Trees in Our Community

An Interdisciplinary Curriculum for Grades 4 to 8

Funded by the United States Dept. of Agriculture Forest Service Urban & Community Forestry Program

Developed by teachers from John Ericsson Junior High School Brooklyn, NY and Environmental Action Coalition New York City

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This curriculum is dedicated to the memory of Sharon Ossenbruggen,
United States Department of Agriculture Forest Service, Urban Forester, Durham NH.
Her guidance and support at the onset of the Asian Longhorned beetle infestation in
Brooklyn inspired us all and made this publication possible.
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Portions of the background information in this curriculum were derived from
by Regional Plan Association and Environmental Action Coalition. Some lessons
were adapted from Project Learning Tree.
Introduction

“As an instrument of planetary home repair, it is hard to imagine anything as safe as a tree.”
Jonathan Weiner, The Next 100 Years, 1990

More than 1,500 public and private trees were destroyed in the Greenpoint and Williamsburg sections of Brooklyn, New York as a result of the Asian Longhorned beetle infestation. First identified in 1996, these foreign insects were accidentally imported to this country some years earlier. Lacking natural predators here, they spread unchecked for some time.

Millions of dollars are being spent to provide thousands of replacement trees at curbside, in local parks, and in private yards. Concerned about their future, the community called for a concurrent effort to increase appreciation for trees and to help ensure that the new ones would be protected and well cared for. In response, the United States Department of Agriculture Forest Service Urban and Community Forestry Program provided funding for development of these teaching materials.

Trees in Our Community lessons were developed by a team of classroom teachers and environmental educators. The authors have sought to create lessons that are user-friendly for both teachers and students. A kit containing items needed for certain lessons is located in your school (see School Kit Contents).

The goals of the Trees in Our Community curriculum are:
• to increase student knowledge and awareness of the urban environment
• to increase student understanding of the value of trees in an urban community
• to foster respect for trees and local parks

The curriculum is divided into four parts:
• Trees in Our Community: The Basics
• The Importance of Trees
• Protecting and Caring for Trees in Our Community
• Teacher Resources

Choose the lessons you feel most comfortable with and ones suitable for your students. However, all are designed to minimize prep time for the teacher, so we encourage you to review them all. Where applicable, learning standards are listed, although revised New York City science standards are not available at this time. In addition, there is a Glossary of useful tree terms, a compendium of Books About Trees for further teacher and student reading, and listings of Field Trip, Internet, district Audio-Visual and Other Resources for teachers.

Trees in New York City’s backyards, parks, woodlands, and along its streets and highways are part of an urban forest ecosystem. Human activities are its most influential variable. Healthy trees help make a collection of houses a neighborhood, a shopping district a destination. Life for trees in a densely developed urban area may never be ideal, but it need not be so rough. Through learning and working together, we can make a difference for them.
The Benefits of Trees

**Environmental Quality**
Trees are one of the most effective natural pollution control devices on Earth. Trees absorb carbon dioxide, a greenhouse gas. Reducing carbon dioxide is essential to slow the effects of global warming. Through the process of photosynthesis, trees store the carbon and return oxygen to the air we breathe. Moisture emitted by trees helps cool the air, a form of natural air conditioning.

While we should be concerned about holes in the ozone layer more than a mile above the planet, at ground level, ozone is a pollutant and a principal ingredient of smog. Trees help absorb ground-level ozone. Trees also capture other air pollutants including nitrogen dioxide, sulfur dioxide, and carbon monoxide. Trees catch airborne particulate matter such as dust, ash, pollen, and smoke, all potential illness-inducing agents.

**Quality of Life**
Trees on a housing project site in Chicago appeared to promote neighborliness, providing pleasant outdoor spaces in which people congregated. Some researchers believe humans possess an innate need to have contact with nature. Studies suggest that natural scenery helps reduce stress and elevate mood.

**Habitat Value and Biodiversity**
Trees provide feeding, breeding, and roosting opportunities for wildlife, such as squirrels, and many birds and insects. Owing to its position on the Atlantic Coast flyway, New York City woodlands (large forested areas) are part of a migratory bird network that extends from Canada to the Caribbean. Contrary to some popular thinking, the significant decline in forest birds is not solely a result of tropical deforestation. Loss of habitat in both northern breeding grounds and rest areas along the route of their twice-yearly journeys is equally a factor.
A Brief History of Trees in New York City

Trees have occupied most or some of the land known today as New York City for the past 17,000 years. First to take root following the last glacier were pines and birches. When the climate stabilized perhaps 6,000 years ago, oaks, hickories, and chestnuts emerged and grew tall. This is the woodland type that greeted the first humans known to have shared the land with trees: Native Americans. It is believed these indigenous people lived compatibly with the trees, although some forest was cleared for farming and understory was burned to improve views for game hunters.

An early 17th-century European visitor to this area wrote, “The whole country is covered with wood...all too much of it in our way.” Thus began the large-scale cutting of trees for construction timber and to make way for farms on the more than 150,000 upland acres that are today’s New York City. What virgin forest remained was destroyed during the Revolutionary War. In their place, European property owners began importing non-native plants such as Norway maple and white poplars for decorative purposes. Today these are a significant component of the city’s forest.

The notion of establishing verdant open spaces as urban amenities did not take hold here significantly until the mid-19th century. A leader of this parkland creation effort wrote, “It is natural that (New Yorkers) should long to get into the country, away from the dust and din and stifling heat of their crowded quarter.” The movement saw an open space system of 200 acres, in 1850, grow to over 5,000 acres in the five boroughs in 1900. However, a parks commissioner of that era was among the first to note that the City failed to recognize that trees in artificial settings must be maintained. He wrote, “dead and dying trees are numerous ...soil has been unduly washed from their roots ...in some places they are crowded and need thinning out.”

In 1902, care of a decrepit population of curbside trees planted by private property owners was given to the municipal Parks Department. Notwithstanding, no funds were provided to tend to these trees. In 1914, a panel of experts commissioned by concerned citizens wrote, “No other city of the size and importance of New York in the civilized world has paid less attention to the proper planting of its streets and parks.”

A 1935 handbook published by the Parks Department included, “The growing of street trees here is probably more difficult than in most cities and has been correspondingly less successful.” In 1956, an agency press release warned that without adequate appropriations citizens should expect “a huge backlog of dead, dying and undesirable trees,” adding, “the public can ask only for what it is willing to pay.” In the following decades funding for tree care declined sharply. It was not until 1984 when the New York City Parks Department began to actively manage and protect almost 5,000 acres of woodlands among its land holdings, remnants of forests which once covered all five municipal boroughs.

Today, there are 93 million acres of urban forests in the United States containing 610 million trees. New York City’s 5.2 million trees (both public and private) are far less than one percent of the total. Related investment in the care of trees here is significantly below the national average. Unfortunately, trees surrounded by pavement or growing in lawns trampled by thousands of park visitors each year rarely live long, healthy, and productive lives. They can, but need care and protection from those who planted them: people.
New York City’s Urban Forest Today

New York City’s percentage of tree cover — 16.6 percent — is less than similar cities in the United States. Factors essential to tree health such as sunlight, water, nutrients, and growing space are often limited here. While a traditional view of a forest calls to mind land dominated by trees growing close together, in an urban setting trees are often interspersed with buildings. The urban forest includes trees in backyards, parks, woodlands, and along streets and highways. It can be divided into three broad categories, here based on surrounding land use and growing conditions:

Street trees
include those along local roads, parkways, and 212 miles of highways. Street trees typically have restricted rooting volume and are encircled by pavement. Highway trees may be part of designed roadside plantings or remnants of natural woodlands fragmented by road construction.

Trees in park-like settings
include trees on developed parkland, as well as trees in public or private park-like settings, such as residences, schools, housing projects, hospital campuses, and cemeteries. Such trees exhibit a range of conditions depending on adjacent land use and maintenance regimes.

Woodland trees
grow close together in more natural settings. Most woodland trees are found in New York City parks. While the size of many established woodland trees here indicates superior growing conditions, the health and integrity of these forested tracts is threatened by human disturbances such as arson, illegal dumping, off-road vehicular and bicycle use, and invasion by non-native vegetation which displaces desirable indigenous trees, shrubs, and ground-cover plants.

<table>
<thead>
<tr>
<th>Category (see definitions at left)</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees in Park-like Settings</td>
<td>3,080,000</td>
</tr>
<tr>
<td>Woodland Trees</td>
<td>1,340,000</td>
</tr>
<tr>
<td>Street Trees</td>
<td>484,000</td>
</tr>
<tr>
<td>Highway Trees</td>
<td>310,000</td>
</tr>
<tr>
<td><strong>Total Trees in New York City</strong></td>
<td>5,214,000</td>
</tr>
</tbody>
</table>

Part 1
Trees in Our Community:
The Basics
Lesson One

Tree Parts

Objective
Learn the basic parts of a tree and understand their functions

Subject areas:
Science, Language Arts

Grades: 4 to 6

Duration:
One 40-minute period

Standards: E 4-a

Materials Needed
- reprints of Tree Parts student worksheet
- pencils or pens

Vocabulary

- bark: exterior protective covering of a tree
- bud: a swelling on a branch or twig that develops into a leaf or flower
- flower: the reproductive unit of a seed-bearing plant
- fruit: a ripened seed with tissue around it
- leaf: a tree foliage unit where food production occurs through photosynthesis
- roots: underground growth that extracts water, oxygen, and nutrients from soil and provides structural support
- seed: part of a flowering plant capable of growing into a new plant
- tree: a tall woody plant, usually with a single trunk, and a leafy crown
- trunk: main stem of a tree where nutrients are transported
Procedure

- Distribute to each student a reprint of the *Tree Parts* worksheet.
- Through questions and answers, have students name and (*correctly*) label the parts of a tree. Discuss their functions (*see Vocabulary*).
- Have students find the labeled tree parts in the *Tree Parts Word Search*.
- Review the students’ answers as a group.

Assessment

Take students outside without their *Tree Parts* worksheet to look at a tree. Have them name the parts and describe their functions.

(Note: Most trees bear fruit and display their flowers and leaves only in the growing season, thus this exercise is best undertaken in the spring or fall.)

Teacher’s Key

*Tree Parts Word Search*

Find the following words hidden in other words:

- bark
- bud
- flower
- fruit
- leaf
- run, it’s a skunk
- big ugly dog
- in the future
- eat owl for lunch
- break a leg
- go to the store
- sad bee

- red tea
- fat elbow
- tree
- leaf
- trunk
- bud
- roots
- flower
- fruit
- bark
- seed
Tree Parts

- Bark
- Bud
- Flower
- Fruit
- Leaf
- Tree
- Trunk
- Roots
- Seed

Tree Parts Word Search

*Find the tree part names hidden in other words:*

- red tea
- fat elbow
- run, it’s a skunk
- big ugly dog
- in the future
- eat owl for lunch
- break a leg
- go to the store
- sad bee
Lesson Two

Shape Up

Objectives
- Increase awareness of basic tree shapes
- Use a continuous line technique to make outline drawings of the three major tree shapes

Subject areas:
Science, Art

Grades: 4 to 8

Duration:
Two 40-minute lessons

Standards: A-1

Materials Needed
- reprints of *Tree Forms* illustration sheet showing various forms of trees (or *Tree Identification books in School Kit*)
- paper
- pencils

Vocabulary
- **continuous line**: an unbroken line from beginning to end
- **shape**: the external form, outline, or contour of an object
Background

In nature, there are more than 50,000 tree species. As with people, trees come in many shapes and sizes. Just by glancing at the silhouette of a tree, some people can tell what kind it is.

The continuous line drawing produces a free-flowing line, like that most often found in nature. The pencil never lifts off the surface until the entire outline is drawn. This technique helps keep the students’ eyes on their subject and builds hand-eye coordination.

Procedure

- Have students draw a picture of a tree from memory. Tell them to save it for later comparison.
- Distribute a reprint of the Tree Forms illustration sheet, or the Tree Identification books in School Kit, showing different tree forms.
- Have students compare and discuss the different forms. Which are tall and straight? (Columnar) Which are shaped like a feather duster? (Vase) Which are shaped like an upside-down ice cream cone? (Pyramidal) Do any of these trees look like the tree they drew earlier from memory?
- Using the three basic shapes (tall and straight, feather duster, upside-down ice cream cone), have students select one tree that resembles each of the three basic shapes.
- Starting at one side of the tree, they will draw the entire outline until they reach the other side. Stress that their pencils will stay on the paper, never lifting off the surface until the entire outline of the tree is drawn.
- After completing the three drawings, students should label their drawings with the names of the trees and their basic shapes.

Assessment

- Have students place their new drawings and their original drawing side by side. Compare and contrast the drawings. Do the drawings represent the three basic forms?
- Have each student write a paragraph on how their thoughts on tree looks changed after exploring the three basic forms.
Tree Forms

columnar
vase
pyramidal

Dawn redwood
Flowering cherry
Callery pear
Shagbark hickory

Tupelo
Zelkova
Tulip tree
Littleleaf linden
Objectives

- Learn to identify trees by studying the shapes and characteristics of their leaves
- Catalogue leaves by quantity and solve grade-appropriate math problems

Background

While trees can be identified through a number of their characteristics, recognizing different leaves is among the easiest methods. This lesson employs ten of the most common leaves found on trees in the Greenpoint and Williamsburg communities to hone student classification and mathematics skills.

Vocabulary

- **leaf**: a tree foliage unit where food production occurs through photosynthesis
- **leaflet**: smaller foliage units (leaflets) together comprising a single leaf
- **compound leaf**: a single leaf comprised of smaller leaflets
- **simple leaf**: a leaf comprised of one piece
Procedure

- Distribute to each student the Leaf Chart and Leaf Key. Ask them to describe the different appearances of various leaves. How can they tell them apart? Most are a simple leaf, but one leaf (the Honeylocust) is a compound leaf (see Vocabulary). Some have peaked sections and are asymmetrical. Others are more rounded in shape and relatively symmetrical. Some have toothed edges, others are smooth.

- Once they have grasped the apparent differences, tell them to count each type of leaf in the grid on the Leaf Chart. Have them record their answers in the totals box on the Leaf Key. Once they are finished with their totals, the class should agree on the total sum for each leaf (see Teacher’s Key). If they have made errors in the totals box, have them correct these before going on to the math problems.

- Based on their leaf totals, direct them to compute the math problems on their scratch papers and enter their answers after each equation. Remind them that first they must figure out what total each leaf represents, then substitute the correct number when computing their answers.

Assessment

Once they are finished, review their answers as a class, one by one. First, ask students which leaves are being used in the equation, followed by the numeric answer to the mathematics problem.

Teacher’s Key

Leaf Totals

<table>
<thead>
<tr>
<th>Leaf</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Callery pear</td>
<td>2</td>
</tr>
<tr>
<td>Ginkgo</td>
<td>7</td>
</tr>
<tr>
<td>Green ash</td>
<td>5</td>
</tr>
<tr>
<td>Honeylocust</td>
<td>9</td>
</tr>
<tr>
<td>Littleleaf linden</td>
<td>4</td>
</tr>
<tr>
<td>London Plane</td>
<td>6</td>
</tr>
<tr>
<td>Norway maple</td>
<td>3</td>
</tr>
<tr>
<td>Pin oak</td>
<td>4</td>
</tr>
<tr>
<td>Red oak</td>
<td>2</td>
</tr>
<tr>
<td>Sweet gum</td>
<td>8</td>
</tr>
</tbody>
</table>

Take your answers and solve the following problems:

Red oak + Green ash + Littleleaf linden + Norway maple = 14
Ginkgo − Callery pear = 5
Honeylocust × Ginkgo = 63
Ginkgo × Green ash = 35
Sweet gum + Littleleaf linden ÷ Pin oak = 3
Sweet gum + Honeylocust + Ginkgo + London Plane ÷ Callery pear = 15
Green ash + Honeylocust + Pin oak ÷ Callery pear = 9
Pin oak × Littleleaf linden − Ginkgo ÷ Norway maple = 3
Leaf Chart
Count the leaf pictures. How many of each kind of leaf can you find? Place your answers in table.
Leaf Key

Callery pear  Ginkgo  Green ash  Honeylocust  Littleleaf linden
London Plane  Norway maple  Pin oak  Red oak  Sweet gum

Leaf Totals

Callery pear
Ginkgo
Green ash
Honeylocust
Littleleaf linden

London Plane
Norway maple
Pin oak
Red oak
Sweet gum

Take your answers and solve the following problems:
Lesson Four

Trees on Down the Road

Objectives
- Identify trees using visible characteristics
- Identify tree locations and record tree species on a map
- Create an illustration sheet of a specific tree and its characteristics

Subject areas:
Science, Art

Grades: 4 to 8

Duration:
Part One - Two 40-minute lessons,
Part Two - One 40-minute lesson

Standards: A 1, A 4

Materials Needed
- drawing paper
- pencils
- crayons for bark rubbing
- plastic bags for collecting leaves, twigs, pods, etc.
- a simple map, prepared by you in advance, of the streets surrounding the school with tree locations marked
- reprints of Trees in Our Community illustration sheets and/or illustrations of specific trees located on or near the school grounds

Background
The goal of an illustrator is to produce an image that is clear, informative, and understandable to others. Usually illustrations are drawings done in precise, firm outlines. An informative tree illustration for students could provide information employing both images and objects. An example would contain an outline drawing of a tree and tactile information, such as a sample of its leaf, bark, twigs, cones, or seed pods. An effective technique to get children to explore the bark of a tree is by doing bark and/or leaf rubbings, bringing them in direct contact with the subject.

Vocabulary
- bark: the tough exterior of a tree
- characteristics: the distinct qualities or features of an object
- illustration: a picture, drawing, or diagram which supplies information
- leaves: the outgrowths of a stem
- seed: part of a flowering plant capable of growing into a new plant
- twig: a slender shoot of a tree
Procedure

Part One

• Tell students they are going to create an illustration sheet of one of the trees surrounding the school. Discuss what an illustration is and the information usually included.

• Distribute illustrations of some trees found by the school. Ask students if they would be able to locate these trees using the illustrations. What added information would be helpful in the identification process? Make a list of possible additions, such as leaves, twigs, bark rubbings, leaf prints, etc.

• Hand out copies of your map of the streets surrounding the school. Explain to the students that the circles represent the locations of trees. Tell them some of the illustrated trees are marked on the map.

• Take students on a walk around the school. Stop at each tree to discuss whether the tree matches one of the illustrations. If so, have students enter the name of the tree at its location on the map. Discuss how the illustration sheets helped them to recognize the tree and review possible additions that can further aid in the identification process.

Part Two

• Tell students to create an illustration sheet for their chosen tree. Remind them that the goal is to create a useful and visually interesting illustration sheet. Its purpose is to help someone else learn and remember that tree’s name and characteristics.

• Review possible elements they can use in their illustrations:
  1. an outline drawing of overall shape of tree
  2. a drawing of leaf shape
  3. examples of fallen bark bits and/or bark rubbings
  4. actual leaves and twigs
  5. short prose description of the specific tree

Assessment

After completing their sheets, students will give an oral presentation of their illustration sheets. Discuss and compare the varied techniques used by each student.
Trees in Our Community

Red oak

Pin oak

London Plane

Gingko
Trees in Our Community

Norway maple

Honeylocust

Callery pear

Littleleaf linden
Lesson Five

Sky High

Objectives
- Learn how trees make food for growth and give off oxygen
- Observe trees in the community
- Explore standard units of measure and measuring techniques
- Make an accurate bar graph displaying various heights of trees

Background
Trees are found in an assortment of sizes. Some grow as high as a 25-story skyscraper or higher.

Standard units of measure and measuring techniques are needed to compare and contrast data.

Bar graphing is a useful visual tool to make these comparisons.

Vocabulary
- **bar graph**: a chart that uses side-by-side bars to represent and contrast data
- **chlorophyll**: pigments that produce the green color of leaves
- **deciduous**: a plant that loses its leaves at the end of the growing season
- **evergreen**: a plant that retains most of its leaves year-round
- **photosynthesis**: the process by which green plants make sugar, aided by sunlight, carbon dioxide, minerals, and water

Subject areas:
Mathematics, Science

Grades: 4 to 6

Duration:
Three 40-minute periods

Standards: M 2-g, M 4-a, M 4-b

Materials Needed
- reprints of the *Sky High Shadow Sheet*
- pencils or pens
- ruler
- long tape measure
  (see School Kit)
Procedure

- Begin by taking the students through a discussion of how trees produce food for growth and give off oxygen, aided by the Teacher Background page, entitled Photosynthesis.

- Subsequently, take students to a tree-lined street and/or a park on a sunny day.

- Have the students measure as many as 10 tree shadows with a long tape measure. One student will stand at the base of the tree holding one end of the tape measure; the other will hold the tape measure at the end of the tree shadow.

- Use the reprints of the Sky High Shadow Sheet to record the data in inches.

- Students will now measure each other’s shadow using the tape measure. Each student should then record the length of their personal shadow in inches. Have them also enter their actual height in inches.

- Have students return to class to compute their findings.

- Students will now divide their personal shadow length into the tree’s shadow length, then multiply the quotient by their actual height in inches. The product will give students the height of the tree. (If you wish, the results can then be translated into feet and inches.)

- Students will now translate their data onto a bar graph.

Assessment

Have students display their bar graphs, then compare these for accuracy and visual clarity.
Teacher Background

Photosynthesis

Leaves are nature’s food factories. Plants take up water and minerals from the ground through their roots. They also absorb the gas, carbon dioxide, from the air through their leaves. Plants then use sunlight to turn the water, minerals, and carbon dioxide into a sugar called glucose. Plants use glucose as food for growth.

The way plants change water, minerals, and carbon dioxide into sugar is called photosynthesis. Photo means light, as in photograph: A diagram (graph) made with light (photo). Synthesis means to combine or mix. Through photosynthesis a plant takes light (photo), mixes it with water, minerals, and carbon dioxide, then makes food (synthesis) for itself. (It is worth remembering that a tree’s other source of sustenance is its root system.)

A chemical in the leaves, chlorophyll, helps make photosynthesis possible. Chlorophyll is what gives plants their green color. If you fall down on the grass and you are wearing light-colored pants, you have probably noticed a green stain on your pants. That stain is made up mostly of chlorophyll.

Photosynthesis is almost exclusive to the plant kingdom. Without photosynthesis, the planet would have no oxygen. The release of oxygen from green plants is a by-product of photosynthesis. The carbon dioxide (carbon and oxygen) has more oxygen than a green plant needs to make food. What is not used by the plant is returned to the air. This is how animals and humans get the oxygen needed to survive.

Autumn Colors

Leaves make more food during the growing season than the plant requires. The excess is stored until needed later. During winter in some parts of the world, there is not enough light or water for photosynthesis. Many trees will rest and live off the stored food. They begin to shut down the food-making operation.

As the days get shorter leading to autumn, green chlorophyll disappears from the leaves. We begin to see yellow and orange colors. Small amounts of some fall colors have been in the leaves all along, but we can’t see them in the summer. This is the principal process that brings the bright hues we enjoy in the fall.

Eventually the leaves die and fall to the ground. Trees that drop their leaves at the end of a growing season are called deciduous. Other trees, evergreens, like pine and fir, keep most of their leaves during the winter. They have special leaves resistant to cold and moisture loss. Evergreens may continue to make food during the winter as long as they get enough water. There is almost always some sunlight to work with.
### Sky High Shadow Sheet

<table>
<thead>
<tr>
<th>Tree #</th>
<th>Name (if known)</th>
<th>Shadow Length in Inches</th>
<th>Actual Tree Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**My shadow length in inches**

_____ inches

**My actual height in inches**

_____ inches

(Use this space to create your bar graph.)
Lesson Six

Rings of Time

Objectives
- Learn how to determine a tree's age by examining tree rings (a tree cookie)
- Develop a time line of the tree's history and write a paragraph imagining the tree's life

Subject areas:
Mathematics, Science, Language Arts

Grades: 4 to 6
Duration:
Two 40-minute periods
Standards: M 4-a, M 4-b, E 2-c, E 2-d

Materials Needed
- tree cookies (see School Kit)
- paper
- pencils or pens

Vocabulary
- heartwood: old, hard, and dead wood tissue forming a tree's center
- sapwood: outer portion of a tree's wood where water and nutrients are transported
- time line: a table listing events for successive years within a period
Background

When a tree grows, its twigs, branches, and trunk grow thicker and longer. Most years a new layer of cells is added. These layers form rings in cross section. By counting the rings, you can tell the age of the tree. The rings are thick in years of plentiful rainfall and thin in drier years. Drought, frost, fire, or disease may cause partial rings. A very dry year may result in a completely missing ring. An annual ring has a clear outer edge; a partial or false ring has a blurry border.

Water and minerals travel up from the roots to the leaves in the tree’s new outer layers called sapwood (or xylem). As the tree grows, the older sapwood hardens and becomes disconnected from the leaves. Then it just stores water. Finally it becomes solid heartwood.

Note: If you have not done Lesson 5 (Sky High) with your students, you should nonetheless review the process of photosynthesis with them (see page 18).

Procedure

- Give each student a tree cookie. Have them examine the rings. Explain how the rings are formed and that the number of rings indicates the age of the tree.
- Have the students pretend that the tree from which the cookie came was planted the same year they were born, then draw a time line on a piece of paper from the year they were born to present, e.g.:
  - 1989 ________________
  - 1990 __________________
  - 1991 __________________
  - 1992 ___________________, etc.
- For each year, write something that happened to the tree, such as a drought, as the students imagine themselves as the tree.
- Use these notes to write a paragraph called The Rings of Time, chronicling the life of the tree.

Assessment

Have some or all student authors read their paragraphs aloud, discussing with the class what made these interesting.
Part 2
The Importance of Trees
Objective
Learn how trees help fight air pollution

Vocabulary

- **greenhouse effect**: the trapping of excess gases in the atmosphere that increases the average temperature of the Earth

- **photosynthesis**: the process in which green plants make sugar (and give off oxygen as a by-product), aided by sunlight, carbon dioxide, minerals, and water

- **respiration**: the processing of nutrients and oxygen in a plant resulting in water, energy, and carbon dioxide

- **smog**: a combination of smoke, fog, and automobile and industrial exhaust

- **transpiration**: the release of water vapor from plants into the air

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**Lesson Seven**

Air Pollution and a Solution

**Subject areas:**
Science, Language Arts

**Grades:** 4 to 8

**Duration:**
Two 40-minute periods (and a homework assignment if desired)

**Standards:** E 2-a, E 5-a

**Materials Needed**
- reprints of *Air Pollution and a Solution*
- pencils or pens
1. To help cut down on air pollution, name at least five other ways to get somewhere besides in a car. Some of these also pollute, but less. Others don’t at all. Which do and which don’t?
Correct answers include, but are not limited to: Bus, subway, train, plane, jet, boat (possible polluters, albeit less usually) and bicycle, walking (non-polluters)

2. Smog is a combination of smoke, fog, and gases from cars and factories. Someone made up the word smog in 1905. Can you figure out why they decided to call it smog?
SMOG is a combination of the words SMoke and fOG

3. Air conditioners pollute the air. Name some other ways to stay cool when it is hot besides running the air conditioner.
Correct answers include, but are not limited to: Stay out of the sun, sit in the shade, keep the curtains (shades, etc.) closed, have a cool drink, go swimming, take it easy (don’t exert yourself), wear light, loose clothing, go to a park or a beach, use a fan (electric or hand-held), eat light, rub a piece of ice on your face and wrist, take a cool shower

4. Trees catch particles like dust, ash, and pollen (all things that can make you sick). Where do dust, ash, and pollen come from?
Correct answers include, but are not limited to:
- dust: parks, ball fields, farms, construction sites
- ash: fires of any type including incinerators, building or forest fires, smoking, factories burning things, volcanoes
- pollen: a wide range of plants

Procedure
- Distribute to each student a reprint of *Air Pollution and a Solution*. Ask one or more of them to read it aloud (perhaps paragraph by paragraph), stopping for class discussion as needed.
- Each student is then directed to answer the *Air Pollution and a Solution* questions in writing.

Assessment
When completed, review the students’ answers as a group, stopping for class discussion as needed.

Teacher’s Key

*Air Pollution and a Solution*

**Student Questions**

1. To help cut down on air pollution, name at least five other ways to get somewhere besides in a car. Some of these also pollute, but less. Others don’t at all. Which do and which don’t?
Correct answers include, but are not limited to: Bus, subway, train, plane, jet, boat (possible polluters, albeit less usually) and bicycle, walking (non-polluters)

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- dust: parks, ball fields, farms, construction sites
- ash: fires of any type including incinerators, building or forest fires, smoking, factories burning things, volcanoes
- pollen: a wide range of plants
The Heat is On

Air pollution comes from many places including:

- the burning of gasoline in cars which produces harmful gases.
- factories that release very small particles (particulate matter) into the air. These can be bad for your lungs.
- gases from chemical plants which can poison people if they breathe too much of them.

Today, air pollution could mean big trouble for our planet. The Earth has an important natural covering of gases (carbon dioxide, methane, nitrous oxide, and ozone). It is like an invisible blanket. This blanket keeps the temperatures on Earth comfortable and safe for life. For thousands of years, the overall temperature of the Earth did not change much. But in the past 200 years, factories, farms, and cars have produced many of the same gases that warm the Earth. These extra gases may be causing the Earth’s overall temperature to go up. Some scientists think this could melt the ice in the Arctic Circle and Antarctica. This could lead to floods along the coast, very heavy rains in some places, and little rain in others.

This rise in temperature is called the **greenhouse effect**. A greenhouse is a building made of glass where plants are grown. The windows let in sunlight which warms the air inside. As the plants in the greenhouse grow, they make more heat. If the greenhouse windows are never opened, the heat stays trapped inside; it keeps getting hotter and the plants can die. The natural gases covering the Earth act like a giant greenhouse to keep us warm. But too much of these invisible gases may cause the planet to get hotter than it should. This is why it is called the **greenhouse effect**.

Another type of air pollution, easier for us to see, is called **smog**. Smog is a combination of smoke, fog, and gases from cars and factories. Smog can irritate your eyes and make breathing harder, especially for people with illnesses like asthma.
How Trees Help Fight Air Pollution

Trees are one of the best pollution control devices on Earth. Trees absorb carbon dioxide, a greenhouse gas. Reducing carbon dioxide is important if we want to slow down global warming. Through its food-making process (photosynthesis), trees store some carbon and return extra oxygen to the air we breathe. Every living thing needs oxygen. Green plants, like trees, are the only place where oxygen comes from. Trees also soak up other pollutants and catch particles like dust, ash, and pollen.

Air conditioners can also pollute the air. Air conditioners run on a lot of electricity. Using less electricity made from burning oil or coal (which causes air pollution) means less pollutants are sent into the air. As a tree makes food and feeds on it, water vapor is released back into the air. Have you ever noticed in summer that after it rains, the air feels cooler? Well, moisture from trees also helps cool the air, a natural type of air conditioning. The release of this water comes from two activities in trees called transpiration and respiration.

Student Questions

1. To help cut down on air pollution, name at least five other ways to get somewhere besides in a car. Some of these also pollute, but less, and others don’t at all. Which do and which don’t?

2. Smog is a combination of smoke, fog, and gases from cars and factories. Someone made up the word smog in 1905. Can you figure out why they decided to call it smog?

3. Air conditioners pollute the air. Name some other ways to stay cool, when it is hot, besides running the air conditioner.

4. Trees catch particles like dust, ash, and pollen (all things that can make you sick). Where do dust, ash, and pollen come from?
Lesson Eight

It Comes from a Tree

Objective
Learn that many products we enjoy and/or rely on are made or come from trees

Subject areas:
Language Arts, Science

Grades: 4 to 6

Duration:
One 40-minute period

Standards: E 1-c, E 2-a

Materials Needed
• reprints of It Comes From a Tree student worksheet
• pencils or pens

Procedure
• Discuss with students the many ways trees can be used to create useful products, such as: - employing the wood directly to build a house; - transforming it through a manufacturing process, such as to make paper; - as a direct source of food, such as oranges.
• Distribute to each student a reprint of the It Comes From a Tree student worksheet. Ask them to complete the first three sections.
• Review the students’ answers as a group, listing the many correct responses for the Classroom and Home lists on the chalkboard.
• Individually, or in groups, have the students complete the alphabet section.

Assessment
Have students (or groups) read their answers in alphabetical order. List the many correct responses on the chalkboard. If there are additional answers on the Teacher’s Key (or others you can think of) that the students have not thought of, elicit responses through a series of questions or clues.
**It Comes From a Tree**

Which things are made or come from trees? (Circle all items you think are correct.)

**Bold type = correct**

- Cherries
- Leather jacket
- **Baseball bat**
- Chair
- Peach
- **Newspaper**
- Wedding ring
- Trumpet
- Telephone
- **Apple juice**
- Compact disk
- Car tire
- **Candle**
- French fries
- Light bulb
- **Book**
- Hot dog
- Penny
- **Maple syrup**
- Strawberry
- **Computer**
- Toothpick
- Violin

Name five things in your school classroom that are made or come from trees?
such as paper, pencils, books, furnishings

Name five things in your home that are made or come from trees?
such as furniture, some fruits, some paint, some shampoo

Name one thing for each letter of the alphabet that is made or comes from trees?

Some correct answers are listed below, but these are not necessarily the only correct answers.

- A: apple, almond, acorn
- B: book, bat, bulletin board, bridge, boat
- C: chair, carpet, comic book, cork
- D: door, desk, drugs such as aspirin, dye
- E: easel, eraser
- F: floors
- G: gum, guitar
- H: house, haunted house, handle, hat
- I: ink
- J: jump rope, jelly
- K: kitchen (floor, table, or cabinet)
- L: lumber, lemon, lime, log, leaf
- M: magazine
- N: newspaper, nut
- O: orange
- P: perfume, paper, peach, picture frame
- Q: Q-tip
- R: rubber band, rope
- S: sign, shampoo, suntan lotion, shoe
- T: table, toilet paper
- U: uniform, utensil, ukulele
- V: vanilla, varnish
- W: wrapping paper
- X: xylophone
- Y: yacht, yardstick, yellow pages
- Z: zither (*a musical instrument*)
It Comes from a Tree

Which things are made or come from trees?
(Circle all the items you think are correct.)

Cherries  Telephone  Hot dog
Leather jacket  Apple juice  Penny
Baseball bat  Compact disk  Maple syrup
Chair  Car tire  Strawberry
Peach  Candle  Computer
Newspaper  French fries  Cardboard box
Wedding ring  Light bulb  Toothpick
Trumpet  Book  Violin

Name five things in your school classroom that are made or come from trees.

1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________
5. ____________________________

Name five things in your home that are made or come from trees.
(They have to be different than your list of school products.)

1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________
5. ____________________________

Name one thing for each letter of the alphabet that is made or comes from trees.

a  ____________  n  ____________
b  ____________  o  ____________
c  ____________  p  ____________
d  ____________  q  ____________
e  ____________  r  ____________
f  ____________  s  ____________
g  ____________  t  ____________
h  ____________  u  ____________
i  ____________  v  ____________
j  ____________  w  ____________
k  ____________  x  ____________
l  ____________  y  ____________
m  ____________  z  ____________
Lesson Nine

What’s Cooking?

Subject area: Art
Grades: 4 to 8
Duration: Two 40-minute lessons
Standard: A 2

Materials Needed
- wax paper
- blender
- water
- white glue (not paste)
- sheets of newspaper torn to shreds
- toilet tissue
- rolling pin, cans, or plastic cups
- sponges

Objectives
- Learn about the value of recycling paper
- Make recycled paper from newspaper

Vocabulary
- paper: a substance used for writing, printing, packaging, and wall covering made chiefly from wood fiber reduced to pulp
- pulp: fibrous material prepared from wood by chemical or mechanical processes for use in making paper
While recycled papermaking can be rather messy, it is well worth the effort. The product is practical and beautiful. Making recycled paper not only helps save the environment, its natural texture offers an ideal surface for nature poems or drawings.

Note: It is safest and wisest for the teacher to operate the blender to produce the recycled paper pulp. Nonetheless, there are ways for students to participate. Have some cover the desks with wax paper, while others shred newspapers. Some students can measure out the glue, while others distribute the rolling pin and sponges. Ten blender loads make approximately (30) 5"x 7" sheets of paper. Enough pulp should be made so that each student can make his/her own 5"x 7" sheet of paper.

Procedure

• Distribute copies and have one or more students read aloud Making Paper: Long Ago and Today, pausing for discussion as needed.
• Distribute copies and have one or more students read aloud Why Recycle Paper?, highlighting the benefits of reusing old paper.
• Recycled papermaking is a wet process, so cover each work space with wax paper.
• Fill the blender halfway with water. Add two tablespoons of white glue and a heaping handful of shredded newspaper. Blend paper into the water. Gradually add toilet tissue until you have a thick, wet pulp mixture.
• Pour the pulp mixture onto the wax paper. Flatten with your hands. Roll a rolling pin, can, or cup over the mixture to form a thin piece of paper. Blot the excess water with a sponge. Let paper dry overnight.
• When dry, use the recycled paper for students to write a poem or draw a picture about different ways to save the environment or various trees.

Assessment

Have students display their drawings and/or poems. Compare the homemade paper to manufactured paper and to the old paper that you recycled.
Making Paper: Long Ago and Today

Thousands of years ago, Egyptians created the first paper from the stems of a plant called papyrus, a tall grass. The word, paper, comes from papyrus. The stems were cut into thin strips, pressed together with a paste, then dried to make a flat, thin writing surface.

Many years later, the Chinese invented another way to make paper. Mashed plant parts, such as tiny bamboo pieces, were put in water and mixed to form a dough, called pulp. The water was drained and the pulp was pressed flat. This became a thin sheet of paper. Paper was used for writing letters and keeping records. Things did not change much for a very long time. The fibers needed to make paper were made by banging logs against a stone, which turned it into pulp. The pulp was mixed with water, pressed into paper, then dried.

Arabs learned papermaking from the Chinese and brought it to Europe in the 12th century. In 1450, the invention of the book printing press, in Germany, greatly increased the demand for paper.

Papermaking finally began to change when two machines were invented. The first was built in France in 1799. It made long sheets of paper. Wood was ground up into fibers by other machines. The fibers were mixed with water, then poured onto a screen that catches the fibers, but lets the water go through. The screen, with the fibers, goes into a press that squeezes more water from it. Then the screen goes over and under hot drying rollers. It is then pressed flat by heavy iron rollers.

In 1809, an Englishman invented the cylinder machine. Wood pulp is put in a big tub where it is picked up by spinning cylinders covered with cloth. The cloth is then put on a screen. Next it is laid on a conveyor belt that takes it to be pressed flat, then dried.

These two methods are basically how paper is still made today. Many modern papers also contain minerals, such as clay. This makes the paper smoother and harder to see through.

Today a lot of paper is made from recycled paper. This helps save forests and creates less pollution than making paper from raw (new) material. Used paper is made into pulp again in hot water. After many screenings and washing to remove ink, the pulp can be pressed into new, clean paper.
Why Recycle Paper?

- Each person in America uses an average of 2 trees worth of paper per year.
- Any paper we do not recycle gets buried or burned. This causes air and water pollution.
- Recycling a pile of newspapers 4 feet high saves one average-size tree.
- When trees are cut down to make paper, new ones are planted. The new trees will take 50 to 150 years to grow as tall as the ones that were cut down.
- If each person in America recycled half of the paper we use each year, we could save 20 million acres of forest each year.
- It is necessary to use water to make paper, whether it is new or recycled. This creates water pollution. Making recycled paper creates less water pollution than making new (virgin) paper.
- Greenhouse gases lead to global warming. Recycling paper cuts down on related greenhouse gases going into the air by 70 percent because making paper from recycled materials creates less pollution than making new paper.
- Particulate matter in the air (like dust) is not good for people with asthma. Recycling paper cuts down on particulate matter being released into the air by 40 percent because making paper from recycled materials creates less particulate matter than making new paper.
- For every student in New York City schools, 140 pounds of trash come out of the school each year. Half of that could be recycled, including all the paper.
**Lesson Ten**

**There Ought to Be a Lorax**

Subject area: Language Arts  
Grades: 4 to 6  
Duration: Three 40-minute lessons  
Standards: E 1-a, E 2-b, E 3-b, E 5-a

Materials Needed  
- copy of *The Lorax* by Dr. Suess (see School Kit)  
- paper  
- pencils  
- chart paper

Objectives  
- Increase awareness of the importance of trees in their environment  
- Write a persuasive paragraph on saving trees or the need to cut trees  
- Write a short paper on how both sides, the tree savers and tree users, can compromise

Vocabulary  
- **environment**: the external conditions that affect the development of an organism  
- **environmentalist**: a person working to solve environmental problems
Procedure

- Read *The Lorax* aloud to your students.
- Guided discussion of the book follows:
  (Important words and ideas should be written on chart paper or the chalkboard.)
  - what is the Lorax?
  - fact or fiction; relationship to the real world.
  - what do we call people who act like the Lorax?
  - why were the Truffula trees cut down?
  - what happened when all the Truffula trees were gone?
  - why are trees cut down in real life?
  - what are the effects of cutting down trees in our neighborhoods?
  - name 3 benefits of neighborhood trees.
- Students should be divided into groups after the discussion. Each group will be assigned a point of view. Some groups will represent the Lorax (environmentalists), other groups will represent businesses that need to cut down trees to make their products (Once-Lers).
- The student groups should work separately to make the best case for their side.
- Each group should produce a two or three paragraph argument for their point of view. Students can be assigned roles within the groups, such as writer and speaker.
- Each group should then make its presentation to the entire class.
- A class vote will be taken to decide which group was most persuasive and why.
- Assign each student to write a paper (length depending on grade) on how the Lorax and Once-Lers might come to an agreement (compromise), perhaps as a homework assignment.

Assessment

Have some or all student authors read their papers aloud. Discuss the compromises that students have presented and how they can be applied to real situations.
Lesson Eleven

Poet Tree for Tree Poets

Subject area: Language Arts
Grades: 4 to 8
Duration: Two 40-minute lessons
Standards: E 1-a, E 1-c, E 3-c, E 5-a

Materials Needed
- paper
- pencils
- Old Elm Speaks: Tree Poems (see School Kit)
- a poetry chart

Objectives
- Learn about two types of poetic form
- Demonstrate knowledge about the life and/or benefits of urban trees
- Write a poem about trees, using one of the forms taught

Background

Writing and sharing poems gives students an opportunity to express their feelings about urban trees in a creative way.

Vocabulary

- **poetry**: writing that formulates an imaginative awareness, in language chosen and arranged to create a specific emotional response, through meaning, sound, and rhythm
- **acrostic poetry**: a composition, in verse, in which sets of letters (such as the initial or final letters of the lines), taken in order, form a word or phrase or a regular sequence of letters of the alphabet
- **picture poetry**: a poem uniquely laid out to mimic the shape of an object
- **prose**: a literary medium distinguished from poetry by its irregularity, and its closer correspondence to the patterns of everyday speech
Procedure

- Discuss the differences between poetry and prose (see Vocabulary).
- Read aloud a poem about trees from Old Elm Speaks (see School Kit).
- Discuss the poem and its meaning.
- Using chart paper labeled Acrostic Poetry/Picture Poetry, explain that two poetic forms will be examined. Have an example of each type of poem under its label.
- Have students produce a poem about urban trees using either form. If the student chooses picture poetry, suggest that the poem be written first, then laid out to form an image.

Assessment

- Have some or all student authors read their poems aloud to the entire class. Discuss why these are poems others would enjoy.
- Create a Poet-Tree book or bulletin board display using student work.

Acrostic Poetry/ Picture Poetry

**Acrostic Poetry:**
- T owering
- R eaching
- E xtending
- E mbracing the sky

**Picture Poetry:** Draw a picture of a tree or leaf. Write a poem inside the figure, fitting the shape.

What am I?
A ladder to the sky.
On a hot day,
I’m happy to say,
if you sit in my shade,
a smart choice you’ve made.

In me birds nest
to breed and to rest.
In spring my leaves are green.
In winter they’re not seen.

If you look up or down, my bark is often brown.
I also should say, sometimes it’s gray.

You know me.

Can’t
you
see?
What can
I be?
You’re
right,
a tree.

by Paul Berizzi

excerpted from Project Learning Tree
Lesson Twelve
On the Street Where You Live

Subject areas: Language Arts, Science
Grades: 4 to 8
Duration: Three or four 40-minute lessons (with a possible homework assignment)
Standards: E 1-c, E 2-a, E 4-b, E 5-b

Materials Needed
• index cards
• paper
• pencils
• copies of Trees Do It
• chart paper
• reprints of Student Tips for Writing and Delivering Testimony

Objectives
• Increase awareness of the number of trees and cars in the neighborhood
• Increase awareness of the benefits of trees in an urban area
• Write and deliver a clear, informative speech (testimony) that will persuade an audience

Vocabulary
• testimony: a public statement given in a formal proceeding
Procedure

- Have students read *Trees Do It*. Discuss the information.
- Tell students that they are going to be observers on the street where they live. Give each student an index card. Have them label it with the name of their street and on one side, air cleaners (*trees*), and the other side, air polluters (*cars*). Tell each student to observe two different things on their home block: how many trees and how many parked cars are on the street? One side of the index card will get a mark for each tree, the other a mark for each car.
  
  *Alternate method: Use the streets surrounding your school. Take an observation walk around the block.*

- Compile the results on chart paper under two headings: Air Cleaners and Air Polluters.

- Discuss the findings. Can trees do all of those good things when they are so outnumbered by cars? Do we need more trees?
- Tell them the City Council is considering providing more money to plant trees. Each student has to write a speech (*testimony*) to be presented to the City Council encouraging them to increase the tree planting budget. *(This could be a homework assignment.)*

- Distribute the reprints (*one per student*) of *Student Tips for Writing and Delivering Testimony*. Review and discuss this information as a class.
- Have students write a speech (*length depending on grade*) as though they were going to make a presentation (*offer testimony*) to the City Council. It should describe the benefits of trees on their block and reasons to plant more.

Assessment

Have some or all student authors read their speeches aloud. Discuss these for clarity and persuasiveness.
Trees give off oxygen.
Without oxygen, people and animals could not survive on the planet Earth.

Trees absorb air pollution.
New York City’s trees soak up tons of air pollutants from cars and factories every year. Trees also catch dust, ash, and pollen which are bad for people with asthma and other illnesses.

Trees save energy.
As a tree makes food and feeds on it, water vapor is released into the air. A large tree evaporates 100 gallons of water during a typical summer day. This is the same amount of cooling as five air conditioners running for 20 hours. Trees also can help block cold winter winds.

Trees reduce street noise.
Noise pollution is a problem in New York City. A dense row of trees can act as a sound barrier.

Trees reduce storm water runoff.
Trees help protect water quality. Trees reduce the force of rainstorms by slowing the falling drops which bounce off the leaves. The tree’s roots also help hold the soil in place. As a result, less pollutants and garbage wash into the surrounding waters and beaches.
Student Tips for Writing and Delivering Your Testimony

Among the many ways people communicate is through speech: public speaking. Public speaking is not conversation between friends and family. Public speaking is a message meant to accomplish a purpose. Public speakers want to convince an audience to form an opinion, to take action.

More than 2,300 years ago, the Greek philosopher, Aristotle, described three things an effective speaker does. Since then, not much has changed when it comes to a good speech.

If an audience believes a speaker deserves respect, they listen. An audience respects a speaker who has knowledge about a topic. An effective speaker is honest, respects the audience, and shows interest in the subject.

A good speaker thinks about the people who will hear a speech. A good speaker decides what will excite listeners and encourages them to take action.

An effective speech is fair and logical. It helps the listener to better understand a point of view.

Writing Your Testimony

★ Understand the topic.

★ Begin your testimony with the following words: Good morning, members of the City Council. My name is (your name). I am (your age) years old and I am a student at (your school). On my block I counted (how many?) parked cars, but only (how many?) trees. Cars cause air pollution, so please put more money in the budget to plant trees because...

Create a draft speech. Underline words you want to stress.

★ Practice with friends and family; ask for suggestions.

Giving Your Testimony

‴ Speakers win audience approval with volume, clarity, and expression.

‴ Perform with positive energy. Be excited about your speech and share that excitement with the people listening.

‴ Don’t draw attention to mistakes—just keep going.
Part 3
Protecting and Caring for Trees in Our Community
In August 1996, a foreign insect called the Asian Longhorned beetle was discovered in trees in Brooklyn and Amityville, New York. Since then, the beetle has also been found in trees in the Bayside section of Queens, New York and many other cities. Scientists believe the beetles arrived in wooden crating material on ships delivering goods from China.

These beetles kill trees slowly, taking several years to die. As they eat their way through the interior wood, the tree begins to strangle. In spring, the insects emerge from inside the tree trunk where they have been feeding. You may see the beetle between May and October. It has a one-inch long black body with white spots. Their antennae can be two or three inches long with black and white stripes.

The beetle does not move very far each year on its own. It probably travels longer distances by people transporting it, such as when hauling firewood or cut branches. The Asian Longhorned beetle is resistant to pesticides and other control methods. Most of its life is spent in the center wood of a tree where chemicals cannot penetrate. When the beetles emerge as adults, a chemical pesticide would have to be sprayed repeatedly in a neighborhood to be effective, raising public safety concerns. Thus thousands of trees have been cut down. After that, the wood is chipped and burned.

Scientists are researching the beetles’ vulnerabilities, such as a sexual attractant (pheromone) to lure them to traps and a chemical that inoculates trees that have not been infested. In Japan, a natural fungus dissolves the white-spotted variety of the beetle. Others are looking at an insect from Japan which eats beetle larvae inside trees. However, bringing a foreign fungus or insect into the United States might also prove deadly for beneficial plants and insects here.

At this time, destroying infested trees is the only known and safe way to prevent the beetle from spreading. However, because the beetles are detected only after a tree is infested and near death, it may be some time before the current crisis eases.
Lesson Thirteen

Beetles in the News

Subject areas:
Language Arts, Science

Grades: 4 to 8

Duration:
Two to three 40-minute periods

Standards: E 2-a, E 3-c

Materials Needed
• reprint of Reporter’s Notebook
• writing paper
• pencils or pens

Objectives
• Learn that the urban forest faces dangers such as foreign pests
• Analyze and organize research notes (Reporter’s Notebook)
• Learn the important elements of any news story: Who?, What?, When?, Where?, and Why?
• Write a clear, informative newspaper story that will grab a reader’s attention

Vocabulary
• byline: name of the writer of a newspaper story
• dateline: the day and place where the story is written
• deadline: the time when a story must be finished
• headline: the title of a newspaper story
• interview: a conversation between a reporter and a person knowledgeable about an event
• quote (quotations): the exact words of a person interviewed for a story, identified with quotation marks in print
• reporter: a person who collects information and writes reports for publication
Procedure

- Discuss with students the details of the beetle infestation (see Teacher Background).

- Discuss with students the classic elements of a good newspaper story: Who?, What?, When?, Where?, and Why? A reporter’s job is to provide clear and accurate information about an event, not to express his or her opinion of that event.

- An effective newspaper story begins with a headline which will catch a reader’s attention. It offers the important details of an event in a logical sequence (beetle invasion, government response, tree removal program, etc.). If possible, direct, factual information from people knowledgeable about the event should be provided (quotations). An effective story conveys the larger importance of an event (threat to trees throughout America). A story likely to be ongoing (tree-killing beetles are still out there) should offer information about possible future actions. A good story ends in an interesting way, so that a reader will want to continue following that story.

- Distribute to each student a reprint of the Reporter’s Notebook. Ask them to read it and identify, in a class discussion, the elements of the Asian Longhorned beetle story: Who?, What?, When?, Where?, and Why? (If possible, students can undertake additional research, such as visiting some of the web sites listed in the Appendix under Internet Resources, interviewing neighborhood residents, or talking to experts drawn from the Field Trips appendix and Other Resources appendix.)

- Each student is then directed to write a one- to two-page story in their own words about the Asian Longhorned beetle, perhaps as a homework assignment, including a headline, byline, dateline, and quotations.

Assessment

Review each student’s story. Select examples and have the authors read their work to the entire class. After each story is read, ask the rest of the class what they liked best about the story and why it grabbed their attention.
Asian Longhorned Beetle

Black insect with white spots. One-inch long, two-inch antennae. Beetle comes from China, Japan, and Korea. Got to America in wood boxes on a boat from China.

First discovered in Brooklyn, New York in 1996 when a homeowner reported a dying tree in front of his house to the New York City Parks Department. Since then, found in Illinois, Indiana, North Carolina, Texas, Washington, and California.

Can be seen flying around from May to October. Leaves small holes in tree trunks and branches when it exits and flies away. Stays inside a tree feeding for rest of the year.

Feeds on trees, such as:
- Maple
- Chestnut
- Elm
- Hickory

Interview with Mr. Al Elder, works for United States Animal and Plant Health Inspection Service:

He says, “The beetle is very bad for trees. It could be dangerous to many trees in America.” Mr. Elder does not think the problem will go away soon.

U.S. Government will inspect all ships coming from China to look for more beetles.

U.S. Government will send inspectors to look for beetles killing more trees in neighborhoods.
Greenpoint, Brooklyn

Beetle killed 1,500 trees in streets, parks, and backyards.

Workers cut the trees down, shipped them away, then burned the wood.

People in neighborhood were very upset about losing big trees. Some were 50 years old.

Mrs. Marie Johnson, 60 years old, lives on Monitor Street, said, "I lived here all my life. I watched my tree grow tall, now it’s gone. I miss it."

The New York City Parks Department is planting 2,000 new trees in the neighborhood. More than 350 in McCarren Park.

Parks Department asks people in Brooklyn to take care of the new trees. Keep dogs away. Don’t break the branches. Don’t cut into the bark with a knife. Give the tree plenty of water in summer.

If people see a beetle, report it to the Hotline: 1-800-201-7275

Stopping the Asian Longhorned Beetle

Chemicals (bug spray) won’t kill them. The beetles hide too far inside a tree, deep in the middle.

No birds or other animals eat the beetles.

Scientists are studying ways to stop the beetle, but do not think they will find a cure soon.

Only way to stop the beetle, today, is to cut down trees, then burn them.
Lesson Fourteen

Bugging Out!

Subject areas:
Art, Language Arts

Grades: 4 to 8

Duration:
Two 40-minute lessons

Standards: E 2-a, E 3-c, E 5-a, A1, A4

Materials Needed
• pencils
• erasers
• rulers
• 8 1/2" x 14" paper
• paper for story and picture planning; background
• examples of simple cartoons and comic strips

Objectives
• Learn to develop a storyline and draw a cartoon strip
• Become knowledgeable about the Asian Longhorned beetle and its visible characteristics
• Learn about an important community environmental event

Vocabulary
• comic strip: a series of narrative cartoons appearing in sequence
• panel: a distinct portion enclosed by a frame or border
Background

In this activity, students will learn more about an event, retelling the story by way of a three-panel comic strip. Comic strips are simply stories told through pictures. The earliest cartoons can be found in ancient Egyptian wall paintings, Greek vases, and stained glass windows found in many churches. When the majority of the world’s population was illiterate, many stories, legends, and events were told in pictures. Cartoon strips today also tell a story in pictures, although the content is often more humorous than these early examples.

Some cartoon strips also use words in telling a story. For single cartoons you can have one sentence (known as the punch line) to express its meaning. Another way to tell a story is through dialogue between characters, using speech bubbles coming from their mouths.

The Sad Song of Our Trees
Anna Smiarowska  JHS 126
Grade 7

Lady Beetle comes to McCarren Park. Lady Beetle makes her home in the trees, while they cry out in pain. Lady Beetle leaves Greenpoint, but she takes its beauty with her.

Procedure

- Tell students about the Asian Longhorned beetle and the damage it caused to the community’s trees. Share with students what the insect looks like, what trees it damages (see Lesson 13), what to look for to determine whether a tree is infested, etc. (see Part Three, Teacher Background).
- Tell students they are going to create a three-panel comic strip on this important community event. Explain that it will be a challenge to present a complete story in three panels, showing a beginning, middle, and end, with accompanying dialogue.
- Next, the students will take drawing paper, ruler, and pencil to create three adjacent 4 inch-square panels, leaving 1 inch on either side and 2 inches at the top and 2 1/2 inches at the bottom. (To save time, a panel sheet can be prepared by you in advance, then photocopied.)
- Tell students to begin the drawing outline, keeping the characters simple, then filling in details.
- After completing the three-panel drawings, add dialogue to the picture or write a caption (storyline) underneath each panel. Add a title and the cartoonist’s name.

Assessment

- Have students display and read their comic strip to the class. Have students compare and contrast these.
- Make copies of the comic strips which can be given to friends, family, the principal, school board, local libraries, or sent to community newspapers.
Bugs Invade Greenpoint
Zachary Ranzie    JHS 126
Grade 9

The Bugs come to Greenpoint. They invade and kill the trees of Greenpoint. The trees die and then get cut down.
Mr. Beetle finds a new home.  
Mr. Beetle destroys his new home.  
Mr. Beetle and the tree are gone.
Objectives

- Germinate a tree seed
- Determine some of what trees require to germinate

Vocabulary

- Germinate: to cause to sprout or develop
- Seed: part of a flowering plant capable of growing into a new plant

Getting Ready

Teacher should collect Honeylocust pods. They are big, black, and flat, found on the ground near a Honeylocust tree. Each pod contains about 5 seeds. Teachers should ask the students to bring milk cartons from lunch. Cut the tops off the milk cartons so just a box is left. Poke holes in bottom for water drainage.
Background

Seed germination requires moisture, oxygen, and suitable temperature. It begins when the seed absorbs water, causing the inner layers to swell enough to break the seed coat. Oxygen is important for the germination of most seeds. Once germination begins, the embryonic root usually emerges first. This grows rapidly down through the soil to establish the root system. Thereafter, the first leaf (or pair of leaves) pushes above the soil. They then unfold and begin producing food. Once the root system is firmly established, the seedling develops an extensive system of shoots and leaves.

Procedure

- Tell students they are going to grow a tree. Give each student a Honeylocust seed. (If students are old enough, tell them to slit the seed by putting a small incision in it. If they are not, the teacher should slit the seeds.)
- Put the slit seeds in water.
- The seeds will begin to swell within a few days. Once you observe roots, the seeds are ready to be planted.
- Put soil in the milk cartons halfway. Put the seed in the soil, at least 1 1/2 inches under the soil. Then put one more inch of soil in the cartons.
- Place some in the window and some in a dark location, such as a closet. Water both on the same schedule. Place other potted seeds in the window, but do not water these. Chart the progress of all seeds.

Assessment

- Compare the success rates and sizes of the sprouts. Discuss with students why some performed better than others. This will help students understand what tree seeds need to germinate and grow.
- If there is a school garden, or some other protected place, the students can plant a few of the healthy sprouts.
Lesson Sixteen

Tie a Yellow Ribbon round the Old Oak Tree... But Wait, Which is the Oak Tree?

Subject areas: Science, Language Arts
Grades: 4 to 8
Duration: Two 40-minute lessons, (best undertaken in the fall)
Standards: E 1-c, E 2-a, E 4-b

Materials Needed
- illustrations or pictures of Pin oak trees (see Lesson 4 or School Kit)
- reprints of Student Tree Care Tips
- pencils or pens
- paper

Objectives
- Recognize a specific and abundant tree in the community
- Learn that urban trees need help to grow
- If possible, have students adopt a tree near the school and care for it

Vocabulary
- compacted (soil): caked topsoil less able to absorb needed water and air for the roots below ground
- cultivate (soil): the act of loosening compacted soil to allow water and air to penetrate to roots below ground
Background

Each tree has characteristics that help individuals identify it. For example, the London Plane can be recognized by its peeling bark. Beech trees have smooth gray bark. This lesson will help students identify one tree found in their community: the Pin oak.

The Pin oak is native to the New York City area and found often, at curbside and in local parks. It has a large, straight, central trunk with numerous branches (as compared to many other city trees). A young Pin oak has smooth gray bark which becomes darker and rougher with age. It produces small acorns in one- or two-year intervals. Its leaves are three to six inches long with narrow, pointed lobes. They appear shiny green in summer, turning bronze or red in the fall. Viewed from a distance, the crown tends toward a cone shape.

To live long and healthy lives in a city, trees need help from people. A tree surrounded by pavement may not get enough water, have enough soil available, or be able to extend its roots as far as desirable. Tall buildings can block the sun during many hours of the day. It is a myth that dog droppings and urine are good for trees. The urine is acidic and burns through the bark at the base of the tree. The droppings foul the soil. Rock salt may do a good job melting pavement ice in winter, but it too fouls the soil. Car doors and people carving their initials in trees damage the bark, which is similar in its protective function to human skin. Young tree branches cannot support the weight of children climbing on them. Soils in parks are often compacted from many people walking and playing on them. It becomes difficult for water to penetrate. In natural settings, fallen leaves and other dead organic matter provide food for trees. Humans often rake and remove leaves and other organic matter around trees to improve the appearance of an area.
Procedure

**Part One**
- Have students examine a Pin oak illustration.
- Have students work in groups to identify the distinct characteristics of a Pin oak: color, height, branching pattern. Is the trunk straight and tall, or bent, or gnarled? What are the characteristics of the leaf?
- After looking at these for about ten minutes, ask the students what they saw.
- Have students write a descriptive paragraph about the tree. Tell them the students in the classroom next door have never heard of a Pin oak tree. Their task is to write a precise description in prose that students, in the classroom next door, could use to locate Pin oak trees in the neighborhood and mark with yellow ribbons. No additional information can be used: no photographs or illustrations. A successful description is one that will easily and quickly lead students, in the classroom next door, to a Pin oak tree.

**Part Two**
- Distribute the reprints of *Student Tree Care Tips*, one per student.
- Take students on a neighborhood walk and count the Pin oak trees. Have them point out the unique characteristics of the Pin oak tree that help identify it, such as the bark, branching pattern, and leaves.
- Have your students adopt that Pin oak tree and care for it during the school year, based on the *Student Tree Care Tips*. This could include signs made by students asking people to keep their dogs away from the tree, etc. (Note: Signs should not be nailed nor stapled into the tree.)
  
  Alternate method: Student paragraphs could actually be given to students in another class. These students could then attempt to find Pin oaks near the school, perhaps marking them with yellow ribbons. Thereafter, your students could train students from the other class in how to care for the tree, perhaps with both classes adopting one or more.

**Assessment**

Review paragraphs as a class for clarity and accuracy.
If you take good care of a tree, it will grow tall and live long. You can help young trees in the city by doing the following things for them:

- **Give it plenty of water** at hot times of the year if the soil feels dry.

- If the soil is hard and caked (*compacted*), loosen (*cultivate*) it, but be careful not to injure the roots which are only 6 to 12 inches below the ground.

- **Keep dogs away from trees.** Dog waste of any kind on a tree is like giving the tree poison.

- In winter, when there is ice on the ground, **don’t put any salt around the tree.** It is also like poison.

- **Don’t let other kids break tree branches or carve in the bark.** To a tree, that’s like breaking an arm or cutting its skin with scissors.

- **In spring and fall, put dead leaves or woodchips on the ground around the tree.** Believe it or not, that’s food for the tree.
Part 4
Teacher Resources
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>atmosphere</td>
<td>the mass of air surrounding the Earth</td>
</tr>
<tr>
<td>bark</td>
<td>exterior covering of a tree</td>
</tr>
<tr>
<td>branch</td>
<td>a large stem growing out from the trunk</td>
</tr>
<tr>
<td>bud</td>
<td>a swelling on a branch or twig that develops into a leaf or flower</td>
</tr>
<tr>
<td>chlorophyll</td>
<td>pigments that produce the green color of leaves</td>
</tr>
<tr>
<td>climate</td>
<td>an ecosystem’s weather pattern over time</td>
</tr>
<tr>
<td>crown</td>
<td>the top branches of a tree</td>
</tr>
<tr>
<td>deciduous</td>
<td>a plant that loses its leaves at the end of the growing season</td>
</tr>
<tr>
<td>ecosystem</td>
<td>an interacting assemblage of living organisms and their environment</td>
</tr>
<tr>
<td>environment</td>
<td>the external conditions that affect the development of an organism</td>
</tr>
<tr>
<td>evergreen</td>
<td>a plant that retains its leaves year-round</td>
</tr>
<tr>
<td>flower</td>
<td>the reproductive unit of a seed-bearing plant</td>
</tr>
<tr>
<td>forest</td>
<td>a large area of land primarily covered with trees</td>
</tr>
<tr>
<td>fruit</td>
<td>a ripened seed with tissue around it</td>
</tr>
<tr>
<td>global warming</td>
<td>the increase in the average temperature of the Earth’s atmosphere</td>
</tr>
<tr>
<td>habitat</td>
<td>an area that provides a living organism with adequate food, water, shelter, and living space</td>
</tr>
<tr>
<td>heartwood</td>
<td>old, hard, and dead wood tissue forming a tree’s center</td>
</tr>
<tr>
<td>leaf</td>
<td>one tree foliage unit where food production occurs through photosynthesis</td>
</tr>
<tr>
<td>compound leaf</td>
<td>a single leaf comprised of smaller leaflets</td>
</tr>
<tr>
<td>simple leaf</td>
<td>a leaf comprised of one piece</td>
</tr>
<tr>
<td>nutrient</td>
<td>a substance needed for growth and development</td>
</tr>
<tr>
<td>phloem</td>
<td>tissues that move nutrients from leaves to other parts of the plant</td>
</tr>
<tr>
<td>photosynthesis</td>
<td>the process by which green plants make sugar, aided by sunlight, carbon dioxide, minerals, and water</td>
</tr>
<tr>
<td>pollution</td>
<td>harmful substances deposited into the air, water, and land</td>
</tr>
<tr>
<td>respiration</td>
<td>the processing of nutrients and oxygen in a plant resulting in water, energy, and carbon dioxide</td>
</tr>
<tr>
<td>roots</td>
<td>underground growth network that extracts water, oxygen, and nutrients from soil and provides structural support</td>
</tr>
<tr>
<td>rootlet</td>
<td>a smaller root</td>
</tr>
<tr>
<td>root hairs</td>
<td>outgrowth at the end of a rootlet that absorbs water and nutrients</td>
</tr>
<tr>
<td>tap root</td>
<td>the primary root which grows straight downward from which smaller growth emanates</td>
</tr>
<tr>
<td>sap</td>
<td>fluid transported in a tree by its phloem and xylem</td>
</tr>
<tr>
<td>sapwood</td>
<td>outer portion of a tree’s wood where water and nutrients are transported</td>
</tr>
<tr>
<td>seed</td>
<td>part of a flowering plant capable of growing into a new plant</td>
</tr>
<tr>
<td>smog</td>
<td>a combination of smoke, fog, and automobile and industrial exhaust</td>
</tr>
<tr>
<td>soil</td>
<td>a ground-level medium composed of organic and inorganic matter that supports plant growth</td>
</tr>
<tr>
<td>transpiration</td>
<td>the release of water vapor from plants into the air</td>
</tr>
<tr>
<td>tree</td>
<td>a tall woody plant, usually with a single trunk and a leafy crown</td>
</tr>
<tr>
<td>trunk</td>
<td>main stem of a tree where nutrients are transported</td>
</tr>
<tr>
<td>twig</td>
<td>a smaller stem growing off a branch</td>
</tr>
<tr>
<td>urban</td>
<td>something of or in a city, versus suburban and/or rural</td>
</tr>
<tr>
<td>urban forest</td>
<td>trees in backyards, parks, woodlands, and along streets and highways interspersed with buildings</td>
</tr>
<tr>
<td>xylem</td>
<td>plant tissue that transports water and stores nutrients</td>
</tr>
</tbody>
</table>
Neighborhood Tree List

Trees along the Streets and in the Parks of Greenpoint and Williamsburg

Ailanthus (a.k.a. Tree of Heaven)
Alder (Black alder)
Ash (Green ash)
Baldcypress
Beech (European beech)
Cedar (Blue atlas cedar, Eastern red cedar)
Cherry (Black cherry)
Cypress (White cypress)
Dogwood (Cornelian dogwood, Gray dogwood, Korean dogwood)
European Hornbeam
Filbert (Turkish filbert)
Gingko
Goldenrain
Hawthorn (Cockspur hawthorn, Lavelle hawthorn, Washington hawthorn)
Holly (American holly)
Hophornbeam (American hophornbeam)
Japanese lilac tree
Katsura
Kentucky Coffeetree
Larch (Japanese larch)
Linden (Littleleaf linden, Silver linden)
London Plane
Maple (Norway maple, Red maple, Silver maple, Sycamore maple)
Mountain-ash Mulberry
Oak (Pin oak, Red oak, Sawtooth oak, Shingle oak, Swamp white oak, White oak, Willow oak)
Pagodatree (a.k.a. Scholartree)
Pear (Callery pear)
Pine (Eastern white pine, Pitch pine)
Redbud (Eastern redbud)
Redwood (Dawn redwood)
Rubber tree (Hardy rubber tree)
Serviceberry
Spruce (White spruce)
Sweet gum
Tulip tree
Tupelo (Black tupelo)

This list does not represent all trees.
# Books about Trees

## Tree Identification: Children and Adults

### Trees of North America
- **Author:** Alan Mitchell, Consultant  
- **Year:** 1994  
- **Publisher:** Thunder Bay Press  
- **ISBN:** 1-85028-265-X

Good tree identification book for use with children. Part of *Science Nature Guides* series. Includes more than 20 easy science projects, such as measuring trees and making leaf skeletons.

## Trees: Picture Books: Nonfiction

### Trees
- **Author:** Carolyn Boulton  
- **Year:** 1984  
- **Publisher:** Franklin Watts, Ltd.  
- **ISBN:** 0-531-04635-4

Basic tree reference book with glossary and suggested activities for identifying and studying trees, such as leaf and bark rubbings, measuring tree height, and seed growth. Highly recommended.

### Discovering Trees
- **Author:** Jill Bailey  
- **Year:** 1989  
- **Publisher:** Bookwright Press  
- **ISBN:** 0-531-18228-2

Excellent reference book with glossary. Explains how trees work and grow individually and in forests, as well as the benefits of trees. Highly recommended.

### A Tree Is Nice
- **Author:** Janice May Udry  
- **Year:** 1956  
- **Publisher:** Harper Collins  
- **ISBN:** 0-06-443147-9

Describes beauty of trees and how we enjoy and benefit from them. Highly recommended. The Caldecott Medal.

### The Tremendous Tree Book
- **Author:** Mary Garelick & Barbara Brenner  
- **Year:** 1979  
- **Publisher:** Four Winds Press  
- **ISBN:** 0-590-07590-X

A raccoon and a squirrel help introduce children to basic information about trees. Read aloud and performance possibilities are combined with excellent tree information.
Books about Trees

**Trees: Picture Books: Nonfiction (continued)**

### Be A Friend to Trees
**Author:** Patricia Lauber  
**Illustrator:** Holly Keller  
**Topic:** Tree Benefits  
**Ages:** 5-9  
**Year:** 1994  
**Publisher:** Harper Collins  
**ISBN:** 0-06-021528-3  
**Pages:** 32

Part of series, *Let's Read and Find Out Science, Stage 2.* Describes many of the ways people and other living things depend on trees. Suggests ways to protect trees through recycling and conserving paper. Highly recommended. Discussion of tree protection can be extended to how to care for street and park trees.

### Why Do Leaves Change Color
**Author:** Betsy Maestro  
**Illustrator:** Loretta Krupinsky  
**Topic:** Leaf Color  
**Ages:** 5-9  
**Year:** 1994  
**Publisher:** Harper Collins  
**ISBN:** 0-06-022873-3

Part of series, *Let's Read and Find Out Science, Stage 2.* Describes how and why leaves change color and what causes differences in leaf color changes from year to year. Highly recommended.

### Have You Seen Trees
**Author:** Joanne Oppenheim  
**Illustrator:** J. and M-S Tseng  
**Topics:** Trees, Leaves, Fruits  
**Ages:** 5-9  
**Year:** 1995  
**Publisher:** Scholastic  
**ISBN:** 0-590-46691-7  
**Pages:** 40


### Trees and Forests
**Author:** Gallimard Jeunesse  
**Topic:** History of Trees  
**Ages:** 7-12  
**Year:** 1995  
**Publisher:** Scholastic  
**ISBN:** 0-590-47639-4  
**Pages:** 44

An interactive book with spectacular art and graphics that traces the history of trees from the first plants to grow on land to modern tree farms. Highly recommended, Outstanding Science Trade Books for Children, National Science Teachers Association - 1996.
**Trees: Picture Books: Fiction**

### The Lorax
- **Author:** Dr. Seuss
- **Publisher:** Random House
- **Year:** 1971
- **ISBN:** 0-394-82337-0
- **Ages:** 9+
- **Pages:** 61
- **Topic:** Environmental Degradation
- **Description:** A political satire against mindless industrial greed and the wanton destruction of the environment - cutting down all the trees. Highly recommended.

### Maya and the Town that Loved A Tree
- **Authors:** Kiki & Kathryn Shaw
- **Illustrator:** Kiki
- **Publisher:** St. Martin’s Press
- **Year:** 1992
- **ISBN:** 0-876-63796-9
- **Ages:** 5+
- **Pages:** 32
- **Description:** Story about a town that develops into a large city with no regard for preserving trees or parks. The town learns about the importance of trees through the actions of a young girl who shares her tree with the town.

### The Gift of the Tree
- **Author:** Alvin R. Tresselt
- **Illustrator:** Henri Sorenson
- **Publisher:** Lothrop, Lee & Shepard
- **Year:** 1992
- **ISBN:** 0-688-10684-6
- **Ages:** 5+
- **Pages:** 32
- **Description:** Traces the life cycle of an oak tree and describes the forest animals that depend on it for shelter and food.

### Poetry

#### Old Elm Speaks: Tree Poems
- **Author:** Kristine O’Connell George
- **Illustrator:** Kate Kiesler
- **Publisher:** Clarion Books
- **Year:** 1998
- **ISBN:** 0-395-87611-7
- **Description:** A collection of short and easy-to-read poems about trees and how they touch our lives. Beautifully illustrated through oil paintings.
Programs for students learning about the urban forest are offered in Brooklyn and throughout the city. Some of these are provided free and others charge a fee. Teachers should call for information on current offerings, registration requirements, costs, and travel instructions.

**Alley Pond Environmental Center**  
228-06 Northern Boulevard  
Douglaston, NY 11363  
(718) 229-4000

With more than 635 acres of woodlands, meadows, fresh and saltwater marshes, Alley Pond Park in northeast Queens is home to a diverse variety of wildlife and habitats. Alley Pond Environmental Center houses exhibits, classrooms, and a library where students are encouraged to develop environmental awareness, understanding, and appreciation. Grade school groups are provided with a range of programs to satisfy many nature-related educational needs. Educators should call for details, as well as for information on teacher training workshops.

**The American Museum of Natural History**  
Central Park West and 79th Street  
New York, NY 10024  
(212) 769-5200

The Hall of Biodiversity alerts the public to the critical role biodiversity plays in sustaining life as we know it. It includes an exhibit of a temperate forest, the type typical of this area. These are home to deer, wolves, foxes, squirrels, and a variety of birds, fungi, insects, and microbes. Teachers should call for tour and fee information.

**Brooklyn Botanic Garden**  
1000 Washington Avenue  
Brooklyn, NY 11225  
Registration Department:  
(718) 622-4433, ext. 216 or 276

The 52-acre Brooklyn Botanic Garden (a.k.a. BBG) provides many tree-related on-site classroom lessons, hands-on greenhouse activities, and outdoor tours for a fee. Pre-visit materials include background information, classroom activities, and discussion topics.

**Brooklyn Center for the Urban Environment**  
The Tennis House  
Prospect Park  
Brooklyn, NY 1125-9992  
(718) 788-8540

Brooklyn Center for the Urban Environment (BCUE) classes range from pre-kindergarten to grade 12. The Center’s environmental educators have developed interdisciplinary programs for classes which open the door to using the city as a learning and teaching resource. BCUE also provide teachers Professional Development Workshops in Prospect Park, at schools, and at sites throughout the borough.
Central Park Conservancy
The Arsenal, Central Park
New York, NY 10021
(212) 360-3444

The Central Park Conservancy is a not-for-profit organization that manages Central Park under a contract with the City of New York Parks and Recreation department. The Charles A. Dana Discovery, located in the northeast corner of Central Park, hosts a variety of environmental events (212) 860-1370. Other educational activities are provided at the Henry Luce Nature Observatory at 79th Street (212) 772-0210, and The Dairy near East 65th Street (212) 794-6564. Call for information on specific program offerings.

City Parks Foundation
Urban Forest Ecology Center
c/o NYC Parks and Recreation
1234 Fifth Avenue, Room 232
New York, NY 10029
(718) 548-0912

The Urban Forest Ecology Center in Van Cortlandt Park (246th Street and Broadway) is the only facility in New York City dedicated exclusively to the study of urban woodlands. It offers school programs, teacher workshops, and summer institutes focused on forest ecology.

New York Botanical Garden
200th Street and Southern Boulevard
Bronx, NY 10458
(718) 817-8739

New York Botanical Garden (NYBG) provides programs to school children for a fee. Most are seasonal and consist of thematic, self-guided grounds tours. NYBG also offers educator workshops that will help you teach students about trees and other plants. The workshops are recommended when registering for school group programs.

New York City Urban Park Rangers
1-888-NYPARKS

Urban Park Rangers highlight the natural world using parks as outdoor classrooms. For information on free school programs in all five boroughs, call 1-888-NYPARKS.

Prospect Park Alliance
95 Prospect Park West
Brooklyn, NY 11215-9992
(718) 965-8948

The Prospect Park Alliance offers school programs, including forest ecology, and hands-on projects such as mulching, weeding, and soil aeration.
Field Trips

Some of these are provided free and others charge a fee. Teachers should call for information on current offerings, registration requirements, costs, and travel instructions.

Queens Botanical Garden
43-50 Main Street
Flushing, NY 11355
(718) 886-8600

Queens Botanical Garden offers courses for a fee to introduce students to elementary botany and ecology. In-depth teacher training sessions can also be planned with the garden’s education department.

Staten Island Botanical Garden
1000 Richmond Terrace
Staten Island, NY 10301
(718) 273-8200

Staten Island Botanical Garden maintains a collection of specimen trees and gardens on an 80-acre site, including butterfly, perennial, and sensory gardens. Of particular interest for those learning about trees are the arboretum, wooded areas, and composting exhibit. Environmental education programs for schoolchildren are available.

Staten Island Greenbelt
200 Nevada Avenue
Staten Island, NY 10306
(718) 667-2165

This partnership of the City of New York Parks and Recreation department and the Greenbelt Conservancy is dedicated to promoting conservation, preservation of natural areas, and increasing public awareness and enjoyment of the Greenbelt. The High Rock Environmental Center is an education and visitor’s facility. The Greenbelt Native Plant Center offers classes in plant rescue and propagation. There are also tours available at the William T. Davis Wildlife Refuge, the first designated wildlife and bird sanctuary in New York City, and other woodland and wetland sites.

Wave Hill
675 West 252nd Street
Bronx, NY 10471
(718) 549-3200, ext. 230

Wave Hill sits on 28 beautiful acres overlooking the Hudson River and serves as a laboratory for discovery of the environment. Wave Hill offers horticulture, forest management, and landscape history and design programs to schools for a fee. Most are available in either single-session or multi-session format, including a 90-minute presentation in the classroom to introduce the program, workbooks for each student, and a teacher’s manual. Teacher Workshops utilize Wave Hill’s unique resources to upgrade their knowledge and experience in environmental science.
Other Resources

**United States Department of Agriculture Forest Service**  
Cooperative Forestry  
P.O. Box 96090  
Washington, DC 20090-6090  
(202) 205-1389

Urban and Community Forestry stewardship programs help people in urban areas sustain shade-trees, forest lands, and open spaces.

**Project Learning Tree**  
New York State Dept. of Environmental Conservation  
Region 2, Forester  
47-40 21st Street  
Long Island City, NY 11101  
(718) 482-1136

Project Learning Tree (PLT) is an award-winning environmental education curriculum designed to help students and educators acquire knowledge of the natural world. The elementary school curriculum (K-8) takes an interdisciplinary, hands-on approach to learning and contains more than 90 lesson plans. A set of three high school modules (Forestry Issues, Forest Ecology, and Solid Waste) is also available, as well as a Spanish translation. For information visit their web site at www.plt.org.

PLT is co-sponsored by the NYS Department of Environmental Conservation and the NYS Education Department. To obtain the PLT curriculum, educators must attend a six-hour workshop. A modest registration fee covers the cost of the curriculum guide, posters, and additional education materials.

**The Council on the Environment of New York City**  
51 Chambers Street, Room 228  
New York, NY 10007  
(212) 788-7900

The Open Space Greening Program helps create and support community gardens. Plant-A-Lot gives technical and materials assistance to create and enhance open spaces. Grow Truck makes garden tool loans and distributes donated plant and garden materials to groups. The Training Student Organizers Program works on a range of environmental issues affecting New Yorkers in neighborhoods, schools, and homes in four boroughs.
Horticultural Society of New York
Education Department
128 West 58th Street
New York, NY 10019
(212) 757-0915

Green Thumb
49 Chambers Street, Room 1020
New York, NY 10007
(212) 788-8059

Trees New York
51 Chambers Street, Suite 1412A
New York, NY 10007
(212) 227-1887

The Horticultural Society of New York is a not-for-profit education and plant resource center. Their programs seek to increase science literacy by teaching about plants, ecology, and gardening. Presented in local classrooms, these combine hands-on activities and a series of lessons.

Affiliated with the New York City Parks Department, Green Thumb provides free technical and design assistance to garden on vacant City-owned property, such as a schoolyard. They supply fencing, tools, lumber, soil, trees, shrubs, seeds, bulbs, and seasonal workshops.

Trees New York (TNY) works to motivate and educate youth. There are two programs for young people which are provided on a sliding-scale fee basis. TNY works with science coordinators and teachers to tailor the program to the needs of children according to age.
## Internet Resources: Trees

**Tree Link**  
http://www.treelink.org/docs/learningcenter.phtml  
Useful links for educators include lesson plans and outlines.

**Branching Out: The North Carolina Forest Stewardship Activity Guide**  
http://www.ces.ncsu.edu/nreos/forest/steward/pdf/brantoc.html  
This guide helps youth appreciate and understand our forest and natural surroundings. Easy-to-follow classroom and outdoor activities on soil and water, wildlife, trees, recreation and natural beauty, and the concept of stewardship.

**The Forest Where We Live**  
http://www.lpb.org/programs/forest/classroom.html  
Lessons designed to help students plant and care for trees at their schools and elsewhere.

## Internet Resources: Asian Longhorned Beetle

**Animal and Plant Health Inspection Service**  
**U.S. Department of Agriculture**  
Information on various urban environmental issues and links to education web sites.
### Audio-Visual Resources

Brooklyn’s Community School District 14 offers teachers loan of video tapes for student viewing for up to one week. Some tree-related offerings are listed below. You may order these by phone from: Multi Media Center, 250 Berry Street, Phone: (718) 387-3123, Fax: (718) 782-2905.

<table>
<thead>
<tr>
<th>Title</th>
<th>Duration</th>
<th>Grade(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Things Plant</td>
<td>18 min.</td>
<td>E J</td>
<td>Plant development is explored from single-celled organisms to giant trees</td>
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<tr>
<td>Animals and Their Homes</td>
<td>9 min.</td>
<td>P I</td>
<td>Animal homes in their natural environments</td>
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<tr>
<td>Biology Concepts: Pollution</td>
<td>24 min.</td>
<td>E I</td>
<td>Students learn about the causes of the greenhouse effect, ozone depletion,</td>
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<td></td>
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<td>and other topics</td>
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<tr>
<td>Dream Forest</td>
<td>24 min.</td>
<td>P E</td>
<td>Explores the need for people to care for and protect wild animals</td>
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<tr>
<td>Ecology: Making the Right Choices</td>
<td>25 min.</td>
<td>I J</td>
<td>Understanding ecology and conservation</td>
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<tr>
<td>Ecology: Understanding Forest Decline</td>
<td>14 min.</td>
<td>J</td>
<td>Examines the history of forest decline, the effects of pollutants on trees,</td>
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<td></td>
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<td>and preservation efforts</td>
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<tr>
<td>The Fall of Freddie the Leaf</td>
<td>16 min.</td>
<td>E I</td>
<td>Understanding the meaning of an individual life as part of a greater whole</td>
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<tr>
<td>Get Ready, Get Set, Grow!</td>
<td>30 min.</td>
<td>I</td>
<td>An introduction to plant growth</td>
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<tr>
<td>Habitats: A Science Walk</td>
<td>15 min.</td>
<td>P E</td>
<td>Children explore a backyard for places where plants and animals live</td>
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<tr>
<td>Legend of Johnny Appleseed</td>
<td>19 min.</td>
<td>P E</td>
<td>A wanderer plants apple seeds in pioneer America</td>
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<tr>
<td>Let’s Explore a Forest</td>
<td>17 min.</td>
<td>I J</td>
<td>A young girl and her uncle explore a mountain forest to learn about the</td>
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<td></td>
<td></td>
<td></td>
<td>workings of trees</td>
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<tr>
<td>Split Cherry Tree</td>
<td>26 min.</td>
<td>I</td>
<td>Three boys accidentally break a branch off a tree</td>
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<tr>
<td>What’s the Biggest Living Thing?</td>
<td>11 min.</td>
<td>P</td>
<td>While the whale may be the largest animal, certain trees are the largest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>living organisms</td>
</tr>
<tr>
<td>What Plants Need for Growth</td>
<td>11 min.</td>
<td>P</td>
<td>Demonstrates the survival needs of plants</td>
</tr>
<tr>
<td>Why Doesn’t Grass Grow on the Moon?</td>
<td>11 min.</td>
<td>P E</td>
<td>What plants need to survive</td>
</tr>
<tr>
<td>Why We Have Seasons</td>
<td>13 min.</td>
<td>E</td>
<td>Why some leaves change color and fall to the ground</td>
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</tbody>
</table>

E = Elementary, P = Primary, I = Intermediate, J = Junior High