The mission of the Texas Forest Service is to provide statewide leadership to assure the state’s trees, forests and related natural resources are protected and sustained for the benefit of all.

Features

- Texas Forests
- Arbor Day
- Wildfire Prevention
- Resources
- Classroom Activities Correlated
This guide provides a brief overview of various aspects of the forest resource in Texas. It also provides a comprehensive list of resources available to educators as well as classroom activities correlated to the Texas Essential Knowledge and Skills (TEKS).

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If you have questions, please visit the Texas Forest Service website at texasforestservice.tamu.edu or contact Angie Cure, Conservation Education Coordinator, at acure@tfs.tamu.edu or 979/458-6650.

“Teaching is more than imparting knowledge, it is inspiring change. Learning is more than absorbing facts, it is acquiring understanding.” - William Arthur Ward

“Tell me and I’ll forget, show me and I may remember, involve me and I’ll understand.” - Chinese Proverb

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**TEKS Correlations to PLT Activities**

**Texas Essential Knowledge and Skills Correlation to Living with Fire**

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**National Correlations**

National Science and Social Studies Correlations may be found at the National Project Learning Tree website at www.plt.org under Curriculum. In addition, Excellence in EE—Guidelines for Learning and Girl Scout correlations are available.

**Acknowledgements**

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**Development and Design:** Kathy Flannery

A special thank you to the American Forest Foundation and Project Learning Tree for the permission to use the PLT activities.
TEKS Correlations to PLT Activities

Texas Essential Knowledge and Skills Correlation to Poet-Tree

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Texas Essential Knowledge and Skills Correlation to Tree Cookies

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Project Learning Tree

Benefits to Educators
Project Learning Tree (PLT) provides a fun, hands-on, interdisciplinary 6 hour workshop for educators which includes training in the materials, a guide with 96 activities, and additional resources such as posters and teacher packets.

The guide is correlated to the following:
- National Science Standards
- National Social Studies Standards
- Math, Science, Social Studies, and Language Arts TEKS

Other benefits include:
- Six hours of Continuing Professional Education (CPE) credit from the State Board of Educator Certification (SBEC) are available.
- Spanish student pages available.
- Great in-service program
- The activities teach students how to think, not what to think.
- PLT is fun while learning!
- Texas Forest Service foresters and staff across the state are trained PLT facilitators.
- Grant sponsored specialized workshops are available - PLT in the City (Houston), Walk in the Forest for Teachers, and Burning Issues: Fire in Ecosystems.

Workshops
To schedule an in-service workshop or to find out more, contact the Texas PLT Co-Coordinators: Angie Cure, Texas Forest Service, at 979/458-6650, acure@tfs.tamu.edu or Cheryl Stanco, Texas Forestry Association, at 936/632-TREE, cstanco@texasforestry.org. The Texas PLT website is www.plttexas.org.
Texas Forests

Many different types of forests can be found in Texas, ranging from the urban forest to the deep East Texas pine forest. More than half of the 1,100 species of native trees in the United States are found in the South. Of these, more than 200 species and varieties are native to Texas. In addition, many exotic species have been introduced and now grow in many parts of the state.

The four major forested regions of the Lone Star State include: 1) the Southern pine forest; 2) the central hardwoods, the post oak and cross timbers; 3) the mountain forest areas, which are a continuation of the timber types of the Southern Rocky Mountains; and 4) the semi-tropical forest in the Rio Grande Valley.

In East Texas, the Southern pine-hardwood forests comprise nearly 12 million acres in all or parts of 42 counties. Many different forest products are manufactured in the Piney Woods of East Texas.

Farther west, in East Central Texas, the post oak forests cover over 5 million acres in all or parts of 39 counties. In North Central Texas, the east and west “cross timbers”, occur on approximately 3 million acres. The term “cross timbers” originated with the early settlers who, in their travels from east to west, crossed alternating patches of forests and prairies and so affixed the name “cross timbers” to these forests.

Farther south in the Edwards Plateau region, are the cedar breaks, which extend over 3.75 million acres. Cedar grows on the steep slopes and rolling hills common to this region, in association with live oak and mesquite.

Two of Texas’ trees, guaiacum and ebony, produce the hardest woods in the United States. Both species are found in the Rio Grande Valley.

Other tree areas of the state include an estimated 500,000 acres of mountain forests in the Trans-Pecos Region and the live oak area along the Gulf Coast.

Source: Forest Trees of Texas, How to Know Them, Texas Forest Service, 1963

Living with Fire Student Page

A FIRE TRIANGLE WORKSHEET

1. Fires need heat, fuel, and oxygen to burn—this is known as the “fire triangle.” Draw a triangle below and label each of the three sides with the word and a picture for each of the three parts.

2. Initially, the heat is provided by an ignition source, which can be human or natural. Name two natural and two human-caused sources of heat for fire ignition.
   Natural: 1. ___________  2. ___________
   Human-caused: 1. ___________  2. ___________

3. Fires need fuel to burn. In a forest, what sort of fuels might you expect to find? Name three potential fuels:
   1. ___________  2. ___________  3. ___________

4. Oxygen is available in the air. Weather has a great influence on when fires occur and on how they spread. Hot temperatures and dry winds can create severe fire conditions by affecting fuel, moisture, and oxygen. What can dry winds do to fuels to make them more likely to burn?

5. If you cut off any one of these three elements, a fire will not burn. What are some ways that firefighters might cut off each of the three parts of the fire triangle?

Source: Copyright 2002, American Forest Foundation. Reprinted with permission from Project Learning Tree Pre K-8 Guide, Activity #81, Living with Fire. The complete Project Learning Tree Activity Guide can be obtained only by attending a Project Learning Tree workshop. For more information, please contact Angie Cure, Texas Project Learning Tree Co-Coordinator at 979/458-6650 or acure@tfs.tamu.edu. Visit www.plt.org or www.plttexas.org for more information.
Main Heading

3. The remaining children should pretend to be trees. They should scatter to different parts of the room and stand still.

4. The Smokey Bear rangers should gather around the Wildfire in the middle of the room.

5. The game starts when someone yells, “Fire!” Then the Wildfire runs to grab the hand of a tree. When this happens, the tree becomes part of the Wildfire, and the two of them run to grab another tree. Thus, the fire builds and spreads.

6. At the same time, the Smokey Bear rangers run to protect the trees by putting fire protection necklaces around their necks. They can protect only trees that have not yet caught on fire.

7. When a tree receives a necklace, it must join hands with the other protected trees to make a “fire break” (a line of protection that the fire cannot penetrate). In reality, this could be a strip of wet or bare earth.

8. When the fire runs out of fuel, it burns out (Wildfire students should drop their hands and stand still to show that new trees have grown in the enriched soil). Once again, there is a forest.

9. Before dismissing the group, discuss the meaning of Smokey Bear’s slogan: “Only you can prevent forest fires!”

END NOTES...

**ASSESSMENT OPPORTUNITY**
Have students create a picture-board story of wildfire—it’s like a comic book but without any dialogue. The picture board should have at least 10 frames showing:
1. how the forest looked before the fire (the fuel-dead trees, leaf litter, should be labeled);
2. how the fire was ignited (natural or human source);
3. the pattern the fire burned (burning near a cabin because there are dry trees around it);
4. how the fire was put out—which parts of the fire triangle were removed to stop the fire?

**Note for Teachers:**

If you have been through a PLT workshop, the PreK-8 activity *How Big is Your Tree?* (#67) would be helpful in teaching students about the various shapes and sizes of trees as well as standard units of measure and measuring techniques. All activities are correlated to National Science standards and the TEKS.
Environmental Benefits of Forestry

**Forestry is bringing back forests.** Across the country an average of 1.7 billion tree seedlings are planted annually. That translates into six seedlings planted for every tree harvested. In addition, billions of additional seedlings are regenerated naturally.

**Forestry helps water quality.** Forests actually help to clean water and get it ready for us to drink. The trees, the soil, and bacteria are all part of this process. Forest cover protects and nurtures the soils that are the key to water retention, filtering, and quality.

**Forestry offsets air pollution.** Foresters nurture forests, which are sometimes called "the gills of the planet." One healthy mature tree absorbs approximately 13 pounds of carbon dioxide a year.

**Forestry helps wildlife.** Foresters employ a variety of management techniques to benefit wildlife, including numerous endangered species.

**Forestry provides great places to recreate.** Foresters manage forests that provide recreational benefits such as birdwatching, hiking, horseback riding, nature photography, and camping.

**Forestry provides renewable and energy-efficient building products.** Wood is a renewable resource which can be produced anew for generations to come on sustainable managed forestlands. Recycling and processing wood products requires much less energy than does the processing of many other non-renewable materials.

**Forestry is good for soils.** Foresters' success in growing forests is dependent on their ability to understand soil properties. This is done by matching tree species with soils and by prescribing activities that not only promote forest growth but also enhance and protect soil productivity and prevent soil erosion.

**Source:** Society of American Forester's *The Top Ten Environmental Benefits of Forestry.* The complete list may be found at [www.safnet.org/aboutforestry/envrbenecfm](http://www.safnet.org/aboutforestry/envrbenecfm)

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**Living with Fire**

**Part B: Cause and Effect**

**Doing the Activity**

1. Students should contact their state forestry agency (Texas Forest Service) or a state office for the U.S.D.A. Forest Service. They can ask for information concerning the causes of all large forest or range fires in the state over the past several years, including data on both prescribed burns and uncontrolled wildfires.

2. Using this information, have the students develop tables and pie charts showing the actual numbers and percentages of fires from different causes for the years studied.

3. Have students compare the data for at least three different years and determine: which cause was responsible for the most large fires in each year; and the fewest? The number of fires caused by each category in each year, noting increases or decreases. Reasons why increases or decreases might have occurred. The average yearly number of fires from each cause for all the years studied.

4. Have students research the effects of fire on the economy and the environment, both detrimental and beneficial. They could find out about: financial costs involved in the loss of natural resources and in fire management; ecological costs or benefits from forest fires; and how various agencies or forest industries manage fire and handle fire prevention.

**VARIATION - Fire Tag (PreK-2)**

This game will simulate how trees can be destroyed by fire, how they can be protected from fire, and how they grow back.

1. Choose one child to become the Wildfire that burns the trees. She or he wears a red head band.

2. Choose four children to be Smokey Bear rangers. They wear green head bands. Give each ranger five “fire protection” necklaces to hold (see Getting Ready).
Living with Fire

- Place a small, lighted birthday candle in a jar (you may want to mount it in a dab of modeling clay). Then seal the jar with the lid to cut off the supply of oxygen. As the flame consumes the oxygen in the jar’s air, the flame will go out. Explain that cutting off oxygen is one way of managing a fire.

- Open the jar, relight the candle, and put the lid back on. Only this time, when the flame starts to go out reopen the lid to let more oxygen in; the candle will reignite. Explain that this illustrates what happens when the wind picks up during a fire; the fire may reignite or burn out of control.

- Take the lid completely off and allow the candle to burn until all the fuel (paraffin) is consumed and the fire extinguishes itself—give the students time to see how long it takes. Set up a wooden match and a paper match (similar size) in bases of clay. Light them both and see which burns longer. How do these two tree products—wood and paper—burn differently? Place a corn or potato chip on a piece of tin foil and light it. See how long it takes to burn up. What fuel in the chip made it burn? (vegetable oil, found in all plants)

Explain that the primary way fire managers prevent fires is by reducing fuels so that fires will not start as easily, and won’t burn as intensely or for as long.

3. Finally, extinguish the flame by adding water, which removes the heat and smothers the flame. With all of today’s “high-tech” firefighting equipment, water is still the primary “tool” used to fight fires.

4. Try to have a local firefighter visit your group to talk about the equipment and techniques that are used to suppress fires. Prepare students to ask questions about how fire can be prevented and how they can protect themselves should a fire occur. You can also have a forester visit your group to talk about wildfires. Prepare students to ask questions about how forest fires are managed in their region, and how they can best be prevented.

Note: For grades 6-8, the demonstration can be done by groups of students rather than the teacher.
Science and Technology

Below are just a few examples of how people in the forestry community use science and technology in their job:

**Fire Predictive Services** is a multi-agency coordination system that integrates climate, weather, fire situation, resource status, fuels and fire behavior information into products. These products include weather forecasts, climate forecasts, fire danger forecasts, fire behavior forecasts, fire risk assessments, status of fire fighting resources, analysis of fire occurrence, and fire fighter safety information. Knowledge of forestry is critical. For example, in order to produce fire danger and fire behavior forecasts, one needs an extensive knowledge of forest vegetation types. Understanding this information helps determine how a fire will burn in a given situation and provides valuable insight into what to expect from these fires. This is important so that fire managers will have an understanding in advance of the type and amount of fire fighting resources they may need on a fire, which in turn helps keep fire fighters safer as they go about their jobs. To learn more, visit the Texas Interagency Coordination Center website: [www.tamu.edu/ticc](http://www.tamu.edu/ticc).

Written by Tom Spencer, TFS Fire Risk Assessment Coordinator, College Station

**Satellite based remote sensing**, which retrieves information about earth's resources from a distance, can provide accurate information concerning forested resources in a timely manner due to high temporal resolution and synoptic perspective. Satellite based remotely sensed data for natural resources, available since 1972, can provide a historical perspective of resources, as well as forest composition maps, forest age class assessments and biometric measurements in a timely and repetitive manner. Current studies focus on applying spatial science to quantify, qualify, map, monitor and manage forested and non-forested resources from a spatial perspective.

Source: SFASU Arthur Temple College of Forestry SFA website at [www.sfasu.edu/forestry](http://www.sfasu.edu/forestry).

Living With Fire

Fire is an essential component in the lifecycle of several tree species. Some are dependent on the heat of fire to open their cones and release the seeds, while others simply need fire to open the forest canopy to provide light. In general, fires return nutrients to the soil in the form of ash.

Preventing, controlling, and suppressing wildfires is becoming more vital as more urban people seek woodland settings for their homes. More and more homes, property and lives are endangered by fire along the wildland-urban interface. Once again, balancing the needs of humans against the needs of the forest system has no easy answers.

**Getting Ready**

**Activity**: Make copies of page 41 and gather materials for the demonstration. You may want to invite a local firefighter or forester who is involved with fire management to visit your class.

**Variation**: You will need an outdoor area or large room for the game. Make four green headbands out of construction paper for the “rangers.” Make one red headband for “fire”. Make 20 “fire protection necklaces.” These can be made by cutting squares out of blue poster board and tying string through them.

**Part A: Fire Triangle**

**Doing the Activity**

1. Pass out the “Fire Triangle” worksheet on page 41. Have students read and work through it on their own. When everyone is finished, ask the class what three things are needed for fire to burn. Draw the fire triangle on the board. Ask them under what conditions they think it would be easy to start a fire, and when they think it would be hard.

2. Demonstrate how a candle burns in a glass (from a science lab) when each of the three different elements are limited:
Living With Fire

Oxygen is, of course, available in the air. Weather conditions have a great influence on when fires occur and how they spread. Hot temperatures and dry winds can dry out trees and grasses in a forest, making them available as fuel for a fire to consume. The stronger the winds, the more quickly moisture evaporates from the vegetation, and the faster the fire can spread.

Even in the largest fires, such as the Yellowstone fire in 1988, not everything burns. Patterns of burned areas across the landscape can help keep ecosystems healthy. Areas that have recently burned do not have much fuel or dry dead litter, and they are less likely to burn again soon. Having trees of mixed ages is healthy for the forest ecosystem in many ways, one of which is preventing the entire forest from burning down.

In the southeastern United States, the months of March, April, and May are called “fire season,” when 75 percent of forest fires occur. Fire season in the West usually runs from June through October, during the very dry months of the year. In the Northeast, it is March through May, and then again in the fall, corresponding to the leaf drop. Wildfires do not generally occur when the fuels (trees, shrubs, and grasses) are wet and cold.

Fire was an important tool in Native American culture and is in other cultures around the world. Some Native American peoples set fires to prairies knowing that new growth would attract game. Fire had traditionally been used to drive game, reduce populations of unwanted animals, and clear forests.

Fire can be an effective management tool for state and federal agencies to manage their wildlands, which include forests, grasslands, and other ecosystems. Over the years, fire management policies and techniques have changed. A prescribed burn (one that is lit by trained fire personnel within prescribed fuel and weather conditions) can prepare a logged area for reforestation, enhance wildlife habitat, protect a native tree species, control insect populations or disease, or reduce future fire hazard by reducing burnable fuels.

History of Arbor Day

Arbor Day was first observed in the United States in 1872. J. Sterling Morton is credited with guiding this country’s first Arbor Day resolution through the Nebraska state legislature in that year.

President Theodore Roosevelt was a strong supporter of Arbor Day. Early in the 20th century, it was becoming clear that the nation’s forests were being exhausted by “cut out and get out” timber harvesting. The science of forest management was emerging, and the government was moving to suppress wildfire and plant trees. President Roosevelt sent a letter to the children of the United States in which he wrote, “A people without children would face a hopeless future; a country without trees is almost as hopeless.”

In Texas, Arbor Day was first observed in the city of Temple on February 22, 1889. W. Goodrich Jones led the citizens of Temple in a mass meeting to call for a tree planting campaign along the streets of the city. One year later, the first statewide observance of Arbor Day was held in Austin. Through the efforts of Senator George Tyler of Belton, February 22nd was set aside by law as Arbor Day to “encourage the planting of trees in this state.”

After the original Texas Arbor Day law expired, the state continued to observe Arbor Day by proclamation of the governor, usually on George Washington’s birthday. In 1949, the state legislature adopted a resolution designating the third Friday in January as Texas Arbor Day. Finally, in 1989 the legislature passed a resolution moving Texas Arbor Day to the last Friday in April to align with the traditionally observed national Arbor Day.

Arbor Day presents a tremendous opportunity to teach fundamental lessons about stewardship of our natural resources and caring for our environment. There is no more powerful demonstration than helping children plant and care for trees that their own children and grandchildren will enjoy. For more information, visit the National Arbor Day Foundation website at www.arborday.org.

Written by Pete Smith, Staff Forester, College Station
Arbor Day Poster Contest

As part of the state Arbor Day celebration, the Texas Forest Service (TFS) is sponsoring the National Arbor Day Foundation’s poster contest in Texas.

Who may enter the contest?
Posters must be created by a Texas student currently enrolled in the fifth grade.

What prizes are available?
State prizes include a 6-8’ tree planted on the school’s grounds, and fun, educational prizes for the winning student, teacher, and class! The state-winning poster is automatically entered in the National poster contest representing the State of Texas.

National prizes for the winning student include a $1,000 savings bond and a trip to the National Arbor Day ceremony in Nebraska with his or her teacher and a parent!

Who can I contact for an Activities Guide or more information?
To receive an Arbor Day Poster Contest Activities Guide, contact the National Arbor Day Foundation at www.arborday.org, or the Texas Forest Service at the information listed below. Visit the Texas Forest Service website to find out current information and this year’s contest theme at texasforestservice.tamu.edu.

College Station Office:
Pete Smith or Debbie Allman
Phone: 979/458-6650
Email: dallman@tfs.tamu.edu

PLT Activity: Living With Fire

Overview
The term “forest fire” may conjure up images of fear and devastation. Preventing fires is still important, but times have changed. In this activity, students will learn how fire is a natural event in forests and other ecosystems and how it helps keep plants and other parts of the ecosystem healthy.

Levels: Activity: Grades 4-8 Variation: PreK-2
Subjects: Science, Social Studies
Skills: Observing, Classifying and Categorizing, Analyzing, Summarizing
Objectives: Students will (1) describe a forest fire: how it starts, spreads, and burns out and (2) explain several approaches to forest fire management.

Materials: Activity: copies of “Fire Triangle” work sheet on student page 41, art materials, glass jar with metal lid, wooden kitchen matches, small birthday candle, paper match, or potato chip; Variation: 20 strands of yarn and pieces of blue poster board or construction paper to make necklaces, pieces of red and green construction paper to make headbands

Time Considerations: Preparation: 50 minutes Activity: 50 minutes Variation: 30 minutes

TEKS Correlations: See Page 43 Assessment: See Page 40

Background
Fire is a natural event in most forest ecosystems. Some forests depend on fire to recycle nutrients back into the soil. From an ecological standpoint, fire is neither “good” nor “bad.” Fire occurs naturally through lightning strikes in the presence of dry fuel. Fires also occur when humans start them intentionally or accidentally.

Fires need heat, fuel, and oxygen to burn—these three elements are known as the “fire triangle.” Remove any one of these three elements and the fire will not burn. Initially, the heat is provided by the source of ignition. Fuels include dry trees, dead trees and limbs, leaf litter, and dry grass.
Poet-Tree

VARIATION

Each student chooses a tree near school or home. Have students spend time with their tree, sitting against it, lying underneath it, walking around it, and observing it from various perspectives. During this time, they should write down words, feelings, ideas, and impressions that enter their heads. Later, they should convert these thoughts into a free verse poem. When the poem is finished, they should think of a word or phrase that sums up the "character" of their tree; this wording will serve as the title. Finally, they should take a photograph of their tree that visually captures the essence of their poem. Encourage them to be creative in choosing the right lighting and perspective for taking their picture. Through this activity, students can strengthen their writing skills and learn the magical power of photography.

ASSESSMENT OPPORTUNITY

As students work on their poems, they should brainstorm and make notes on their ideas, keeping their rough drafts. Later, they should arrange these raw materials in a portfolio that shows the development of their poem and submit it along with the finished poem.

Source: Copyright 2002, American Forest Foundation. Reprinted with permission from Project Learning Tree Pre K-8 Guide, Activity #5, Poet-Tree. The complete Project Learning Tree Activity Guide can be obtained only by attending a Project Learning Tree workshop. For more information, please contact Angie Cure, Texas Project Learning Tree Co-Coordinator at 979/458-6650 or acure@tfs.tamu.edu. Visit www.plt.org or www.plttexas.org for more information.

Arbor Day Activities

There are many different ways educators can help students learn about and celebrate Arbor Day. Here are a few suggestions:

- Take your class on a tree identification hike around campus or within your community.
- Plant trees on the school campus. (Be sure to have a plan to water them through the summer months.)
- Do a web search on the benefits of trees and prepare a list with pictures.
- Have a contest for students to find the oldest trees in the community and research the history of the tree. (See Tree Cookie activity on page 24.)
- Have an essay contest where students describe the importance of trees to their community.
- Dedicate library time for students to read books about trees and forests.
- Host an Arbor Day Celebration (See tips below)
- Do Project Learning Tree activities (i.e. Plant a Tree # 31)
- For more ideas, visit the National Arbor Day Foundation website at www.arborday.org.

Sample Arbor Day Program

1. Invocation
2. Song: “America the Beautiful”
3. Messages: Guest Speaker
4. Poem: “Trees” by Joyce Kilmer
5. History and Importance of Arbor Day: Guest Speaker (Forester)
6. Group Recitation: “What Trees Teach Us” by Helen O. Hoyt
7. Song: “Smokey the Bear”
8. Recitation: “What Do We Plant?” by Henry Abbey
9. Ceremony: Plant and Dedicate Trees
10. Song: “Texas Our Texas”
11. Benediction
Fires in Texas

Despite its potential for destruction, fire in nature is neither “good” nor “bad,” from an ecosystem perspective. Rather, fire has played—and continues to play—a vital role in perpetuating fire-adapted ecosystems and plant communities. Differences among plant species make some species more fire tolerant or more dependent on fire. For example, southern pines found in the South (including eastern Texas) are tree species whose life cycles benefit from fire. Likewise, prairies and rangelands can benefit from periodic fires, which help prevent encroachment by brush and tree species, such as mesquite and juniper.

Wildfires occur naturally, primarily as a result of lightning strikes in dry vegetation. Lightning, though, causes relatively few of the total number of wildfires that occur every year in Texas. In our state, people cause over 90 percent of all wildfires. Most result from carelessness while burning brush, trash and other debris. Other significant wildfire causes include sparks from equipment operation, arson, carelessly discarded smoking materials, abandoned campfires, and, at certain times of the year, unsafe use of fireworks.

As more is learned about the effects of fire on plant communities and ecosystems and its potential for positive modification of the landscape, land managers have increasingly used fire as a management tool. Prescribed burning, or the controlled use of fire under carefully specified environmental conditions, can accomplish a variety of objectives. Prescribed fires can reduce hazardous fuel accumulations, help maintain plant and animal species dependent on periodic fire and control less desirable vegetation competing with crop species. The use of fire as a fuel management tool requires extreme care by fire management experts, so that the destructive potential of fire isn’t unleashed as a wildfire. For more information, visit the Texas Interagency Coordination Center website at www.tamu.edu/ticc.

Written by Mahlon Hammetter, TFS Fire Prevention Specialist, Lufkin

Poet-Tree

adjectives, participles, etc.). Write these on the chalkboard and have students generate a short list of examples under each category to make sure everyone understands.

3. Present the poetic forms described in the background information and give examples. Tell students there are many other types as well.

4. Take the students to visit nearby trees in the school yard, park, or forest to gather “tree impressions”. (This can be done indoors through windows, if necessary.) Tell students to write descriptive words about how the tree feels, smells, looks, and so on; sounds that come from the tree; living things they see on the tree; and the way they feel sitting underneath the tree.

5. While you’re outside or once you’re back inside, have the students write their own poems about trees and forests. Encourage them to try more than one poetic form. Then let the students share their poems with the rest of the group. Have them explain which poetic form they used and why they chose it.

6. Discuss some of the following questions with the students. Point out how people see trees and forests differently. Does your poem mention the influence people have on trees or forests? Does it mention the value of trees or forest products to people? Does your poem speak of people’s place in nature? How?

7. Have students review the poem or poems they wrote and choose the one they like the best. Then assemble everyone’s favorite poems into a book. You may want to create just one class book, or you could run off enough copies of each poem so that each child can assemble his or her own book. You might make extra copies of the class publication to be distributed around the school and to parents.

8. Help students to identify and contact appropriate local, regional, and national organizations that might publish the students’ poems in their publications, and encourage students to submit their work. (For example, Project Learning Tree publishes The Branch, which often uses “poet-tree”.)

American Forest Foundation/Project Learning Tree ©
Poet-Tree

The words in *picture poetry* form a picture of what is happening in the poem.

**EXAMPLE:** (a tree)

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**Getting Ready**

Make preparations to take students outdoors to observe a variety of trees.

**Doing the Activity**

1. Ask the students to name some of the benefits they derive from trees and forests. What experiences have they had with trees and forests? How do trees and forests make them feel? Do they have any favorite neighborhood trees? Any special wooded places they like to visit? Any favorite stories about forests or trees? Any forest issues that concern them? Come up with a group list of characteristics and attributes of trees or forests. Tell students they are going to have an opportunity to create a book of poetry expressing their ideas and feelings about trees and forests.

2. Review with the students the major parts of speech (nouns, verbs, adjectives, and adverbs) used in tree science.

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**Note for Teachers:**

October is National Fire Prevention Month. For more information and teacher resources about Smokey Bear visit [smokeybear.com](http://smokeybear.com) or [www.symbols.gov](http://www.symbols.gov). If you would like Smokey to come to a school event, contact your local Texas Forest Service office. The Texas Interagency Coordinator Center website [www.tamu.edu/ticc](http://www.tamu.edu/ticc) under Prevention and Urban Wildland Interface provides safety tips and other useful information.

If you have been through a Project Learning Tree workshop, the following activities can be used to teach your students more about fire. All are correlated to National Science standards and the TEKS. **PLT PreK thru 8 Activities:** *Forest for the Trees* (#69), *Nothing Succeeds Like Succession* (#80), *Living with Fire* (#81). See page 35. **High School:** The Changing Forest: Forest Ecology module: *Understanding Fire* (#7) and *Fire Management* (#8).
BUGS: Bothersome and Beneficial

The **Texas leaf cutting ant** is the only ant of the genus *Atta* that lives in the United States. It only resides in Texas and west central Louisiana. It can be a pest when it strips the leaves from young pine trees, garden plants, or citrus orchard trees. The ants do not eat the green vegetation they collect; rather they grow a fungus on the green plant material and the fungus is their main source of food. The ants do not sting.

Bark beetles are the most destructive group of insect pests in the forests of the United States. In the south in particular, the **southern pine beetle** (about half the size of a grain of uncooked rice) can cause tremendous losses in southern pine forests.

**Bess beetles** are common in decaying hardwood logs. They are beneficial insects because they aid in recycling dead wood.

The **wheel bug** is a beneficial insect in the group known as true bugs. Wheel bugs prey on other insects. When handled carelessly, they can inflict a painful bite to people.

*Photos and text by Joe Pase, TFS Entomologist, Lufkin. Texas leaf cutting ant photo by Scott Cameron.*

**Note for Teachers:**
If you have been through a Project Learning Tree workshop, these activities can be used to teach your students more about Forest Insects and Diseases. All are correlated to National Science standards and the TEKS. 

**PLT PreK thru 8 Activities:**  *Peppermint Beetle (#3), The Fallen Log (#23), Nature’s Recyclers (#24)*  

**PLT High School Activities:** The Changing Forest module:  *Home Sweet Home (#4), Saga of the Gypsy Moth (#5)*  

**Poet-Tree**

**Cinquain** poems consist of five lines, and each line has a mandatory purpose and number of syllables: ① the title in two syllables, ② a description of the title in four syllables, ③ a description of action in six syllables, ④ a description of a feeling in eight syllables, and ⑤ another word for the title in two syllables.

Example:  
Forests  
Graceful, Growing  
Climbing among the clouds  
Calmly awaiting the sunrise  
Alive.

**Diamante** poems are diamond-shaped and consist of seven lines that follow the following pattern:

```
noun adjective adjective
participle participle participle
noun noun noun noun
participle participle participle
adjective adjective
noun
```

A **windspark** poem has five lines with the following pattern: ① “I dreamed,” ② “I was...” (something or someone), ③ where, ④ an action, and ⑤ how.

**EXAMPLE:**  
I dreamed  
I was a tree  
On a hillside  
Playing with the wind  
Joyfully.  

AFF/Project Learning Tree ©
PLT Activity: Poet-Tree

**Overview:** Writing and sharing poems will give your students an opportunity to express their feelings, values, and beliefs about the environment and related issues in creative and artistic ways.

**Levels:** Grades 3-8  
**Subjects:** Language Arts, Science, Social Studies

**Skills:** Observing, Composing, Discussing

**Objectives:** Students will express their feelings and attitudes about the environment using various forms of poetry and analyze their own and other people’s poetry to discover its full meaning.

**Materials:** Paper, pens or pencils, and clipboards (or cardboard and paperclips) for writing outdoors

**Time Considerations:** Preparation: 15 minutes  Activity: 50 minutes

**TEKS Correlations:** See Page 42  
**Assessment:** See Page 34

**Background: Poetic Forms**

- **Haiku** is a Japanese form of poetry that consists of three lines: the first line has five syllables, the second line has seven, and the third line has five again.

  Example: The snow-covered tree  
  Sparkles in the soft moonlight.  
  The wind rushes by.

  In **acrostic** poetry the first letter in each line, when read vertically, spells out the name of something or conveys some other kind of message.

  Example: Towering  
  Reaching  
  Extending  
  Embracing the sky

- **Free verse** follows no set formula or style.

  Example: I am the tree that overcomes all. I am the one that laughs at the wind. I am one with the wilderness.

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Urban Forestry

Urban forestry is the protection, development, and care of trees and forests where people live, work, and play. The mission of the Texas Forest Service Urban Forestry Program is to help build self-sustaining urban forestry and tree care programs in Texas communities. With a handful of urban foresters, the agency acts as facilitator, bringing together interested parties to find local solutions to local tree problems.

**Benefits of Urban Trees:**

- Trees Reduce Air Pollution
- Trees Save Energy
- Trees Reduce Noise Pollution
- Trees Conserve Water and Reduce Soil Erosion
- Trees Increase Economic Stability
- Trees Modify Local Climate
- Trees Increase Property Value

**Source:** Benefits of Urban Trees by USDA Forest Service Southern Region

**Where to find trees for schools:**

- Local nurseries
- Trees for Dallas at www.texastreesfoundation.org
- Trees for Houston at www.treesforhouston.org
- CommuniTrees in Austin at www.treefolks.org
- Texas Forest Service nurseries at texasforestservice.tamu.edu

**Note for Teachers:**

If you have been through a Project Learning Tree workshop, these activities can be used to teach your students more about Urban Forests. All are correlated to National Science standards and the TEKS. **PLT PreK thru 8 Activities:** Trees as Habitats (#22), Three Cheers for Trees (#30), Planning the Ideal Community (#55), People, Places, and Things (#74).
Children’s Books

This is just a short list of the many children’s books available about forests and trees.


Tree Cookies

**VARIATION—MY LIFE AS A TREE**

1. Show students a tree cookie and explain how it was obtained from a tree. Let students feel and examine the tree cookie.

2. Explain what the rings on the cookie are and what they tell us about the tree (age of tree, years of rapid or slow growth). Show students how to count the rings to determine the tree’s age and let them practice.

3. Using white paper plates with ridges, demonstrate for students how to create a “tree cookie” using the bumpy perimeter as the bark, the smooth inside edge as the cambium, and center circle as the heartwood.

Have students each use a paper plate and crayons to create a tree cookie the same age as themselves. They can then use sticky labels to identify when important events in their lives took place such as when they were born, when they started school, and so on.

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**End Notes...ASSESSMENT OPPORTUNITY**

Slowly read the following story to your students and ask them to take notes. (Have them pay particular attention to the years mentioned.) Once upon a time, a tree grew in the forest. In its first 10 years it grew slowly because the large trees overhead blocked the sunlight. In its 11th year, the large tree next to it blew down in a storm. This allowed sunlight to reach the little tree, and for the next 10 years it grew rapidly. In its 21st and 22nd years there was a severe drought, and the tree could not get enough water. This stress caused the tree to grow very slowly for three years. In its 25th year, favorable conditions returned and the tree grew normally for 15 years. In its 40th year, wildfire raged through the forest. The tree’s thick bark enabled it to survive, but it was deeply scarred. It grew slowly for several years after that. Year 45 was particularly bad. Bark beetles got under its skin, fungus entered its body through woodpecker holes, and caterpillars ate most of its leaves. For five years the tree hardly grew at all and became very weak. In its 50th year, it blew down in a storm. A science teacher found the fallen tree and used a chain saw to make a big tree cookie from the trunk. Ask each student to draw a picture of what the tree cookie of this tree might look like. Assess each drawing to make sure students have indicated the events in the tree’s life at points that match the time frame in the story.

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American Forest Foundation/Project Learning Tree ©
Texas Forest Service Resources Available

**Arbor Day Poster Contest**
Statewide annual contest for 5th grade students. See page 10 for more details.

**Contact:** Debbie Allman
dallman@tfs.tamu.edu or visit the TFS website at texasforestservice.tamu.edu

**Forest Tree Trunks**
Available for teachers who enjoy teaching with a “hands-on” approach, a traveling trunk containing forest and wood related materials.

**Grade level:** 3-8  **FREE**
**Contact:** Local Texas Forest Service office or Debbie Allman at dallman@tfs.tamu.edu

**Pecan Poster**
Colorful poster depicting the history and description of Texas’ state tree.

**Grade Level:** All  **FREE**
**Contact:** Local Texas Forest Service office or Debbie Allman at dallman@tfs.tamu.edu

**Resource Professionals**
Available to facilitate Project Learning Tree workshops or to present at school wide events such as Arbor Day, Fire Prevention Week, etc.

**Contact:** Local Texas Forest Service office or visit the website at texasforestservice.tamu.edu for the nearest office location.

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**Tree Cookies**

**PART B: TREE STORIES**

**Doing the Activity**

1. Divide the group into teams. On a very large piece of paper, have students draw a life-size cross section of a redwood tree. It should be about 6 feet (1.8 m) in diameter to be of average mature size. Draw an appropriate number of growth rings for its size: about 150-200 rings. As a group, decide on the year the tree began growing and the year it was cut. Remember, there should be some variety in the growth rings to reflect changing environmental conditions.

2. Have teams research different information that relates to the redwood tree cookie. Categories for research should include: (i) possible significant events in the tree’s lifetime, such as years of drought, flood, or fire; (ii) significant world events during the life of the tree; (iii) significant events in U.S. history during the life of the tree; and (iv) significant events of people in your classroom, school, or community during the life of the tree. Teams should each identify at least five dates for events in their category.

3. Have each group select a color for its event labels. Labels can be placed around the outside margin of the cross section and connected with string to a map tack and inserted at the appropriate year.

**Enrichment**

Invite a forester to talk with your group about how he or she uses core sampling to learn about trees and the forest environment. If possible, have the forester bring an increment borer and demonstrate its use on a tree in your school yard or neighborhood (if necessary, get permission to use the tree).

**Source:** Copyright 2002, American Forest Foundation. Reprinted with permission from Project Learning Tree Pre K-8 Guide, Activity #76, Tree Cookies. The complete Project Learning Tree Activity Guide can be obtained by attending a Project Learning Tree workshop. For more information, please contact Angie Cure, Texas Project Learning Tree Co-Coordinator at 979/458-6650 or acure@tfs.tamu.edu. Visit www.plt.org for more information.
Tree Cookies

PART A: COOKIE COUNTING

Doing the Activity

1. On the blackboard make a copy of this diagram for class review. Have students help identify these parts of a tree: bark, phloem (FLOW-uhm), cambium (KAM-bee-uhm), xylem (ZEYE-lem), heartwood. Explain how to count the rings to find the age of the tree (count only the light OR only the dark rings). As a class, count the number of growth rings. Try to find indications of past disturbance or events in the life of the tree, such as fire, insect damage, drought, or the loss of a branch.

2. Pass out the tree cookies, if available, or photocopies of page 29 to individuals or small groups.

3. Have students estimate how old the tree was when the tree cookie was cut. Ask the students how they counted and if they think they are accurate.

4. When students have discovered how old the tree is, ask if there is anything else they can guess about the tree’s life.

5. (optional) Hand out hand lenses to the students. Have them look for small holes in the sapwood and heartwood of the tree cookie. These tiny channels are the xylem, through which water travels up and down the trunk and branches of the tree.

American Forest Foundation/Project Learning Tree ©

Texas Forest Service Resources Available

Smokey Bear Posters
Different posters of flowers, trees, butterflies, fish, wildlife, etc. available for free at local TFS offices while supplies last. May also be purchased from NASF website at www.stateforesters.org.

Discovering the Urban Forest
Activity book that acquaints students with the environmental benefits of an urban forest. Created by the USFS and South Carolina Forestry Commission.

Wildfire History for Children Coloring Book
Portrays the history of wildfire, fire suppression, and urban sprawl into the wildlands.

Forestry and Fire Information
There are many free brochures, fact sheets, newsletters, and magazines available at your local Texas Forest Service office.

Contact: Local Texas Forest Service office or visit texasforestservice.tamu.edu for the nearest office location.
Additional Resources Available

**If Trees Could Talk**
This 8-module, middle school curriculum gives teachers the opportunity to download social studies activities that are based upon archival materials.

**Contact:** The Forest History Society
Cheryl Oakes, coakes@duke.edu  Website: www.lib.duke.edu/forest/Education/curriculum/

**International Paper Company**
Free 10 piece poster set available to educators. The Life of the Forest series provides beautiful illustrations that help teach seed germination, tree growth, how the tree is utilized, and much more.

**Contact:** www.iplifeoftheforest.com

**Smokey Bear and Woodsy Owl Poster Contest**
The USDA Forest Service and the National Garden Club, Inc., sponsor an annual contest to promote wildfire prevention and conservation education.

**Grade Level:** 1st through 5th
**Contact:** www.gardenclub.org under Education/Youth or www.symbols.gov

**Teachers Conservation Institute**
Six day workshop which uses the forest to teach all subjects using environmental education. Educators earn 45 hours of SBEC CPE.

**Contact:** Cheryl Stanco, Texas Forestry Assn 936/632-TREE or cstanco@texasforestry.org
**Website:** www.texasforestry.org

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**Tree Cookies**

The shape and width of the annual rings often differ from year to year because of varying annual growth conditions. During a moist growing season, a tree in a temperate region may produce a particularly wide ring. During a drought, a colder-than-average winter, or an unseasonable frost, a tree will produce a particularly narrow ring. In a science called **dendrochronology** (which literally means “the study of tree time”), scientists have found that they can learn about past climates by studying the ring patterns of very old trees.

Many factors besides weather can affect a tree’s growth. Accordingly, tree rings reflect a tree’s response to such stressors as root damage, disease, and competition from other plants. Sometimes a disturbance will occur after the growth season, producing a narrow or misshapen ring in the following year. (See diagram, page 29). To study a tree’s growth rings without harming the trees, foresters use a technique called coring. By drilling into the center of a tree trunk with a hollow instrument called an **increment borer**, they can remove a long, narrow cylinder of wood (called a core sample). The growth rings of the tree appear as lines on the core sample.

**Getting Ready**

From the trunk or limb of a fallen tree, saw cross sections 1 1/2” - 2” (3.8 cm-5cm) thick. (Cross sections, or “tree cookies”, can usually be obtained from a local tree-trimming service, state forester, forest products company, firewood company, or utility company.) If the wood is not dry, you will need to dry it to keep it from splitting. The wood can be dried by placing the tree cookies on small wooden slats and microwaving them for 20 minutes. (CAUTION: Tree cookies will burn and may catch on fire if left in the microwave too long.) After that, let the cookies dry for a couple of days. If you cannot obtain tree cookies, make photocopies of page 29.

*cont’d on page 26*

American Forest Foundation/Project Learning Tree ©
PLT Activity: Tree Cookies

Overview: One of the best ways to learn about a tree is to look at its annual rings. Tree rings show patterns of change in the tree’s life as well as changes in the area where it grows. In this activity, students will trace environmental and historical changes using a cross section of a tree trunk, or “tree cookie”.

Levels: Activity: Grades 3-8 Variation: Grades 1-3 (see page 28)

Subjects: Science, Social Studies, Visual Arts, Language Arts

Skills: Researching, Observing, Identifying, Relationships and Patterns, Interpreting Information

Objectives: Students will identify heartwood, sapwood, and a tree’s annual rings; infer from a tree’s rings what damage or stress might have occurred in its life; and make a timeline of human history that coincides with a tree’s rings.

Materials: tree cookies (cross-sectional slices of tree trunks or limbs) or photocopies of the tree cookie on page 29, string, pins, small paper labels, paper plates, optional hand lenses. (Note: TFS Forest Tree Trunks contain tree cookies. See page 18 for more information)

Time Consideration: Preparation: 15 minutes Activity: 50 minutes

TEKS Correlation: See page 42 Assessment: See page 28

Background
By counting a tree’s growth rings, you can tell its age. Every growth season, a tree adds a new layer of wood to its trunk. Each ring has two parts: a wide, light part (early wood) and a narrow, dark part (late wood). The early wood grows during the wet, spring growing season. During the transition from the drier summer to fall and winter, growth slows and the late wood forms. The rings provide clues about the climate, or weather, of the area over time and evidence of disturbance to and around the tree, such as fires and floods.

Additional Resources Available

Teaching Youth About Trees
Free lesson plans correlated to the National Science standards, on-line activities for youth, and resources available to purchase.

Contact: National Arbor Day Foundation
www.arborday.org or 888/448-7337
Grade Level: K through 8

Texas Forestry Museum
Tour the museum in Lufkin or participate in grade-level programs correlated to the TEKS. They offer three traveling trunks that are available for checkout, as well as an extensive video library.

Contact: Mendy Hattaway
mhattaway@treetexas.com or 936/632-9535
Website: www.treetexas.com

Texas State Envirothon
Envirothon is North America’s largest and most academically challenging high school environmental competition. Visit www.texasenvirothon.org

Contact: Wendy Reistle
Environmental Institute of Houston
281/283-3045 or Reistel@cl.uh.edu

Natural Inquirers (Spanish and English)
Science education resource journal which stimulates critical reading and thinking about scientific inquiry and investigation. Created by the USFS.

Grade level: 5th– 8th
Contact: www.naturalinquirer.usda.gov
**Website Resources**

**TEACHER RESOURCES/STUDENT PROJECTS**
- American Forest and Paper Association: www.afandpa.org
- Environmental Institute of Houston: www.eih.uh.edu
- Forestry Images: www.forestryimages.org
- Forestry Suppliers: www.forestry-suppliers.com
- Forest History Society: www.lib.duke.edu/forest/
- National Arbor Day Foundation: www.arborday.org
- National Tree Trust: www.nationaltreetrust.org
- North American Assn, for Env, Ed: naace.org
- Official Smokey Bear Website: www.smokeybear.com
- Society of American Foresters: www.saforest.net/education
- Texas Forest Service: texasforestservice.tamu.edu
- Texas Forestry Association: www.texasforestry.org
- Texas Forestry Museum: www.treetexas.com
- Texas Project Learning Tree: www.plttexas.org
- Texas State Envirothon: www.texasenvirothon.org
- USDA Forest Service: www.fs.fed.us/kids
- Texas A&M Department of Forest Science: forestry.tamu.edu
- Texas Cooperative Extension: texasextension.tamu.edu
- Texas Interagency Coordination Center: www.ticc.tamu.edu
- Texas Project Learning Tree: www.plttexas.org
- Texas State Envirothon: www.texasenvirothon.org
- USDA Forest Service: www.fs.fed.us/kids
- Texas A&M Department of Forest Science: forestry.tamu.edu
- Texas Cooperative Extension: texasextension.tamu.edu
- Texas Interagency Coordination Center: www.ticc.tamu.edu
- Texas Forest Service: texasforestservice.tamu.edu

**INFORMATION SITES**
- American Forest Foundation: www.affoundation.org
- American Forests: www.amfor.org
- Association of Consulting Foresters: www.acf-foresters.com
- Firewise: www.firewise.org
- Forest Landowners Association Inc.: www.apulpa.org
- Forest Resources Institute: www.fri.sfasu.edu
- National Association of State Foresters: www.stateforesters.org
- SFASU Arthur Temple College of Forestry: www.tamucc.edu/forestry
- Southern Forest Products Association: www.sfpa.org
- Texas A&M Department of Forest Science: forestry.tamu.edu
- Texas Cooperative Extension: texasextension.tamu.edu
- Texas Interagency Coordination Center: www.ticc.tamu.edu
- Texas State Envirothon: www.texasenvirothon.org
- USDA Forest Service: www.fs.fed.us/kids

**Glossary of Forestry Terms**

Below are a few common forestry terms defined:

- **Acre** – a unit of land measurement that contains 43,560 square feet. Sometimes expressed as 10 square chains.
- **Basal Area** – the sum of the cross sectional areas in square feet of the trees on an acre when measured 4.5 feet above the ground.
- **Board Foot** – a piece of wood measuring 1 foot x 1 foot x 1 inch. The term is commonly used to measure the amount of wood in trees, sawlogs, or boards.
- **Chain** – a unit of measure used by foresters and surveyors that equals 66 feet.
- **Crown** – the branches and foliage of a tree
- **DBH** – An abbreviation for tree Diameter at Breast Height (4.5 feet above the ground)
- **Forestry** – the science, art, and practice of managing, and using trees, forests and their associated resources while sustaining these resources for current and future generations.
- **Prescribed Burn** – the controlled use of fire to achieve forest and other natural resource management objectives
- **Reforestation** – the regeneration of new trees on an area where the forest has been or will be removed, either naturally by seed fall or artificially by direct seeding or planting seeds.
- **Sapling** – a small tree usually between 1 and 4 inches in diameter at breast height (DBH)
- **Seedling** – a tree less than 1 inch in diameter
- **Tract** – a piece of land considered separately from adjacent land because of differences in ownership, timber type, management objectives or other characteristics.

**Source:** Glossary of Forestry Terms at texasforestservice.tamu.edu