. Explain continued

B. Small Group Activity: Move students into small groups to encourage participation by all students. Give each group a sheet of paper or chart paper and have them label it Growth. Have each group brainstorm what growth means to them. Ask them to include how Growth relates to Benefits.

C. Large Group Discussion: Ask each group to share their lists/charts with the class. Place each group's list under the Growth box of the chart. Before continuing the activity about Benefits, review the forestry definitions of Benefits and Value: benefits are a list of items and value is a dollar calculation. (Optional: Use a Compare and Contrast graphic organizer to further explain the definition of benefits and value.)

D. Small Group Activity: Repeat the small group activity for the Benefits Box. Give each group a sheet of paper or chart paper and have them label it Benefits. Have each group brainstorm what benefits trees and forests provide for us. Remind students that they may name some of the items they found in the Scavenger Hunt. Encourage them to think about other types of benefits such as lumber, wildlife habitat, recreation or air quality. Ask them to include how Benefits relate to Value.

E. Large Group Discussion: Ask each group to share their lists/charts with the class. Place each groups' list under the Benefits Box.

F. Small Group Activity: Repeat the small group activity for the Value Box. Give each group a sheet of paper or chart paper and have them label it Value. Remind students to include how trees contribute economic value.

G. Large Group Discussion: When all groups have shared all three concepts, ask students to check to see if they have included other ideas they have learned about essential life-support systems for our neighborhood, community and world. Add additional information to each term as deemed appropriate.

Teacher Tip: Forests provide a wide range of ecosystem services. In addition to providing food, fuel and fiber, forests clean the air, filter water supplies, control floods and erosion, sustain biodiversity, genetic resources, and provide opportunities for recreation, education, and cultural enrichment. Many other social and economic benefits exist, find more at Texas A&M Forest Service and Arbor Day Foundation websites.

IV. Extend/Elaborate

A. Large Group Discussion: Explain that the purpose of this module is to learn about the benefits trees have for us and learn about the value of trees.

B. Small Group Activity: Ask the students to move into their Tree Trail groups and retrieve their Tree

IV. Extend/Elaborate continued

Trails Data Sheet. Then they should follow on their tablet/laptop as projected. Project the class Tree Trail. Review the Annual Benefits box on the left side of the screen.

Teacher Tip: When you open the Tree Trails application, you will see the benefits for all trails on the map. To see the value for a specific trail, search for that trail, then select the green trail line. You should now see the name of that trail under the words "Annual Benefits." The values shown are for the entire trail. To see the value of a specific tree, select that tree. You should now see the name of the tree under the words "Annual Benefits" and the values for that tree listed.

C. Large Group Discussion: Lead a discussion about the value of their trees. Ask students to notice the breakdown of the annual benefits: stormwater intercepted, air quality, carbon dioxide, energy savings, and property value. Have students refer to the Annual Benefits Breakdown resource handout to find the definition of the term and to learn about how their tree benefits their school and its landscape.

Teacher Tip: As students review each category, take time to discuss these benefits and what they mean. Refer to the Annual Benefits Breakdown reference handout for information.

D. Large Group Discussion continued: Next, ask students to determine which benefit has the most dollar value as indicated by the list. Have students determine which tree or trees provide the most dollar value and which are predicted to have the most after growing. Ask each group to write the name of their tree and its overall dollar value and the value predicted as the tree grows on card stock paper and hold it up to report this.

Teacher Tip: To predict future benefits after growing, students will change the measurements for their trees. Select an individual tree, change the measurements, save, then select that tree again to see the benefits displayed. Record the new dollar values. Be sure to go back to each tree and change the measurements back to the original ones recorded on the Data Sheet.

Teacher Tip: Another website for reviewing benefits and calculating values is the National Tree Benefit Calculator. You will enter the tree species, diameter, and land-use type where the tree is located. On the Overall Benefits tab, you can review the value at the tree's current size and for future growth.

E. (Optional) Small Group Activity: Have each group find a Champion or Famous Tree and compare the values of the benefits to their tree.

F. (Optional) Small Group Activity: Using the data provided by the list, develop a chart listing each tree and each benefit, including the overall benefit totals. Project the data chart and ask each group to provide the benefit information about their tree. After the chart is complete, move the students into five small groups and assign each to a different benefit. Ask the small groups to evaluate the benefits of each tree to determine which tree provides the most value in each category and report their findings to the class.

G. Large Group Closure: Return to the "Growth ▶ Benefits ▶ Value" Chart and have students contribute additional information they have acquired.

V. Evaluate

A. Small Group Activity: Ask each group to calculate the dollar increase in the value of their tree as its growth increases. (Use the predicted growth value already calculated and subtract from the current overall benefits.)

B. Small Group Activity: Divide the class into three groups. Each group will develop a part of the plan to increase the value of their trail tree. Give each group about 10 minutes to work. Group One will write about Now (what we are doing) Group Two will write about Need (what we need to do) and Group Three will write about Future Care (what we will do in the future). Remind the students of the events in a tree's life that can affect its growth. Ask each group to present their plan and ask the other groups to critique the plan. When all groups have concluded, post the plans in the classroom.

C. (Optional) Have the students submit their plan to Increase Trail Trees Value for consideration to post on the school's website.

VI. Extra Mileage/Attention

Extra Mileage: Provide small groups with chart paper or manila paper and markers. Ask them to draw a picture of a home without landscaping. Have the groups exchange drawings and ask each group to add trees to the drawing. Lead a discussion about how the value of the home increases with trees and what benefits the trees may provide for the value of the home.

Extra Attention: Have students work in small groups with an "expert" peer. Have students think of their home and decide which tree would provide for the most needs at their home.

(Optional) Have these students draw the tree at their home and put in their Learning Log.

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

Benefits and Values of Trees

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 tell how my trail tree benefits our school.	1	2	3	4	5
2.	I can name five benefits trees provide.	1	2	3	4	5
3.	I can determine the dollar value a tree would add to a property.	1	2	3	4	5
4.	I know the difference between benefits and value.	1	2	3	4	5
5.	I can name a tree part and a benefit it provides.	1	2	3	4	5
6.	I know how to determine my trail tree's value.	1	2	3	4	5
7.	I can use the Tree Trail website to calculate the value of trees at home or a friend's home.	1	2	3	4	5
8.	I can help my family learn more about the benefits and value of trees.	1	2	3	4	5
9.	I am interested in knowing how I can maintain and improve the value of our Trail Trees.	1	2	3	4	5

Annual Benefits Breakdown

Stormwater Intercepted

Trees reduce stormwater runoff and help regulate stream flows. Water runoff from surfaces like roadways and parking lots wash chemicals like oil or gasoline into streams, wetlands, rivers and oceans. These chemicals may harm drinking water, aquatic life and the ecosystem.

Find an interactive poster at http://www.arborday.org/trees/stormwater.cfm

Air Quality

Tree improve air quality. Leaves absorb air pollution that causes asthma, coughing and other health issues. Leaves also help remove dust and other matter from the air, then rain washes it to the ground.

Carbon Dioxide

Trees help reduce atmospheric carbon. They absorb carbon dioxide during photosynthesis. Trees store carbon dioxide in their roots, trunks and leaves while they grow.

Energy Savings

Trees alter climate and conserve energy use. Trees help buildings use less energy. In summer, trees shading east and west walls keep buildings cooler. In winter, allowing the sun to shine on the southern side of a building can warm inside spaces. Trees slow down winds around buildings and help decrease heat loss.

Find an animated model showing trees around a house at

1. http://texastreeplanting.tamu.edu/energy_efficiency.html
2. http://www.arborday.org/globalwarming/summerShade.cfm

Property Value

Trees in front of homes increase property value. Research has verified this by showing that homebuyers are willing to pay more for properties with more trees.

Resources:

National Tree Benefit Calculator
http://treebenefits.com/calculator/

USDA Forest Service Center for Urban Forest Research
http://www.fs.fed.us/psw/programs/uesd/uep/

Arbor Day Foundation
http://arborday.org/trees/index-benefits.cfm

International Society of Arboriculture Consumer Information Program
http://treesaregood.org/

Every year,
1 large tree

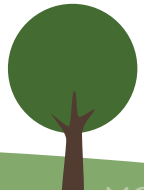
Retains
1000 gallons
of rainwater

Absorbs the carbon dioxide of a car driven
500 miles

Generates
260 pounds
of oxygen

Saves $32 in summertime air conditioning

Provides a home for
1-3 species of wildlife



Tree Scavenger Hunt

Group _____

Try to find as many items on this list as you can. You may either find the item or a picture of it. You will have 10 minutes for the scavenger hunt. Items are divided into three levels of difficulty. Keep a talley because each level is worth a different amount.

If you can name what part of the tree the item comes from or what part is used in the product, you will get bonus points!

Easy Items: Find it = 1 point; What part of the tree does it come from = 2 points

- ☐ Chair _____
- ☐ Toilet tissue _____
- ☐ Apple _____
- ☐ Pecan _____
- ☐ Paper money _____
- ☐ Envelope _____
- ☐ Mulch _____

Easy Score _____

Difficult Items: Find it = 2 points; What part of the tree does it come from = 3 points

- ☐ Molasses (syrup) _____
- ☐ Toothbrush handle _____
- ☐ Cork _____
- ☐ Birdhouse _____
- ☐ Food packaging _____
- ☐ Chocolate _____
- ☐ Charcoal _____

Difficult Score _____

Expert Items: Find it = 3 points; What part of the tree does it come from = 4 points

- ☐ Aspirin _____
- ☐ Cinnamon _____
- ☐ Rayon cloth _____
- ☐ Hairspray _____
- ☐ Nail polish _____
- ☐ Ice cream _____
- ☐ Eyeglass frames _____

Expert Score _____

Total Score _____

Tree Scavenger Hunt

Answer Sheet

Easy Items: Find it = 1 point; What part of the tree it comes from = 2 points

Chair - solid wood (trunks and limbs)
Toilet tissue - pulp
Apple - fruit
Pecan - nut
Paper money - pulp
Envelope- pulp
Mulch - bark or the whole tree

Difficult Items: Find it = 2 points; What part of the tree it comes from = 3 points

Molasses (syrup) - sap
Toothbrush handle - pulp
Cork - bark (mostly from cork oak tree)
Birdhouse - solid wood (trunks and limbs)
Food packaging - pulp
Chocolate - nut (from cacao tree)
Charcoal - wood

Expert Items: Find it = 3 points; What part of the tree it comes from = 4 points

Aspirin - bark (of willow tree)
Cinnamon - bark (of laurel tree)
Rayon cloth - wood fibers
Hairspray - contains wood resin
Nail polish - contains chemicals (leftover from making paper, makes polish glossy)
Ice cream - contains cellulose (makes it smooth and thick)
Eyeglass frames - Cellulose (dissolved and forms a shape)

Wood is made of tiny fibers (cellulose) and the natural glue (lignin) that holds them together. When wood is turned into pulp, heat and chemicals dissolve the lignin and release the cellulose fibers.

Sap is the watery solution that circulates through the tree.

Resin is a clear or translucent substance that oozes from trees and other plants.

Tree Trails

6 ELEMENTARY

★ Diversity of Species and Ecosystems ★

Promoting 'diversity' is a basic principle of urban forestry. A diverse forest implies a more resilient forest, since disease or insect outbreaks likely won't affect every tree all at once.

Goal and Objectives

Goal: Students will evaluate how the diversity of species affects the ecosystem.

Objectives: Students will

1. Explain the meaning of diversity and biodiversity in an ecosystem.
2. Investigate and explain the benefits of a diverse forest ecosystem.
3. Define ways fire benefits the ecosystem.
4. Develop a campaign commercial and conduct a rally addressing diversity, biodiversity and ecosystem issues.
5. Design and evaluate an ideal diverse forest community.
6. Evaluate a *Diversity of Species and Ecosystems* experience.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Tree Trails Portfolio, Learning Log/Journal

Handouts

- Tree Characteristics Observation Record
- Diverse Ecosystem Rubric
- (Optional) Platform Statements and Resources

Activity Materials

- Legos or similar building pieces
- Chart paper and markers for small groups
- (Optional) Cameras or camera phones

Time and Internet Links

Preparation Time: 3 hours
Instructional Time: 2-3 sessions, 45 minutes each

- Instructional Strategies, Graphic Organizers
  http://schools.spsd.sk.ca/curriculum/instructionalstrategies/
- Fire is Nature's Housekeeper
  http://smokeybear.com/natures-housekeeper.asp
- Fire Adaptations - Nowhere to Run
  http://www.nps.gov/fire/wildland-fire/learning-center/educator-resources/lesson-plans/fire-adaptation.cfm
- History and Human Use of Fire
  http://www.nps.gov/fire/wildland-fire/learning-center/fire-in-depth/human-use.cfm
- Tree Trails
  www.treetrails.org

Instructional Procedures

I. Engage/Excite

A. Large Group Activity: Ask the students if they have noticed different kinds of trees around their neighborhood. Take students outside on a walk around the school grounds. Move students into small groups consisting of three or four students. Assign all groups a specific area of the school grounds to investigate. But assign only one group to a section that has limited diversity of plants or trees, such as just grass or just one type of plant or tree.

B. Small Group Activity: Ask each group to investigate their assigned section for a variety of plants and animals and trees. Provide each group paper and with a list of different tree characteristics to observe: size, shape, leaves, fruit, and bark. Tell students to list the plants and animals they observe and to indicate the characteristics of the trees they observe on the tree characteristics list. Ask each group to appoint a recorder to take notes and/or photographs of the trees, animals and organisms they observe. Students need to save their tree characteristics list, their notes and drawings and the photographs for the evaluation section.

C. Small Group Activity continued: Give each group a set of Legos or building pieces. Have each group build a replica to represent their landscape with different trees, shrubs, plants, etc. They may add birds and animals on the trees and ground. The group without contrasting landscape will build a landscape also. Ask each group to talk briefly about their landscape. Then have all groups connect their landscapes to represent the entire area observed.

D. Large Group Discussion: Ask students to notice that one set of building blocks does not have much difference, it is mostly the same. Help students connect the concept of "Diversity" to their landscape replicas. Ask students why diversity is important. Ask what might happen if we did not have diversity and all landscapes were the same. Guide students to conclude that without diversity, the landscape would not be as varied and pleasing; animals would not be different and the health of the trees might be affected. For instance, one disease could wipe out the entire population. Tell them they will learn more about diversity and its importance in this module.

E. (Optional): Large Group Demonstration: Ask students what it would look like if a destructive insect or disease invaded the landscape. A student group could pretend to be the pest and swoop across the blocks and knock them down to animate that an insect or disease could seriously harm the diversity of the landscape.

F. (Optional) Individual Activity: Have the students take the *Diversity of Species and Ecosystems* 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.

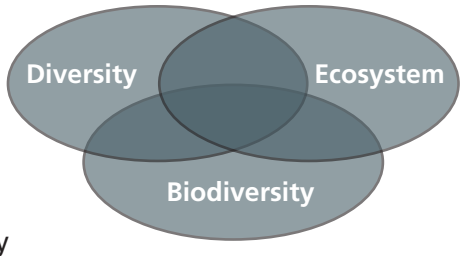
To administer the tests by paper, copy from the teacher lesson module. To administer the test electronically, recreate the test in an online survey program. Free programs allow the creator to see results from a class set.

II. Explore

A. Large Group Discussion: Lead a brief discussion to explain that the purpose of this module is to

II. Explore continued

understand how the diversity of trees, the biodiversity of forests and animals and its ecosystems are important to our community and world. Depending on the depth of student knowledge about these terms, a Venn diagram concept map may be used to expand the students prior knowledge. The diagram should have the terms "Diversity" and "Biodiversity" in two ovals that are connected and these two terms connected to an oval with "Ecosystem" on a chart/whiteboard. (Optional: Combine Diversity and Biodiversity into the same oval to make two ovals instead of three.)



B. (Optional) Small Group Discussions: Move students into small groups to explore the three concepts: Diversity, Biodiversity and Ecosystem. Ask students to discuss and define the difference between diversity and biodiversity and ecosystems and the relationship between the concepts.

C. Large Group Discussion: Write or have students write their responses around or on the corresponding area of the diagram. Have students draw a conclusion that describes the relationship of these concepts and write that description at the bottom of the chart.

Teacher Tip: As students respond with their definitions, lead a discussion to help them understand the difference in the terms: diversity, biodiversity and ecosystems. ***Diversity*** *is the difference in a set of like species, such as trees.* ***Biodiversity*** *means the diversity, or variety, of plants, trees, animals and other living things in a particular area or region. An* ***ecosystem*** *is a complex set of relationships among the living and non-living resources, habitats, and the community of residents of the area. This includes plants, trees, animals, birds, fish, microorganisms, water, soil and people interacting as a system. Everything that lives in an ecosystem is dependent on the other species and elements. The balance of an ecosystem is delicate and a disruption, such as the introduction of a new element, can damage or interrupt the balance.*

III. Explain

A. Large Group Discussion: Have a discussion about elections and campaigns. Ask students to define a campaign and tell what makes a campaign successful. Lead students to conclude that a campaign must provide convincing reasons to vote for the candidate. Tell students to imagine that they have joined a campaign to elect Mr. D. V. Forest as Mayor. The campaign's purpose is to convince the public that Mr. D. V. Forest is the best candidate for Mayor. He has promised to address the public's biggest concerns about diversity, biodiversity and the forest ecosystem.

B. Large Group Discussion continued: Explain to the students the steps they will take to create a Commercial and have a Campaign Rally to get Mr. D. V. Forest elected. The students will need to divide into small Campaign Committees to address different platform statements. Students should 1. research one campaign platform statement, 2. write a convincing script for their platform statement, 3. make the script into one section of the commercial, 4. put all the sections together to create the Campaign Commercial and 5. conduct a Campaign Rally using their section of the commercial.

C. Large Group Discussion and Small Group Assignments: Put the following platform statements on a

III. Explain continued

chart/whiteboard or pass out the Diversity Platform Statements and Resources handout so all students can read and make a selection. Ask students to select one platform statement they want to research. As possible, assign the students to the platform committee of their choice. Each committee should appoint a leader, recorder, reporter and assistants to find the answers. The platform statements and the supporting resources are:

1. Platform: Every forest needs to contain a variety of habitats that support diverse, interdependent communities of plants and animals.

   Resources: Have students return to the list of diverse trees, plants and animals they observed earlier. Have them focus on the interaction of the ecosystem organisms. (They may need to return outside to add to their lists. They may make a food chain and/or take pictures or videos to use in the commercial.)

2. Platform: We need to promote a diverse forest because of its many benefits.

   Resources: Make pictures or videos of the forest benefits we share in our ecosystem.

3. Platform: We need to evaluate how altering a forest environment affects all living things and interrelationships in an ecosystem.

   Resources: Use pictures or make a before and after drawing depicting a change in the diversity of their own environment and the way it would alter the landscape.

4. Platform: We need to better understand fire and ways to use fire to benefit natural habitats and the ecosystem.

   Resources: Fire is Nature's Housekeeper. Review the website and animated illustrations.

   Have students summarize the presentation and/or show it or parts of the recording.

5. Platform: We need to understand how animals and plants, including trees, protect themselves from fire so we can promote a better ecosystem for them.

   Resources: Nowhere to Run section of the National Park Service's Fire Adaptations lesson background information on helping animals and plants and trees protect themselves. Review the website.

   Have students summarize the internet information and/or show parts to the class.

6. Extra Platform, Potential Teacher Committee: Remind the public of how Native Americans managed forests with fire and the History and Human Uses of Fire

   Resources: National Park Service's Human Use of Fire information on how Native Americans managed forests with fire. Review the website.

   Have students summarize and/or show sections of the internet resource.

IV. Extend/Elaborate

A. Small Group Activity: Provide students with a format to compile the research and develop a script for the campaign commercial. They should develop a platform statement presentation that will not take more than two to four minutes to present.

   1. Topic: the Platform Statement

IV. Extend/Elaborate continued

2. Purpose: one sentence telling why this action is important
3. Findings: three to five phrases or sentences telling how to make this action happen
4. Conclusion: summary of what Mr. D. V. Forest will do (one sentence)

B. Small Group Activities continued: Once the groups have finished their research and script, have them add music and/or interesting media into their commercial section.

C. Large Group Presentation: Brainstorm possible slogans for the campaign. Have students vote on their choice. Each of the small groups come together to conduct the recording/filming of the commercial. Select someone (teacher, administrator, student or parent) to introduce the candidate for Mayor (selected by the class) and the campaign committees. Each group presents their platform script. Then, for the ending, all groups may chime in to convince the public to elect Mr. D. V. Forest who will "Make the Forest Ecosystem Better for All" or (whatever slogan is chosen).

D. Large Group Activity: Take the groups outside to conduct the rally to take advantage of the setting to present the mayor and the platform committee's stand on issues related to diversity, biodiversity and the ecosystem. Invite other classes to attend. The person selected to introduce may also close the rally by restating all the reasons the public should elect Mr. D. V. Forest for Mayor. Other students, parents, etc. may record and/or take pictures to display after the campaign rally.

V. Evaluate

A. Small Group Activity: Have each group retrieve their photographs, drawings, notes, etc. from Excite: B. Have students review their work and decide what needs to be added to make a better, more diverse landscape to their materials. Provide each group with the diverse ecosystem rubric to assist them with adding the ingredients that can create a better landscape. Have each group share with another. hen have the class decide which group has developed the most diverse ecosystem.

B. (Optional) Individual Activity: Have students take the *Diversity of Species and Ecosystems* 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 locate a different forest ecosystem (in another area of the community, a local park, the state capitol or county seat, etc.) and evaluate it according to the Diverse Ecosystem Rubric handout.

Extra Attention: Have an "expert" peer work with students to draw a community that has diversity, biodiversity and is a healthy ecosystem.

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

Diversity of Species and Ecosystems

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 define the difference in diversity and biodiversity.	1	2	3	4	5
2.	I can describe an ecosystem.	1	2	3	4	5
3.	I can tell why a forest ecosystem needs diversity.	1	2	3	4	5
4.	I can name two ways fire benefits the ecosystem.	1	2	3	4	5
5.	I know two causes of an unhealthy ecosystem.	1	2	3	4	5
6.	I can describe what Native Americans did to preserve their forests.	1	2	3	4	5
7.	I can evaluate a forest ecosystem community.	1	2	3	4	5
8.	I can help my family learn more about the needs for a healthy ecosystem.	1	2	3	4	5
9.	I am interested in knowing what I can do to improve the quality of the ecosystem in my neighborhood.	1	2	3	4	5

Tree Characteristics Observation Record

Describe and/or draw the Tree Characteristics observed:

Size - compare to the height of another object like a light pole or building

Branches - how are they organized, what patterns can you see

Shape - pretend to draw an outline around the tree, describe that shape

Fruit - look at color, shape, and size

Leaves - look at color, shape, size, and movement

Bark - what patterns are found in the bark, look at color, how does it feel

Plants and animals observed:

Sketches of trees, plants, and animals:

Diverse Ecosystem Rubric

Directions:
Review the ecosystem plan and decide which level your plan achieves. Circle the description that fits best for each Quality. Record the points for each below the table and add them together.

	1 Point	2 Points	3 Points	4 Points
Tree Qualities	Little or no trees	Few of same trees	Diverse number of trees	Diversity of trees planted in ideal locations
Plant Qualities	Little or no plants	Few of same plants	Diverse number of plants	Diversity of plants planted in ideal locations
Animal Qualities	Little or no animals	Few of same animals	Diverse number of animals	Diversity of useful animals on landscape
Insect Qualities	Little or no insects	Few of same insects	Diverse number of insects	Helpful insects found in landscape

Tree Qualities _____

Plant Qualities _____

Animal Qualities _____

Insect Qualities _____

Total _____

Score Review:

0-3 = Poor Plan, You need more variety, consider adding items for each Quality.

4-8 = Average Plan, You're on your way, consider adding items for each Quality.

9-13 = Good Plan, Well done, your plan shows some diversity.

14-16 = Excellent Plan, Diversity in your ecosystem shows a healthy system.

Diversity Platform Statements and Resources

1. Platform: Every forest needs to contain a variety of habitats that support diverse, interdependent communities of plants and animals.

   Resources: Return to the list of diverse trees, plants and animals you observed earlier. Focus on the interaction of the ecosystem organisms. (You may need to return outside to add to your lists. You may want to make a food chain and/or take pictures or videos to use in the commercial.)

2. Platform: We need to promote a diverse forest because of its many benefits.

   Resources: Make pictures or videos of the forest benefits we share in our ecosystem.

3. Platform: We need to evaluate how altering a forest environment affects all living things and interrelationships in an ecosystem.

   Resources: Use pictures or make a before and after drawing depicting a change in the diversity of your own environment and the way it would alter the landscape.

4. Platform: We need to better understand fire and ways to use fire to benefit natural habitats and the ecosystem.

   Resources: Fire is Nature's Housekeeper. Review the website and animated illustrations at http://smokeybear.com/natures-housekeeper.asp

   Summarize the presentation and/or show it or parts of the recording.

5. Platform: We need to understand how animals and plants, including trees, protect themselves from fire so we can promote a better ecosystem for them.

   Resources: Nowhere to Run section of the National Park Service's Fire Adaptations lesson background information on helping animals and plants and trees protect themselves. Review the website at http://www.nps.gov/fire/wildland-fire/learning-center/educator-resources/lesson-plans/fire-adaptation.cfm

   Summarize the internet information and/or show parts to the class.

6. Extra Platform: Remind the public of how Native Americans managed forests with fire and the History and Human Uses of Fire

   Resources: National Park Service's Human Use of Fire information on how Native Americans managed forests with fire. Review the website at http://www.nps.gov/fire/wildland-fire/learning-center/fire-in-depth/human-use.cfm

   Summarize and/or show sections of the internet resource.

Tree Trails

7

ELEMENTARY

★ Tree and Forest Health ★

History has shown us the risk of planting too many of the same species in the urban forest. Cities and forests have lost many millions of trees to foreign or species-specific diseases and insect pests. Exotic tree species can sometimes invade our forest landscapes and crowd out native species.

Goal and Objectives

Goal: Students will demonstrate ways to keep trees and forests healthy.

Objectives: Students will

1. Determine the qualities of a healthy forest.
2. Specify the causes of the major disruptions to a healthy forest.
3. Provide reasons why forests health is important.
4. Conduct a research investigation on forest health; complete a report and present conclusions to the class.
5. Evaluate the health of the campus landscape and name ways to maintain its health.
6. Evaluate their *Tree and Forest Health* experience.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Tree Trails Portfolio, Learning Log/Journal

Handouts

- Tree Cross Sections
- Signs of Unhealthy Trees Guide
- Investigative Report Outline
- List of Investigative Procedures
- List of Research Topics
- (Optional) Media Presentation Instructions

Activity Materials

- (Optional) Materials for tree simulation props (construction paper, markers, paper plates, etc.)
- (Optional) Cameras or camera phones

Time and Internet Links

Preparation Time: 1-2 hours
Instructional Time: 3 sessions, 45 minutes each

- Texas A&M Forest Service, Forest Health
  http://tfsweb.tamu.edu/foresthealth/
- Texas Chapter International Society of Arboriculture
  http://isatexas.com/
- The Benefits of Prescribed Fire Video
  http://www.nature.org/ourinitiatives/habitats/forests/howwework/maintaining-fires-natural-role.xml
- Fighting Fire with Fire
  http://goodfires.org/fire
- Tree Trails
  www.treetrails.org

Instructional Procedures

I. Engage/Excite

A. Large Group Discussion: Discuss and/or review how tree cookies (a thin slice or cross section of the trunk of a tree) are used by foresters to demonstrate the way the trunk of the tree functions; i.e., which part takes nutrition for the soil and distributes it to the rest of the tree and which parts send food from the leaves throughout the tree. Tell students that foresters also use cross sections for other reasons.

B. Small Group Activity: Provide groups of two to three students with a Tree Cross Sections handout. or actual tree cookies. Tell students the tree cookie has important signs of tree health. Ask students why they think the tree rings sizes and markings are different. Have each group write their responses in their learning logs. Ask each group to share.

C. Large Group Discussion continued: Lead the discussion to inform that foresters use the tree rings as a sign of the tree's life, its health and disruptions in its life.

Teacher Tip: Add to the list, if students did not, signs that rings can tell if the tree had sufficient food, water, if it was crowded, if there was an insect invasion, disease, or fire, etc.

D. (Optional) Individual Activity: Have the students take the *Tree and Forest Health* pretest.

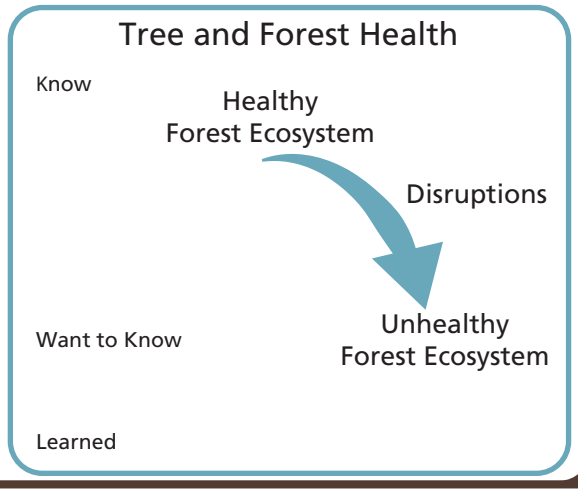
Teacher Tip: Explain that the test is only to make sure the learning activities are appropriate and not something they already know. The pretest will help them know more about what they will be learning.

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: Develop a concept chart for Tree and Forest Health. Include Healthy Forest Ecosystem, Disruptions (insects, diseases, etc.) and Unhealthy Forest Ecosystem. Let students know they will be investigating the meaning of each term. Add KWL to the concept chart and ask students "What they *Know*" about:

1. How and why a healthy forest is important to the ecosystem? Record their responses next to Healthy Forest Ecosystem.
2. What are signs of disruptions to trees, plants and animals that affect the ecosystem? Record responses next to Disruptions.
3. What are the signs of an unhealthy ecosystem? Record responses next to Unhealthy Ecosystem. Let students know they are going to find answers to these questions about forest health and its importance to ecology. Later, they will check the chart for what they knew and learned.



II. Explore continued

B. Large Group Activity: Activate "Team Forest Investigators" to investigate Forest Health. Discuss the positive results such an Investigation Team could have. They will work in small groups of four or five and create an investigative documentary to answer the questions posed about what they "*Want* to Know" about forest health (from the KWL chart).

C. Large Group Exploration: Before they begin their online investigation, they will start with an exploration of their own school grounds. Provide all students with a Signs of Unhealthy Trees handout, pictures and list of symptoms of unhealthy trees such as cavities in trunks or branches, many broken branches, unusual leaf shapes or colors, numerous branches without leaves, damage from carvings or lawn equipment, insect presence or evidence such as leaf chewing and rolling, holes in the bark, sawdust, etc., slime oozing from trunk or branches, mushrooms or other fungi growing from trunk, branches or roots. Take students outside with their guides to look for signs of healthy and unhealthy plants and trees and anything they think is important to the health or harm of the plants and trees. Students may make drawings or take photos of their findings.

D. (Optional) Individual activity: Students may take their search home and look in their neighborhood and add their findings to their group's lists.

E. Large Group Discussion continued: Have the students return to the classroom and lead a discussion of their findings. Tell students to keep their notes in their Portfolios to include in their research investigation to get to the bottom of causes for unhealthy forests. Let students know how important they are as scientific researchers. They will take on the important investigative task to "Find the Real Culprits of the Sick Forests."

III. Explain

A. Large Group Discussion continued: Provide each group with a list of Investigative Procedures and explain each step. Each group will:

   a. Be responsible for a chapter of the investigative documentary and present to the class. They will use their laptops/tablets and go online to generate their report.

   b. Read the narrative provided by Texas A&M Forest Service Forest Health sections, which reports factors contributing to forest health such as heat, drought, flooding, lightning, animal damage, construction damage, soil compaction, wildfire, etc.

   c. Be given a list of online resources to use for their specific chapter.

   d. Write a synopsis of their findings to develop their chapter. They may incorporate any resources into their report. They may include photos, graphs or other graphics as supporting evidence for their conclusions. The chapter should include evidence found on their investigative campus trip.

B. Large Group Discussion: Explain how the students will work in small groups to investigate, report findings, write their investigative report and present their report as a chapter of the documentary. They will research five major topics: overcrowding, helpful insects, harmful insects, disease and invasive species. Provide each group with a Investigative Report Outline format to write their synopsis.

C. Large Group Discussion continued: Project the Texas Chapter International Society of Arboriculture website and go to Arbor Pod and select Detective Dendro and ask students to

III. Explain continued

find an investigation to view. This is an example of the type of investigation they will conduct. Later they may want to send an inquiry to Detective Dendro to investigate. ISA requests; "If you want to know more, please contact us at eLearning@isa-arbor.com."

Teacher Tip: Provide a research report format of your choice. The report should include the following information and may be written in five paragraphs. The following is an example you may use.

Title: Investigative Documentary on the Real Culprit of Sick Forests
Chapter: Name of Investigation
Section I. Purpose of investigation
Section II. Hypothesis predicting the results
Section III. Research procedures
Section IV. Findings to include possible causes for the disruption (drought, etc.)
Section V. Conclusions
Investigators: Names of students

D. Large Group Discussion: Provide each group of students with a list of their topic and the internet resources. The title, chapters and the resources to use are:

1. "Overcrowded, Make Room"
   - Find "Thinning young pines to prevent insects and disease" article on the Texas A&M Forest Service Forest Health website under Miscellaneous
   - Fires make room for new trees and prevent wildfires, review Fighting Fire with Fire on the Good Fires website.
   - The Benefits of Prescribed Fire Video
2. "Insects: the Good and the Bad and the Ugly"
   - Find insect information on the Texas A&M Forest Service Forest Health website under Insects
   - "Useful and Ugly Insects" such as Barklice and "Ugly Insects" that are not harmful such as the Hickory Horned Devil and Giant Walkingsticks.
3. "Insects: the Good and the Bad and the Ugly"
   - Find insect information on the Texas A&M Forest Service Forest Health website under Insects
   - "Harmful and Ugly Insects" to certain trees such as Pine Regeneration Weevils and one "Ugly Insect."
4. "Difficult Diseases"
   - Find disease information on the Texas A&M Forest Service Forest Health website under Diseases
   - Students should carefully read and report the information in the first paragraphs about how diseases occur (remaining trees are weakened by drought, floods, wildfire, etc.) and how to prevent them and keep the forest healthy. Examples of the conditions contributing to these diseases are found in the sections about the particular disease: Oak Wilt, Root Rot, etc.

III Explain continued

5. "Invasive Awfuls"
   - Find invasive species information on the Texas A&M Forest Service Forest Health website under Invasives
   - Students should report why invasive species are harmful to our forests, found in the first few paragraphs (decrease biodiversity by threatening the survival of native plants and animals). Encourage this group to select a pest (Emerald Ash Borer) and a plant from South Texas.

IV. Extend/Elaborate

A. Large Group Activity: Provide a "stage" for each group to present their Chapter. Remind students of proper and appropriate audience etiquette. Remind them that each group contributes to the whole class learning experience. Sharing gives everyone input to a class project. Students should save their questions until each group has finished their report. Have students display their visuals, audios and their completed report.

B. Large Group Discussion: After the presentations, allow students to generate conclusions about healthy and unhealthy trees and the disruptions. Record responses on the Tree and Forest Health chart.

C. (Optional) Large Group Activity for Media Production: Explain to students that they will make a media production out of the investigative documentary report. Tell students you will help facilitate the production but they will be the directors, producers, writers and performers. Explain the Media Presentation Instructions and/or provide each student with the Media Presentation Instructions handout. Discuss the directions and ask each group to assign roles for their group.

Teacher Tip: These are the suggested Presentation Instructions. Each group will appoint a:

1. *Director to introduce the Chapter Question, coordinate the performers and close the presentation.*
2. *Producer to coordinate the research, produce the order/sequence of the presentation and present the first section of the chapter.*
3. *Writer to gather and compile the information, record the script and present the second section of the chapter.*
4. *Assistant Producer and Writer to help with the script, the production and conclude the presentation.*
5. *Performers: This is a suggestion for the performers but the group may decide a different order. All students in the group should have an individual role.*

You may want to record the presentation and/or have another class, guests, parents visit the performance. You may want to appoint a student(s) to write a playlist and provide it to students and guests. You will introduce the production and the performers and provide the final closure and acknowledgments as appropriate. You may want to divide the five presentations into two days of five to eight minute reports.

D. (Optional) Small Group Activity: During their presentations, the students may role play a healthy

IV. Extend/Elaborate continued

tree becoming unhealthy due to their specific type of disruption. One or two student(s) play(s) the tree, one or two student(s) play(s) the culprit or disrupter and one student narrates the event where the tree changes from healthy to unhealthy. Students may make and use props for their roles. For example, tree with brown paper trunk and green hair, disrupter with paper plate face of bug or disease or invasive species and narrator with microphone.

V. Evaluate

A. Large Group Discussion: Review the Tree and Forest Health concept map. Ask why a healthy forest is important. Record their responses on the "What I *Learned"* portion of the KWL Chart. Include other ideas they have learned.

B. Individual Activity: Have students review their Tree Cross Sections and write about the tree's life in their Learning Logs.

C. Large Group Discussion: Discuss how the class can use their ideas to develop a class plan or list of ways to maintain and/or improve the forest health around their school or neighborhood. Have the students make a poster or bulletin of their plan to improve the forest health around their school or community and display it in the room, hall or on the school's website. They should also record their plans in their Learning Logs.

D. Small Groups: Have each small group present their investigative report to another class and critique their own presentations.

E. (Optional) Individual Activity: Have students take the *Tree and Forest Health* 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 pose a hypothesis to investigate a question that they are interested in investigating. Have them conduct their research and present it at a convenient time for extra credit, a prize, a privilege, etc. Record in their Learning Log.

Extra Attention: Have students brainstorm ideas about their part of the report that they liked the most and why and the part they did not like, why and what they can do about their dislikes.

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 and Forest Health

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

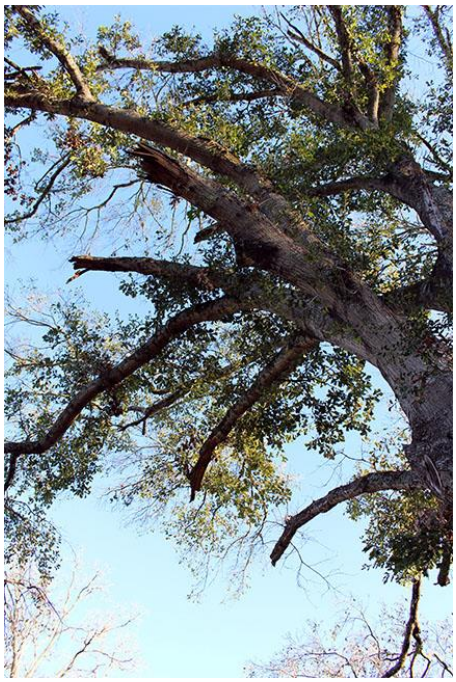
Key: 1 = Not Sure 2 = Poor 3 = OK 4 = Good 5 = Great

1.	I can write an investigative report.	1	2	3	4	5
2.	I can describe three disrupters to a healthy forest.	1	2	3	4	5
3.	I can analyze and explain the signs of an unhealthy forest.	1	2	3	4	5
4.	I can describe the results of an overcrowded forest.	1	2	3	4	5
5.	I can provide examples of a harmful forest disease.	1	2	3	4	5
6.	I can provide an example of a harmless forest insect.	1	2	3	4	5
7.	I can provide an example of a harmful invasive species.	1	2	3	4	5
8.	I can help my family learn more about how to improve and maintain a healthy forest.	1	2	3	4	5
9.	I am interested in knowing what I can do to help our forest ecosystem thrive and stay healthy.	1	2	3	4	5

Signs of Unhealthy Trees

Cavities in trunks or branches

Many broken branches or severe topping



TREE TRAILS

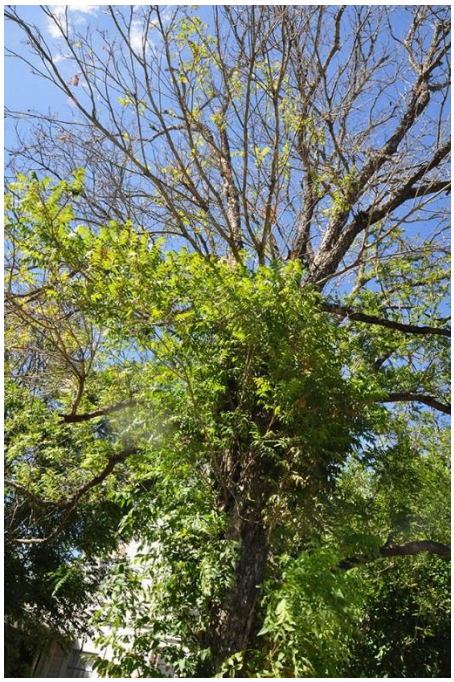
Signs of Unhealthy Trees

Unusual leaf shapes or colors

Pine attacked by engraver beetles

Squirrel damage

Numerous branches without leaves



TREE TRAILS

Signs of Unhealthy Trees

Damage from carvings or lawn equipment

Insect presence or evidence such as leaf chewing and rolling, holes in the bark, sawdust, etc.

Soapberry borer infestation

Engraver beetle galleries in loblolly pine bark

Caterpillars feeding

Boring dust in cedar elm

TREE TRAILS

Signs of Unhealthy Trees

Slime oozing from trunk or branches

Mushrooms or other fungi growing from trunk, branches or roots

Mushrooms on trunk

Brown fungus is Hypoxylon canker

Hypoxylon canker

TREE TRAILS

Investigative Procedures

a. You will be responsible for a chapter of the investigative documentary and present it to the class. You will use your laptops/tablets and go online to generate your report.

b. You should read the narrative provided by Texas A&M Forest Service Forest Health sections, which reports factors contributing to forest health such as heat, drought, flooding, lightning, animal damage, construction damage, soil compaction, wildfire, etc.

c. You will be given a list of online resources to use for your specific chapter.

d. You will write a synopsis of your findings to develop your chapter. You may incorporate any resources into your report. You may include photos, graphs or other graphics as supporting evidence for your conclusions. The chapter should include evidence found on your investigative campus trip.

Report Guidelines

Title: Investigative Documentary on the Real Culprit of Sick Forests

Chapter: Name of Investigation

Section I. Purpose of investigation

Section II. Hypothesis predicting the results

Section III. Research procedures

Section IV. Findings to include possible causes for the disruption (drought, etc.)

Section V. Conclusions

Investigators: Names of students

(find a fillable worksheet for the Report in the Tree Trails Resources section online)

Investigative Report Outline

Title: Investigative Documentary on the Real Culprit of Sick Forests

Chapter: Name of Investigation

Section I. Purpose of investigation

Section II. Hypothesis predicting the results

Section III. Research procedures

Section IV. Findings to include possible causes for the disruption (drought, etc.)

Section V. Conclusions

Investigators: Names of students

Research Topics

1. "Overcrowded, Make Room"
   - Find "Thinning young pines to prevent insects and disease" article on the Texas A&M Forest Service Forest Health website under Miscellaneous, http://tfsweb.tamu.edu/foresthealth/
   - Fires make room for new trees and prevent wildfires, review Fighting Fire with Fire http://goodfires.org/fire
   - The Benefits of Prescribed Fire Video, http://www.nature.org/ourinitiatives/habitats/forests/howwework/maintaining-fires-natural-role.xml

2. "Insects: the Good and the Bad and the Ugly"
   - Find insect information on the Texas A&M Forest Service Forest Health website under Insects, http://tfsweb.tamu.edu/foresthealth/
   - "Useful and Ugly Insects" such as Barklice and "Ugly Insects" that are not harmful such as the Hickory Horned Devil and Giant Walkingsticks.

3. "Insects: the Good and the Bad and the Ugly"
   - Find insect information on the Texas A&M Forest Service Forest Health website under Insects, http://tfsweb.tamu.edu/foresthealth/
   - "Harmful and Ugly Insects" to certain trees such as Pine Regeneration Weevils and one "Ugly Insect."

4. "Difficult Diseases"
   - Find disease information on the Texas A&M Forest Service Forest Health website under Diseases, http://tfsweb.tamu.edu/foresthealth/
   - Carefully read and report the information about how diseases occur and how to prevent them and keep the forest healthy. Examples of the conditions contributing to these diseases are found in the sections about the particular disease: Oak Wilt, Root Rot, etc.

5. "Invasive Awfuls"
   - Find invasive species information on the Texas A&M Forest Service Forest Health website under Invasives, http://tfsweb.tamu.edu/foresthealth/
   - Report why invasive species are harmful to our forests. Select a pest and a plant to highlight.

Media Presentation Instructions

Each group will appoint a:

1. ***Director*** *to introduce the Chapter Question, coordinate the performers and close the presentation.*

   Group Member _____

2. ***Producer*** *to coordinate the research, produce the order/sequence of the presentation and present the first section of the chapter.*

   Group Member _____

3. ***Writer*** *to gather and compile the information, record the script and present the second section of the chapter.*

   Group Member _____

4. ***Assistant Producer and Writer*** *to help with the script, the production and conclude the presentation.*

   Group Member _____

5. ***Performers****: This is a suggestion for the performers but the group may decide a different order. All students in the group should have an individual role.*

   Group Members _____

   _____

Tree Trails

8 Elementary

★ Tree History ★

Trees fascinate us because the oldest among them span many human generations. Trees can be a living link to our past, or may be planted by the current generation as memorials to important events or people in the community.

Goal and Objectives

Goal: Students will research the history of a tree(s) and make connections to the past.

Objectives: Students will

1. Investigate a specific Famous tree(s) and its past.
2. Describe reasons historians developed a Famous Tree book and website.
3. Summarize important events leading to the establishment of Texas A&M Forest Service.
4. Connect a tree's historic life span to ties with people and events.
5. Create and present a timeline of the tree's history that depicts significant events from its beginning to the present.
6. Evaluate their experience during the *Tree History* Module.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Tree Trails Portfolio, Learning Log/Journal

Activity Materials

- Butcher paper or copy paper and markers

Time and Internet Links

Preparation Time: 2 hours
Instructional Time: 2-3 sessions, 45 minutes each

- Famous Trees of Texas
  http://famoustreesoftexas.tamu.edu
- Texas History
  http://www.history.com/topics/us-states/texas
  http://www.tshaonline.org/handbook/online
- How to Create a Timeline in Microsoft Office
  http://goo.gl/XsUGYj
- Tree Trails
  www.treetrails.org

Instructional Procedures

I. Engage/Excite

A. Large Group Discussion: Ask students to imagine their trail tree can talk. Ask what would it say about its history? Ask students to pretend they are interviewing their tree. Ask: "What is your name? Where were you born? Who were your friends when you were a baby? Have you lived in more than one place? If so, where? What were some events that happened while you were growing up? What has happened at the school since you have been here? Do you think you will become famous?"

B. Small Group Activity: Move students into their small Tree Trail groups and have them share their answers and write the answers to the questions (some or all) to keep in their Portfolios and/or Learning Logs.

C. Large Group Discussion continued: Have each group share with the class their Learning Log/Portfolio entries. Ask students if they are curious about their tree's relatives. Tell them there is a website to learn about famous trees like their tree and they will go online to find if any trail tree relatives are famous and if so, why.

D. (Optional) Individual Activity: Have the students take the *Tree History* 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: Explain that the purpose of this module is to develop an appreciation for ways in which trees connect to our history. Tell students before they go online to learn about their trail tree, they will have some fun answering some questions about some of the Famous Trees. Project this website for all students to see. Ask students to look at the "Famous Facts" at the top middle of the page. Ask one student to read the first question and let the others guess the answer. They may record their answers in their Learning Logs/Portfolio. Select the question and let students read the answer and the information about the tree Ask one or two students to summarize.

B. Small Group Activity: Provide laptops/tablets to students and assign the other five questions on the "Famous Facts" page to five groups. Have them find the answers and provide a brief synopsis about them. Each group may appoint one or more students from their group to talk about the question and the answers to the class.

III. Explain

A. Small Group Activity: Keep the students in the small groups and ask everyone to listen to find out why people thought it was important to develop a book and a website about Famous Trees. Ask

III. Explain continued

students to stay online and select "About Us" and then on the "Preface." Have all students read to find the answers and discuss their findings in the small groups. Ask each group to report the information they found. Record their summaries on a Why Trees Are Important Historical Landmarks chart/whiteboard.

Teacher Tip: Lead the students to conclude that the purpose of the Famous Trees of Texas website is "to memorialize those trees which have been a witness to some of the exciting periods and events in Texas' frontier history." Let students know that because trees present a link to the past, they are often used to link past events or important people to our lives and/or community.

B. Large Group Discussion: Lead a discussion about how historical events are presented to make them easier to understand. Writers often use graphics and other visuals to assist them to create a story of time in our mind. Ask students what kind of visuals might help them tell a tree history story. Guide them to select a timeline as a method (As deemed appropriate, demonstrate a timeline of a person in the class.) Inform the students that they can create a historical timeline to connect their trail tree to a Famous Tree, important events/people of its life span, themselves and/or important events/people of their community, school, etc.

C. Small Group Activities: Move students into their Tree Trail groups and go outside to sketch an outline of their tree to put on the timeline. They will want to keep the outline to make a marker for their tree in another module.

D. Small Group Activity: Have the Tree Trail groups return to the classroom find a famous tree of the same species as their trail tree. on the Famous Trees of Texas website. They should select Explore Our Trees, then Species, find the species that is the same as their trail tree and select it. Then, they should read the information about the tree. Tell them they will develop a summary about the Famous Tree for the timeline. Each group may appoint a recorder to write the summary. They may use this format:

1. Name of Tree Trail Group
2. Famous Tree common name and scientific name
3. Historical period that begins their timeline
4. Historical topic of the period
5. County were the tree is located
6. Is the tree accessible - yes or no (indicates if the tree is or is not able to be visited)
7. Summary of why the tree is famous (three or more phrases)

Teacher Tip: Options: a.) If students find the same species of Famous Tree as their tree, the students may adopt the Famous Tree. If there are several trees of the same species they may choose the one they want. b.) If students cannot find the same tree species, they may adopt a Famous Tree of choice but still include their trail tree on the timeline.

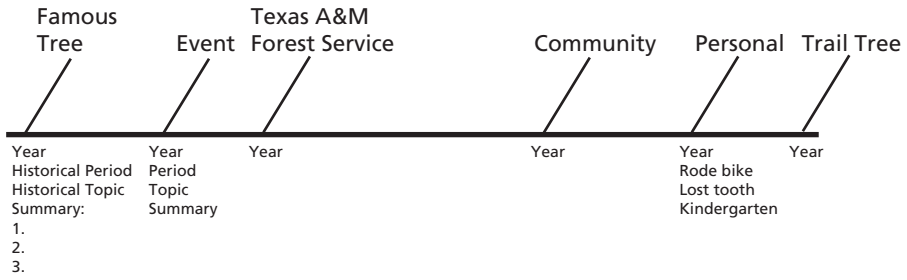
E. Small Group Activity continued: Next have each Tree Trails group locate, summarize and record the information about their trail tree to use on thir timeline.

IV. Extend/Elaborate

A. Large Group Discussion/Small Group Activity: Discuss other information available on the Famous Trees of Texas website. Ask them to select "About Us" and then on "Forestry in Texas." Assign a paragraph or two to each Tree Trails group to read and summarize for the class. Ask students to share in the same sequence as the paragraphs of the text their summaries about why the establishment of the Texas A&M Forest Service was an important event. Record their summaries (events, people and years) on a "Forestry in Texas" summary chart/whiteboard. Keep the summary chart available for students to use on their timeline.

B. Large Group Demonstration: Demonstrate the format and style to use for the Timeline. One way to develope the Timeline shows dates/years on a horizontal date line, and then list the events above the timeline and the information about the event under the Timeline. Dates/years should be left to right with oldest date on the left. The Famous Tree date begins the timeline and the Trail Tree is at the end. Keep the sample available for students to reference as they work on their Timeline.

Sample Timeline Format:



C. Large Group Discussion continued: Discuss where the information is on the sample Timeline, how it is ordered and the categories presented. Point to the categories as these are explained. These categories of information are:

1. Famous Tree history (each group has their Famous tree information)
2. Texas A&M Forest Service history (all students use the same information)
3. (Optional)Texas History People and/or Events
4. Community History (all groups use the same information)
5. Personal History (each student in each group includes their unique information)
6. Trail Tree History (each group uses the information collected for their tree)

Teacher Tip:

1. *Community: Provide the information about the community or have groups find information such as when: the school was built, the town was established, the city hall was built, the first hospital built, the first or nearest park was developed, etc.*
2. *Personal: Remind students to include their personal information. They may use their Tree Cookies developed in Module Two and/or add other information about themselves, their families and/or their neighborhoods, etc.*
   (Optional) Allow students to take home a list of questions to ask their family for use on the timeline.
3. *Trail Tree: Information may be the date it was registered on the Tree Trails website, the date it was planted (if available), the date the Class Tree Trail was named, etc.*

IV. Extend/Elaborate continued

(Optional) As desired, students may investigate other Tree Trails in Texas, Famous Trees, Champion Trees, or other trees of specific species (by using the Search By Species feature) on the Tree Trails map application.

D. Small Group Activities: Provide the students with the materials: butcher paper roll or copy paper taped together and markers, or have students develop the timeline with PowerPoint. Have students create a draft of their timeline. Check each draft to make sure it includes all the information. Once the drafts are approved, have students develop the final Timeline. Each group should assign a member to present the different sections of the timeline.

E. Large Group Activity: Have each group present their Timeline and discuss the events, dates, etc. Invite guests as desired and record the presentation as appropriate. Have students display their timelines in the class or on the wall outside the classroom.

V. Evaluate

A. Individual Activity: Ask students to review their timelines and evaluate the accuracy of the dates, the information, and the quality of their work and the clarity of their presentation.

B. (Optional) Individual Activity: Each group member may rate each category (Famous tree, historical events, Texas A&M Forest Service event, personal events and trail tree information) from 1-5 with1 being the lowest and 5 being the highest and put their evaluation in their Learning Logs/Portfolios.

C. (Optional) Small Group Activity: Have each group review another timeline and rate it the same way then discuss their evaluation with the other group members.

D. (Optional) Individual Activity: Have students take the *Tree History* 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 create a Famous Tree named after something important in their life or their family's life. Have them illustrate the tree and write about the important event in their Learning Logs/Portfolios.

(Optional) Have students create a challenging question for the Famous Tree Famous Facts for one of the Famous Trees that does not have a question.

Extra Attention: Have students' role play how one of the Famous Trees became famous. Have them name the tree in their Learning Logs/Portfolios.

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 History

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 a Famous Tree of Texas.	1	2	3	4	5
2.	I know how to find out about Famous Trees of Texas.	1	2	3	4	5
3.	I can tell why trees are important to our history.	1	2	3	4	5
4.	I can name two reasons why Texas A&M Forest Service was established.	1	2	3	4	5
5.	I know how to collect information about trail tree species.	1	2	3	4	5
6.	I can name three important events in my community/school.	1	2	3	4	5
7.	I can name three events that are important events to my family.	1	2	3	4	5
8.	I can develop a timeline of important events in my life.	1	2	3	4	5
9.	I am interested in learning more about why Famous Trees are famous.	1	2	3	4	5

Tree Trails

9 ELEMENTARY

★ Urban Forestry ★

The trees around us – those that make up the 'urban forest' – are a reflection of the community itself. Cities often organize the protection, planting and care of trees in public spaces, through a Tree Board or other volunteer group. Tree City USA is one symbol of a community that cares about its trees.

Goal and Objectives

Goal: Students will create a Campus Tree Trail Care Plan.

Objectives: Students will

1. Define the role of Urban Forestry.
2. Research forestry organizations and resources that assist with evaluating the needs of the tree trail, the school and/or the community urban forestry programs.
3. Design and develop a plan for present and future care of the tree trail, school and/or community trees.
4. Produce a resource list internet link or booklet of local and state forestry service organizations available for consultation.
5. Evaluate their experience during the *Urban Forestry* Module.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Tree Trails Portfolio, Learning Log/Journal

Activity Materials

- Chart paper for murals
- Art materials for Mural such as different papers, paints, fabrics, markers, etc.
- 5 W's Graphic Organizer
- Assistants or Volunteers to organize the Tree Trails Resource List and the Campus Tree Trails Care Plan
- (Optional) index cards or sticky notes
- (Optional) Cameras or camera phones

Time and Internet Links

Preparation Time: 1-2 hours
Instructional Time: 2-3 sessions, 45 minutes each

- Texas A&M Forest Service, Urban Forestry
  http://tfsweb.tamu.edu/urbanforestry/
- Texas Chapter International Society of Arboriculture
  http://isatexas.com/
- Natural Inquirer, USDA Forest Service Scientists' Cards
  http://www.naturalinquirer.org/Scientist-Card-Series-v-168.html
- Tree Trails
  www.treetrails.org

Instructional Procedures

I. Engage/Excite

A. Large Group Discussion: Ask the students what they think of building a mural of their Tree Trail. Since their Tree Trail is in an urban setting, it would be urban Tree Trail mural. Let them know a little about how it would look. The mural would look like a type of map that depicts trees, landscape workers and tools, structures, gardens or other plants. The mural could grow as changes are made in the landscape to showcase an ideal urban forestry setting. Students could choose their materials for the mural, such as papers and/or fabrics of different textures, paints, markers, etc.

B. Large Group Activity: Take students outside to visit their Tree Trail and other parts of the campus landscape. Ask them to notice the landscape as it exists now. They may take photographs and/or make sketches to use as reference for their mural. Let them know that they will begin by depicting the present landscape. Later they will revisit the Tree Trail to observe the changes made and/or recommended.

C. Small Group Activity: Return to the classroom and assign small groups to develop their mural. Allow students to decide the media they will use and provide time to create their objects and place on the mural. They may add small narratives (on sticky notes or index cards) next to their pictures/objects as desired. Have them think about adding structures, signs, gardens, fountains, benches, etc. and including animals and birds, people like arborists, professional landscape architects and others designing paths or trails. Use a variety of materials and textures.

Example:

D. Large Group Discussion: Have students evaluate the present look and consider what might be needed for the future care of their landscape and jot down a few ideas in their Learning Logs/Portfolio.

E. (Optional) Individual Activity: Have the students take the *Urban Forestry* 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: Project the Urban Forestry section of the Texas A&M Forest Service website. Invite students to discuss their Tree Trail as an urban forest trail that can be better

II. Explore continued

maintained using urban forestry resources. Ask students to find the definition of Urban Forestry and write it in their Learning Logs/Portfolios.

B. Large Group Discussion continued: Discuss that the resources available on this website are for everyone to use to maintain trees in the community. Open some of the links to demonstrate that communities often use these resources to organize planting and care of trees in public spaces. Inform students that communities may create a Tree Board and/or other volunteer-led groups, and contact urban forestry resources to assist with planning. Discuss that they will be creating a Tree Trails Resource List to use in a Campus Tree Trail Care Plan. They will jot down important highlights or copy and paste the information into a document or their Learning Log.

Teacher Tip: Find a member of the school staff, Parent-Teacher organization, Room Parent, teacher assistant, student teacher, or volunteer to assist with compiling the list. The list should credit the authors (students, teachers, grade, class, school and any volunteers) who assist with the development of the resource list.

C. Small Group Activity: Have students move into their Tree Trail small groups and peruse the information on the Texas A&M Forest Service website, the Texas Chapter International Society of Arboriculture website, and other Urban Forestry resources. Have the students continue the search for other resources on the internet and bookmark these. Urban Forestry resources may include those found on the Texas A&M Forest Service website or other sites such as Texas Urban Forestry Council, Tree City USA, Trees of Texas, Tree Line USA, Tree Campus USA , Arbor Day Foundation, Keep Texas Beautiful, Texas Forestry Association, Texas Garden Clubs, Texas Nursery & Landscape Association and other organizations.

D. Small Group Activity continued: Remind students to also find and list Urban Forestry personnel that are our human resources such as Arborists, Landscape Architects, City Foresters, Teachers, etc. Have students list and describe these careers in their Learning Logs.

Teacher Tip: Definitions of some of these positions are on the Natural Inquirer website. The Scientist Card Series highlight specific people and their positions for the U.S. Forest Service.

Teacher Tip: Discuss the definition of arboriculture and an arborist. Arboriculture is defined as the cultivation of trees and shrubs; this includes the planting and care of individual trees and trees in small groups. An arborist is an individual trained in the care of trees and shrubs. This training can come from formal college education or years of experience. There are several areas of practice for arborists: municipal, commercial and utility as well as consultants.

E. Large Group Activity: Have each small group choose a leader to report the resources they found. Ask students to send/email their resources to the teacher, school clerk, parent or whoever will be responsible for assembling the Tree Trail Resource List as a link on the school website and/or as a booklet. Let students know that with the assembly of the resource list, the class will add a valuable contribution to their school and class and, even, the community. Information about the Tree Trail Resource List link or booklet will be available for those interested. Let the students know that the Tree Trail Resource List will be the primary source for development of a Campus Tree Trail Care Plan.

Teacher Tip: If possible, arrange for an Urban Forestry resource representative to visit the classroom.

III. Explain

A. Large Group Discussion: Tell students they have become the school leaders as student urban foresters on campus. They will take the leadership as the Student Tree Board to establish a Campus Tree Trail Care Plan to ensure their Tree Trail and other trees on campus will be maintained in the future for all to enjoy.

B. Small Group Activity: Divide the students into small groups to play the roles of one of the following kinds of urban foresters on the Student Tree Board: Arborists, Horticulturists, Landscape Architects, City Foresters, Plant Care Technicians and Community Forest Supervisors.

C. Small Group Activity continued: Tell the students that the Tree Trail Resource List will be the primary source for development of the Campus Tree Trail Care Plan. But the most important resource is the students themselves because they have acquired the expertise to lead the development of the plan and now they are members of the Student Tree Board who will accomplish an important mission for their school. They will put into action what they have learned from other modules.

C. Large Group Discussion: Assign each small group of the Student Tree Board to one section of the 5 W's to organize the Campus Tree Trail Care Plan. Project or provide students with a copy of a 5 W's graphic to organize the Campus Tree Trail Care Plan.

Why
Purpose of the Campus Tree Trail Care Plan
What
List steps to take care of trees and list practices to avoid
When
Schedule checkpoints on timeline
Who
Resources and what they will do to help with steps of plan
WIN
List of ideas that wins the hearts of all the campus to join the Campus Tree Trail Care Plan

D. Large Group Discussion continued: Tell students the chart is a beginning point to develop the Campus Tree Trail Care Plan. Ask students to think of an ideal care plan for their tree trail and how they will develop a sustainable urban tree care program for their Tree Trail and trees on their campus. Refer to the purpose statement of this module: "Cities often organize the protection, planting and care of trees in public spaces, through a Tree Board or other volunteer group." The Student Tree Board is the campus organization to protect, plant and care for its trees. Each group should develop actions that address diversity, forest health, value and benefits, and aesthetic value as well as practices to avoid.

E. Small Group Activity: Provide students with laptops/tablets and have them use the internet as necessary to develop a draft of their section of the plan.

F. Large Group Discussion: Ask a representative from each group to introduce their group and the urban forester role they played on the Student Tree Board, then share their career perspective and their section of the plan and ask for input from the other groups. They may add information as appropriate. Allow students to finalize their drafts and send/email to the person responsible for

III. Explain continued

the assembly into the Campus Tree Trail Care Plan. The Campus Tree Trail Care Plan should be published as a link on the school website and/or as a handout to give to parents and community members.

Teacher Tip: If a school chooses to opt out of publishing the Campus Tree Trail Care Plan, they may choose another method to get the Campus Tree Trail Care Plan to parents. Schools may decide to have a sponsor to assist with the Campus Tree Trail Care Plan. If so, please note in the comments and/or recommendation section of the evaluation.

IV. Extend/Elaborate

A. Large Group Activity: Ask the students to revisit their mural to update it with actions included in the Campus Tree Trail Care Plan such as adding other students helping with mulchin and planting, adding resource personnel, additional diverse trees, etc.

B. Small Group Activity: Allow students time to make changes and additions to their mural.

C. Large Group Activity: Have students title their mural, choose a location and display it.

V. Evaluate

A. Large Group Discussion: Have students self-evaluate by asking them if there is anything they would add to their Campus Tree Trail Care Plan and list their responses.

B. Small Group Activity: Ask students to show their definitions for Urban Forestry, share in groups and list in their Learning Logs.

C. Individual Activity: Ask students to revisit their roles on the Student Tree Board and list their duties and add anything else they might do or change regarding their role.

D. (Optional) Individual Activity: Have students take the *Urban Forestry* 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: Organize a recruiting team to expand their Campus Tree Trail Care Plan to include the whole campus.

Extra Attention: Have students role play different forestry resource personnel such as arborists, landscape design, landscape maintenance, conservationists, forestry consultants, etc.

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

Urban Forestry

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 define Urban Forestry.	1	2	3	4	5
2.	I can name three resources or organizations that assist communities to plan tree care programs.	1	2	3	4	5
3.	I can evaluate and name three needs for the care of our Tree Trails.	1	2	3	4	5
4.	I can define four Urban Forestry positions.	1	2	3	4	5
5.	I can describe steps to develop a Tree Trails Care Plan.	1	2	3	4	5
6.	I can name three ways I can assist with the care of our Tree Trail.	1	2	3	4	5
7.	I can perform three tree care services for our home and/or community.	1	2	3	4	5
8.	I will apply three of my Tree Trail learning experiences to design a Campus Tree Trail Care Plan.	1	2	3	4	5
9.	I am interested in learning more about ways I can be involved in a campus tree care program.	1	2	3	4	5

Tree Trails

10 Elementary

★ Student Service Leader ★

Arbor Day is the celebration of trees where we live, work, learn and play. Communities set aside one day each year to plant and care for trees, usually on public property, such as a school or park. Students can provide the leadership for a project to plant or care for trees – either on school grounds or in the surrounding community.

Goal and Objectives

Goal: Students will design and conduct a service learning project.

Objectives: Students will

1. Conduct an informal or formal needs assessment for services for the class or community.
2. Design and develop a tree or forest related service project for the class or community.
3. Apply knowledge gained from the Tree Trails modules to the service project.
4. Conduct a service learning project for students and/or parents, administrators, etc.
5. Develop, administer and analyze an evaluation of the Student Service Learning Project.
6. Evaluate their experience during the *Student Service Leader* Module.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Tree Trails Portfolio, Learning Log/Journal

Handouts

- Charades Directions and Cards
- Tree Tag template
- Sample Needs Assessment Format
- Service Learning Sample Projects
- Student Service Learning Project Invitation Sample

Activity Materials

- Butcher paper or copy paper and markers
- Stop watch, timer or phone with alarm
- (Optional) Cameras or camera phones

Time and Internet Links

Preparation Time: 1 hour

Instructional Time: 3 sessions, 45 minutes each plus additional time for the service learning project

- Arbor Day Foundation
  http://www.arborday.org/
- Texas A&M Forest Service, Urban Forestry
  tfsweb.tamu.edu/urbanforestry
- Texas Tree Planting Guide
  http://texastreeplanting.tamu.edu/
- Getting Started in Service Learning
  https://gsn.nylc.org/topics/all
- Tree Trails
  www.treetrails.org

Instructional Procedures

I. Engage/Excite

A. Large Group Discussion: Ask students if they can name careers related to the modules they have experienced. Start with a review of the module topics and careers associated with them; for example, tree identification is important to foresters, biologists, landscapers and nurserymen. Tell them they are going to play a game of Charades to identify related careers. Discuss the directions/rules for playing Charades and demonstrate or select students to demonstrate the pantomime actions.

Teacher Tip: You may want to provide a short set of directions printed on cards for playing Charades or provide the directions on a chart.

B. Small Group Activity: Divide the class into four teams: Team A, Team B, Team C and Team D. A and B will play against each other and C and D will do the same. Pass out career cards to Teams A and B and to Teams C and D. Team A and Team C selects a student to act out the first career card. Remind students not to reveal the career on the card to the opposing team. A different student should be chosen each turn. Team B and Team D is given two to three minutes to name the career. If Team B or Team D names the career, they are given a point and the next turn. If they cannot name the career within the time limit, Team A or Team C gets the point and the next turn. Each set of teams are given three turns to try before the teams change turns. When all cards are used, the points are added and the winner announced. The winner of Teams A and B will play the winner of Teams C and D in the final round. The final winner is declared.

C. Large Group Discussion: Ask students to think about which career they might choose or if there is a different related career they might choose. Discuss activities each career might perform. Tell students they will have fun creating a project that uses some of the skills these careers require. Have students write in their Learning Logs/Portfolios their first choice of a career and name one or two activities the job might require.

D. (Optional) Individual Activity: Have the students take the *Student Service Leader* 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: Lead a discussion about the importance of student leaders who can inform their school and community about the virtues of trees and forests, their beauty and the enormous benefits and values we receive from them. The Tree Trail students have had a special opportunity few schools have experienced, an in-depth study of trees and forests that opens the door to all fields of study. Now they can share their knowledge as student leaders by providing their services to the school and community.

II. Explore continued

B. Large Group Discussion continued: Explore services that students could provide for their class, school or community related to the Tree Trail modules, including the careers portrayed in the Charades game. Record their ideas on a chart/whiteboard.

Teacher Tip: There are lots of different ways students can be student service leaders. The following list of activities is provided as a suggestion for the class to consider. As appropriate, the total service project and activities may be performed by an individual, teams or as one class project. It is the decision of the teacher and students which student service leader projects to provide and what students will be involved. However, every student must play a role.

Teacher Tip: To reveiw the basics of a service learning project visit the Generator School Network's Getting Started in Service-Learning website.

C. Large Group Discussion: If deemed appropriate, display on a chart/whiteboard the following sample learning services as a possible choice. This list of learning services are suggestions. While Arbor Day is listed as a separate project, most Arbor Day activities can be incorporated into any service learning project. It is up to the class and teacher to decide the most appropriate learning service. (See Teacher Tip above.) These suggestions are followed by a simple lesson plan.

1. Plan and host an Arbor Day event.

   Coordinate dates, school calendar, Texas Arbor Day (which is the first Friday in November, but can be celebrated at the local level at any time) and National Arbor Day schedules for the Arbor Day event, brainstorm activity ideas, create a schedule of events, select hosts or docents, assign tasks, and plan an evaluation for participants.

2. Plant a tree.

   Research where trees are needed, what trees are best for the site - visit Texas A&M Forest Service's Tree Planting Guide, who will fund the tree(s), what materials are needed and who will plant the tree, who will water the tree, plan dedication of the tree and develop and conduct an evaluation of the activity.

3. Install signage for the Tree Trail.

   Prepare and install signage for the Tree Trail, one for each trail tree. A template is provided to develop a marker for each tree. Possible items to include ona tree sign: tree outline, tree number, common and scientific name, measurement, date entered as a trail tree, etc. Place signs in holders and on stakes, decide where to place in ground and install the signage.

4. Host a Tree Trail Tour for other classrooms, administrators, parents, or other guests.

   Prepare a Tree Trail Tour outline that includes objectives for the tour, route of tour, schedule, narrative at each stop, evaluation for tourist, and brochure for the Tree Trail Tour. Include audio or visuals needed.

5. Create a script for each tree that can be uploaded as a podcast on the school website.

   Prepare an outline for the script, develop the goal, purpose and objective statements, write narrative for each tree, including the signage information, tree history, and future plans for the Tree Trail, and develop an evaluation of event.

D. Large Group Discussion: Tell students they will use all ideas and suggestions to develop, conduct and analyze a needs assessment to determine the best service project for the class, school and

II. Explore continued

community. They will survey other classes, teachers, administrators and parents using informal or formal assessment questions. Once the needs assessment results are tallied, the class will decide on specific student service leadership to provide.

E. Small Group Activity: As desired, divide the class into small groups to develop the needs assessment format and style. A suggested format follows:

Title such as Tree Trails Student Service Learning Project
Name of Participants and Date
Introduction and Purpose (Written by the teacher)
Deadline to return survey
List of possible projects and rating system to decide the most important
Lines to list suggested projects
Lines to provide comments and recommendations

F. Large Group Activity: Conduct the needs assessment. Remember to involve as many school personnel, such as other teachers and students, administrators, etc. as possible.

G. Large Group Discussion: Project the results of the needs assessment to review. Allow students to use the results to decide on the service project they want to perform. Organize the students to work on their services. Students may be assigned individual or group tasks. If the class chooses one service, assigned individuals to a task for that service.

III. Explain

A. Large Group Directions: Remind students to develop an evaluation form for the service project chosen. It may look like the module evaluations but it may have as few as four to five questions.

B. Large Group Discussion: Inform students that they need to develop an invitation for guests to attend the dedication of the service learning project. Provide a sample invitation and get feedback from the students. Then develop the chosen invitation format.

C. Large Group Activities: Develop a schedule for students to work on their project.

(Optional: Develop a project timeline and have students plan to check progress toward completion or have the students make their own project timeline to share or post.)

D. Large Group Activities continued: Provide the materials needed and plan the activities to complete the project within the preferred time period. Encourage students to plan to take pictures and/or use a variety of media during their project and its development.

IV. Extend/Elaborate

A. Large Group Activity: Provide time for students to work on their Service Learning Project(s). Periodically check on their progress. Post a notice and/or a list of the Service Learning Project statuses as they are completed.

B. Individual Activity: Have students complete invitations for the guests they wish to invite, including the principal, other classes and special guests such as public officials, the local newspaper and

IV. Extend/Elaborate continued

television/media journalists. Provide students with the number of invitations needed for their family and guests and have them complete the invitations and deliver these.

Teacher Tip: Discuss the event with administrators and faculty and decide on a time and location for the project dedication and include on the invitation.

C. Large Group Presentation: Conduct the Tree Trails Student Service Learning Project Dedication. Record the presentation, if possible.

D. Large Group Activity: Remind the students that all visitors or anyone involved in the project should complete an evaluation form. Have students inform the audience where to leave their completed evaluations.

V. Evaluate

A. Large Group Discussion: Have students tally the evaluations and summarize the results. Conduct a discussion of the results of the evaluations of the project.

B. Small Group Activity: Have each student or team share their learning experience with the class by presenting a short synopsis of what they did for the project and the results of the evaluations. They may download their pictures and share with the classroom.

C. Individual Activity: Have each student record in their Learning Logs/Portfolios a summary of their services and how they feel about the results.

D. (Optional) Individual Activity: Have students take the *Student Service Leader* 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: Produce a video of the activities conducted during all the modules and/or for the final module.

Extra Attention: Have students draw and/or describe their favorite part of the Student Service Learning Project.

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

Student Service Leader

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 plan a Tree Trail service to perform for my school.	1	2	3	4	5
2.	I can organize and conduct a needs assessment.	1	2	3	4	5
3.	I can develop an evaluation form for a service project.	1	2	3	4	5
4.	I can name three reasons why Tree Trail student services are important.	1	2	3	4	5
5.	My Trail Tree experiences have boosted my knowledge of how important trees are to our community.	1	2	3	4	5
6.	I want to apply my Tree Trails learning to become a Service Leader for my school.	1	2	3	4	5
7.	I can perform at least two Tree Trails Services for my family.	1	2	3	4	5
8.	I will apply three of my Tree Trails learning experiences to preserve the health of our trees and forests.	1	2	3	4	5
9.	I am interested in learning more about ways I can be involved in forestry services.	1	2	3	4	5

Career List

Accountant
Arborist
Archeologist
Christmas Tree Farmer
Engineer
Entomologist or Insect Scientist
Forester
Hydrologist or Water Scientist
Landscape Architect
Law Enforcement Officer
Mechanic
Nurseryman
Soil Scientist
Teacher
Technology or Computer Specialist
Wildland Firefighter
Wildlife Biologist
Writer

Career Cards

Accountant

a person who keeps the financial records of a business or person

Arborist

a person who is trained in properly planting and taking care of individual trees, such as pruning, fertilizing, or controlling disease.

Archeologist

a person that deals with past human life and activities by studying the bones, tools, etc., of ancient people

Christmas Tree Farmer

a person who grows and shapes trees for the winter holiday season

Engineer

a person that designs and creates new systems or structures

Entomologist or Insect Scientist

a person that studies insects

Forester

a person who takes care of forests by planting trees, cutting down trees, etc.

Career Cards

Hydrologist or Water Scientist

a person who studies how water moves through the Earth, the water quality, and water supply.

Landscape Architect

a person who plans and creates large outdoor spaces such as gardens, parks, etc.

Law Enforcement Officer

a person who enforces the law

Mechanic

a person who repairs machines (such as car engines) and keeps them running properly

Nurseryman

a person who owns or works in a place where trees and shrubs are grown and sold

Soil Scientist

a person that deals with the methods used by farmers to raise crops like trees and care for the soil

Teacher

a person who teaches students about certain subjects

Career Cards

Technology or Computer Specialist

a person that uses computers to create and maintain data and maps

Wildland Firefighter

a person puts out a fire that occurs in a wildland area

Wildlife Biologist

a person that manages, protects, and enhances habitat for wildlife

Writer

a person who writes books, poems, stories, news articles etc.

Service Leader Sample Projects

1. Plan and host an Arbor Day event.

   Coordinate dates, school calendar, Texas Arbor Day (which is the first Friday in November, but can be celebrated at the local level at any time) and National Arbor Day schedules for the Arbor Day event, brainstorm activity ideas, create a schedule of events, select hosts or docents, assign tasks, and plan an evaluation for participants.

2. Plant a tree.

   Research where trees are needed, what trees are best for the site - visit Texas A&M Forest Service's Tree Planting Guide (http://tfsweb.tamu.edu/urbanforestry/), who will fund the tree(s), what materials are needed and who will plant the tree, who will water the tree, plan dedication of the tree and develop and conduct an evaluation of the activity.

3. Install signage for the Tree Trail.

   Prepare and install signage for the Tree Trail, one for each trail tree. A template is provided to develop a marker for each tree. Possible items to include ona tree sign: tree outline, tree number, common and scientific name, measurement, date entered as a trail tree, etc. Place signs in holders and on stakes, decide where to place in ground and install the signage.

4. Host a Tree Trail Tour for other classrooms, administrators, parents, or other guests.

   Prepare a Tree Trail Tour outline that includes objectives for the tour, route of tour, schedule, narrative at each stop, evaluation for tourist, and brochure for the Tree Trail Tour. Include audio or visuals needed.

5. Create a script for each tree that can be uploaded as a podcast on the school website.

   Prepare an outline for the script, develop the goal, purpose and objective statements, write narrative for each tree, including the signage information, tree history, and future plans for the Tree Trail, and develop an evaluation of event.

Sample Needs Assessment Format

Tree Trails Service Learning Project

Name of Survey Participant:_____ Date:_____

Introduction and Purpose of the project:

Deadline to return survey:

List of possible projects, please rank the most to least important (1 being most important):

Suggest other important projects not found in the above list:

Comments and recommendations:

Thank you for taking the time to add your valuable input and assist with our needs assessment.

Sample Tree Tag

I am a _____
Tree species

on _____
Tree Trail name

I provide ecologial benefits valued at

$ _____

Find our trail online at
www.treetrails.org

Certificate of Achievement

awarded to

_____

for their service leadership
in the Tree Trails program at

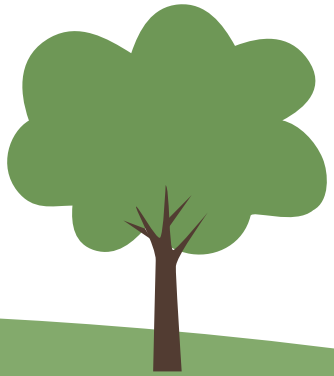
_____

_____ _____

Date Teacher

TREE TRAILS

Notes



TREE TRAILS

Elementary Content Area TEKS - Grade 5

Module One - Map a Tree Trail

Language Arts: 5.13. (B) interpret factual or quantitative information presented in maps, charts, illustrations, graphs, timelines, tables, and diagrams.

Mathematics: 5.15 (A) explain and record observations using objects, words, pictures, numbers, and technology.

Science: 5.2 (E) demonstrate that repeated investigation may increase reliability of results.

5.2(G) construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information.

Social Studies: 5.6 (A) apply geographic tools, including grid systems, legends, symbols, scales, and compass roses, to construct and interpret maps.

Module Two - Tree Identification

Language Arts: 5.8 (A) evaluate the impact of sensory details, imagery, and figurative language in literary text.

5.29 Students work productively with others in teams.

Mathematics: 5.14 (C) select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a similar problem, or working backwards to solve a problem.

Science: 5.2 (C) collect information by detailed observations and accurate measuring.

5.2 (E) demonstrate that repeated investigations may increase the reliability of results.

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

5.4 (B) use safety equipment, including safety goggles and gloves.

Social Studies: 5.6 (B) translate geographic data into a variety of formats such as raw data to graphs and maps.

Technology Applications: (b) (1) (C) use virtual environments to explore systems and issues.

Module Three - Tree Measurement

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

Mathematics: 5.7 (A) perpendicular, and congruent parts of two-and three-dimensional geometric figures.

5.10 (C) select and use appropriate units and formulas to measure length, perimeter, area, and volume.

Science: 5.2 (C) collect information by detailed observations and accurate measuring.

5.2 (D) analyze and interpret information to construct reasonable explanations form direct (observable) and indirect (inferred) evidence.

5.2 (E) Demonstrate that repeated investigations may increase reliability of results.

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

Social Studies: 5.24 (B) analyze information by sequencing, categorizing, identifying cause and effect relationships, comparing, contrasting, finding the main idea, summarizing, making generalizations and predictions, and drawing inferences and conclusions.

Technology Applications: b (3) (C) validate and evaluate the relevance and appropriateness of information.

b (3) (D) acquire information appropriate to specific tasks.

Module Four - Tree Structure and Function

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 form 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.

Elementary Content Area TEKS - Grade 5

Module Five - Benefits and Values of Trees

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

Mathematics: 5.5 (A) describe the relationship between sets of data in graphic organizers such as lists, tables, charts, and diagrams.

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.

Social Studies: 5.24 (B) analyze information by sequencing, categorizing, identifying cause and effect relationships, comparing, contrasting, finding the main idea, summarizing, making generalizations and predictions, and drawing inferences and conclusions.

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

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

Module Six - Diversity of Species and Ecosystem

Language Arts: 5.11 (D) use multiple text features and graphics to gain and overview of the contents of text and to locate information.

Mathematics: 5.5 (A) describe the relationship between sets of data in graphic organizers such as lists, tables, charts, and diagrams.

5.9 (A) locate and name points on a coordinate grid using ordered paires of whole numbers.

Science: 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.

5.9 (D) identify the significance of the carbon dioxide-oxygen cycle to the survival of plants and animals.

Social Studies: 5.6 (A) apply geographic tools, including grid systems, legends, symbols, scales, and compass roses, to construct and interpret maps.

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

b (4) (B) collect, analyze, and represent data to solve problems using tools such as word processing, databases, spreadsheets, graphic organizers, charts, multimedia, simulations, models, and programming languages.

Module Seven - Tree and Forest Health

Language Arts: 5.13 (B) interpret factual or qualitative presented in maps, charts, illustrations, graphs, timelines, tables, and diagrams.

5.24 (A) follow the research plan to collect data from a range of print and electronic resources (e.g., reference texts, periodicals, web pages, online resources) and data from experts;

5.27 (A) listen to and interpret a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose or perspective.

Mathematics: 5.14 (B) solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness.

5.14 (D) use tools such as real objects, manipulatives, and technology to solve problems.

Science: 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 (C) express ideas orally based on research and experiences.

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

b (4) (A) identify information regarding a problem and explain the steps toward the solution.

Elementary Content Area TEKS - Grade 5

Module Eight - Tree History

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

5.26 (A) compiles important information from multiple sources.

Mathematics: 5.13 (C) graph a given set of data using an appropriate graphical representation such as a picture or line graph.

Science: 5.2 (F) communicate valid conclusions in [both] written [and verbal] form[s].

5.2 (G) construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information.

Social Studies: 5.24 (C) organize and interpret information in outlines, reports, databases, and visuals, including graphs, charts, timelines, and maps.

5.24 (E) identify the historical context of an event.

5.25 (C) express ideas orally based on research and experiences.

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

b (4) (D) evaluate technology tools applicable for solving problems.

Module Nine: Urban Forestry

Language Arts: 5.13 (A) interpret details from procedural text to complete a task, solve a problem, or perform procedures.

5.26 (A) compiles important information from multiple sources.

5.27 (B) follow, restate, and give oral instructions that include multiple action steps.

Mathematics: 5.14 (B) solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness.

5.9 (A) locate and name points on a coordinate grid using ordered pairs of whole numbers.

Science: 5.13 (D) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

Social Studies: 5.25 (C) express ideas orally based on research and experiences.

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

b (4) (D) evaluate technology tools applicable for solving problems.

Module Ten - Student Service Leader

Language Arts: 5.13 (A) interpret details from procedural text to complete a task, solve a problem, or perform procedures.

5.26 (A) compiles important information from multiple sources.

5.27 (B) follow, restate, and give oral instructions that include multiple action steps.

Mathematics: 5.14 (B) solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness.

Science: 5.1 (B) make informed choices in the conservation, disposal, and recycling of materials.

5.13 (D) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

5.2 (E) Demonstrate that repeated investigations may increase reliability of results.

Social Studies: 5.25 (C) express ideas orally based on research and experiences.

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

b (4) (D) evaluate technology tools applicable for solving problems.

TREE TRAILS

TEXAS A&M FOREST SERVICE

TEXAS URBAN FORESTRY COUNCIL

KEEP AMERICA BEAUTIFUL

www.treetrails.org