

A TREE ON THE REBOUND

FEATURING *Charlie Chestnut*, STAR OF "THE LIFE
AND TIMES OF CHARLIE CHESTNUT"

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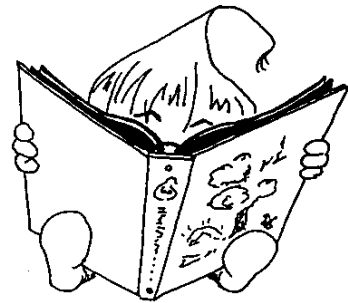
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To the Teacher . . .

Why do we want you to involve your students in a program about the American chestnut tree, especially since you already have so many other things to teach? Our response: students need opportunities to explore and discover scientific concepts and principles in the life sciences. This is especially true according to the National Science Education Standards (1996) and the Learning Standards for Mathematics, Science, and Technology (1996). These lessons will allow your students to investigate trees, in general, while they inquire and learn more about the American chestnut tree.

So, how will you accomplish this goal? We suggest that "Charlie Chestnut," a special video character, introduce your students to the American chestnut tree problem. Your students can then further investigate the concepts identified in the video by completing the activities in this book. You will discover background information for the objectives emphasized in each lesson. Key words, list of materials, specific activity procedures, and student activity pages are provided. A glossary, integrated subject ancillary activities, and kit materials will help your students learn about the American chestnut tree. Charlie Chestnut specifically points to those activities, or parts of specific activities with special focus on the American chestnut tree. Consistent with the U.S. Metric Conversion Act (1975), all children should become familiar with, and be able to use the metric system of measurement. Therefore, metric units are used; English unit equivalents are provided in parentheses. Finally, black line masters for each student activity (in larger print) are provided right in the text. You have permission to make copies of each page that you need in order to make teaching this program a success.



More than 50 teachers first used this manual with their children in 1996. Their comments from the pilot instructional program helped to shape this final copy. The American Chestnut Foundation New York Chapter appreciates their candid responses; each comment was considered during the revision process.

Kit Materials

Embossed leaf to make rubbings
American chestnut

Laminated real leaves

American Chestnut
Beech
Chinese Chestnut
Horse Chestnut

Tree stem pieces

cross sections
longitudinal

Nuts and Burs

American Chestnut
Beech
Horse Chestnut

Ordering Chestnut seeds

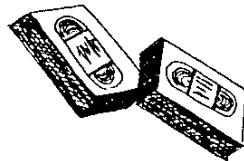
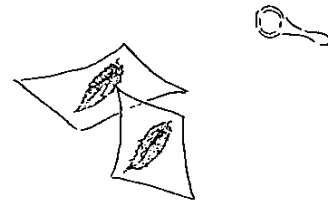
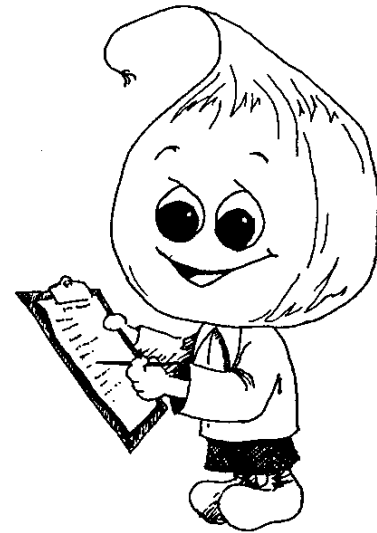
Original kit order includes 4 seeds
Seeds shipped **ONLY** in spring
Please see order blank (page 71)
for new seed orders

Videos

"Biological Powerhouse"
"The Life and Times of Charlie Chestnut"

4 Hand lenses

Kitchen tongs



Story to be read to children

The American Chestnut Story

Those who know the story can never forget it, but the tragedy happened long enough ago that many, now, have never heard of the tree's demise.

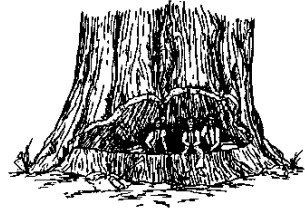
"whara thara ba mountains,
thara ba chestnuts"
a member of DeSoto's expedition, 1520

The American chestnut was once one of the most important trees in our eastern hardwood forests. It ranged from Maine to Georgia, and west to the prairies of Indiana and Illinois. It grew mixed with other species, often making up 25 percent of the forest. In the Appalachian Mountains, the ridges were often pure chestnut.

In early summer, when the trees were covered with their long, creamy flowers, the mountains looked as if their crests were covered with snow. In the virgin forests, where

large chestnut trees were commonplace, mature trees could be 600 years

old. They averaged 1.5 meters (4-5 feet) in diameter and 28-35 meters (80-100 feet) tall. Many specimens 3.1 meter (8-10 feet) in diameter were recorded, and there are rumors of trees bigger still.



The nuts were acknowledged to be the finest-flavored of all chestnuts and though not as large as their European or Oriental cousins, demand for them was high.

Railroad cars full were shipped to the big cities for the holidays, where street vendors sold them fresh-roasted, and they were essential to the traditional stuffings for roast goose and turkey. Unlike other nut trees, the chestnuts usually produced heavy crops every year, and the nuts were a major cash crop for many families in Appalachia.



Wildlife depended extensively on the nuts, too--bear, deer, wild turkey, squirrels and once, the huge flocks of Passenger Pigeons (now extinct)--all waxed fat for the winter in the chestnut forests. The tree was also one of the best for timber. It grew straight and tall, often branch-free for 18 meters (50

feet). Loggers tell of loading entire railroad cars with boards cut from just one tree. Straight-grained, lighter in weight than oak and more easily worked, it was as rot-resistant as redwood. It was used for everything--telegraph poles, railroad ties, heavy construction, shingles, paneling, fine furniture, musical instruments, pulp and plywood. The chestnut was also the country's major source of tannin for tanning leather.

Disaster Struck In 1904



The chestnut, unfortunately, was tragically susceptible to the deadly chestnut blight imported early in the twentieth century on Oriental chestnut trees planted in New York City. These trees were brought into the country before passage of plant quarantine laws. The blight rampaged through the forests, spreading 30-80 kilometers (20-50 miles) per year, killing nearly every chestnut in its path. Within decades, an

estimated nine million acres of trees were killed by the blight as it spread throughout the eastern United States. By 1950, the American Chestnut was nearly eliminated as a forest tree. However, since the root system is unaffected by the blight, some survive, mostly as shrubs, where giants once stood.

In 1983, a group of prominent scientists established the American Chestnut Foundation as a non-profit organization. This organization's only goal is to reestablish the American chestnut, magnificent king of the Eastern forests, back as part of our natural heritage. The American Chestnut Foundation opened

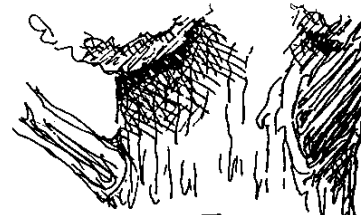
its first research farm in April 1989, where researchers in genetics and plant pathology are working to produce a blight resistant strain of American chestnut. The organization advocates a multiple attack on the fungus, encouraging research in biological control and genetic breeding. This farm, located near Meadowview, Virginia, on the road to Cumberland Gap in Appalachia (Exit 24, Interstate 81), serves as the focus of a specialized breeding program. Thousands of chestnut trees are already in the ground.

The public is invited to visit the site to learn more about the latest research.





Size of a Tree



What to know:

Trees are different from the grass in your yard. They have woody stems. Trees are also bigger in height than the shrubs or bushes. But, remember, shrubs and bushes have woody stems, too. So then, the biggest difference between trees and shrubs is their size, both in height and circumference (girth). Some trees near your house may range in height from 15 - 30 meters (50 - 100 feet).

Two easy ways to measure height of a tree include the Native American method and the meter stick method (see activity). If you are measuring the circumference of a tree, (distance around the trunk), place the tape 1.5 meters (4.5 feet) above the ground. This is a standard height used to measure tree circumference.

What to learn:

Determine the height and the circumference of a tree by measuring.

Words to learn:

circumference girth Native American

What to use:

ball of string
scissors
meter stick
a large tree outdoors



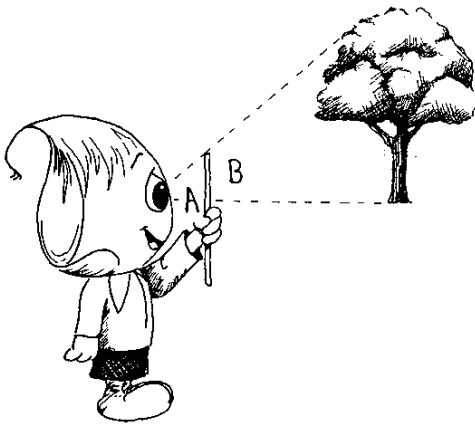
What to do:

1. Using the background information, discuss the ways of measuring the height and circumference of a tree.
2. Model measuring the height of a tree using the Native American method. Keep this information for later use. (See "Size It Up" activity for measuring directions.)
3. Allow the children to measure the height of a second tree. This may be completed as a whole class or small group activity.
4. Model measuring the circumference of the original large tree using the string method. (See "Size It Up" activity for directions.)
5. Allow the children to measure the circumference of the second tree.

6. Have the children estimate a length of 8 meters (approximately 26 feet) using a ball of string. Check your estimate by cutting the string at 8 meters (approx. 26 feet). Tell the children the American chestnut tree had a circumference of 8 to 10 meters (approx. 26 - 33 feet).
7. Compare the length of the circumference string from the original tree to that of the American chestnut tree.
8. Make a circle around the original tree with the American chestnut tree circumference string.
9. Complete the activity pages: "Size It Up" and "Who's the Tallest of Them All?"

Other things to do:

1. Using the example from the video, model the comparison of an American chestnut tree of 30 meters (100 feet) tall to a stack of seven single-story houses.
2. Use the meter stick method to measure the height of a tree.



Step 1. Work with a partner. Hold your arm straight so your fist is level with your shoulder. Have your partner measure the distance from your fist to your eye. (See A on the picture.)

Step 2. Hold the meter stick straight up and down so the distance from your hand to the top of the stick is the same as the distance in Step 1. (See B on the picture.)

Step 3. Moving backwards from the tree, stop when you see the base of the tree just-over your fist and the top of the tree even with the top of the meter stick. Keep your arm straight and level with your shoulder; do not move the stick in your hand.

Step 4. Your partner should measure the distance from you to the tree. This distance is the height of the tree.

Charlie Challenge:

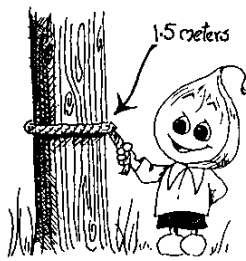
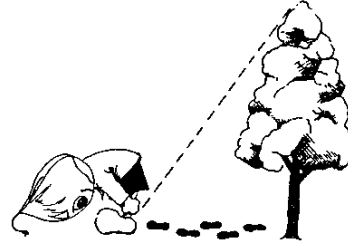
- Use the Native American measuring method to find the height of your house. Calculate how many of your houses you would need to stack on top of each other to equal the height of an American chestnut tree 30 meters (100 feet) high.

Name: _____

Size It Up

How to measure the height of a tree:

Some Native Americans measured the height of a tree this way. Holding your ankles, walk away from a tree until you see the top of that tree between your legs. Measure the distance you are from the tree. That distance is approximately the height of the tree.



How to measure the circumference of a tree:

Using a piece of string, have one person hold the end of the string on the tree trunk 1.5 meters (4.5 feet) above the ground. A second person should wrap the string around the trunk until it meets the starting point. Cut the string. Take the string down. Measure it.

1. What is the height of your tree? _____ meters
2. What is the circumference of your tree? _____ meters
3. Describe how your tree's circumference compares to that of the American chestnut tree's circumference.

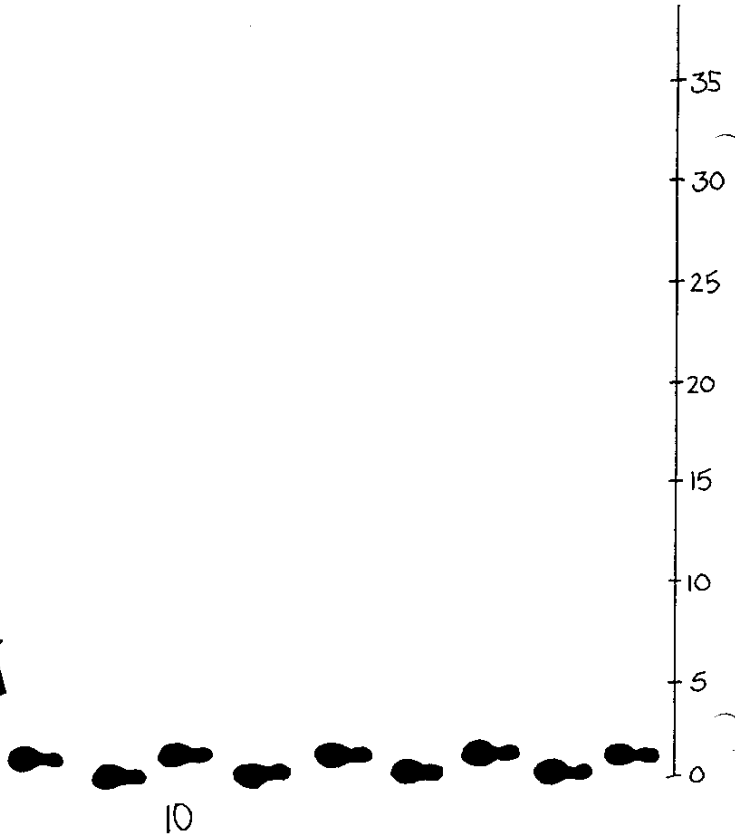


4. Complete the graph of the height of the Charlie's American chestnut tree.

How does Charlie's Tree Size Up ?

Directions:

Charlie is using the Native American method to measure the height of an American chestnut tree. Charlie is 28 meters from his tree. Draw the height of the tree Charlie saw on the scale below. Use this symbol:



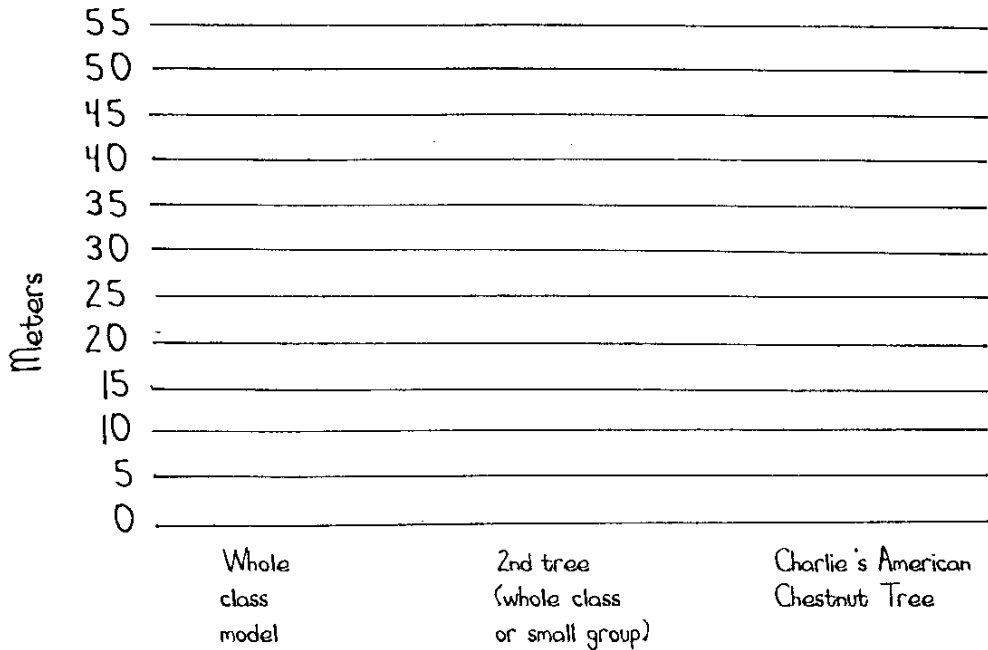
Name:-----

Directions:

Using a bar or a tree shape, show the height of:

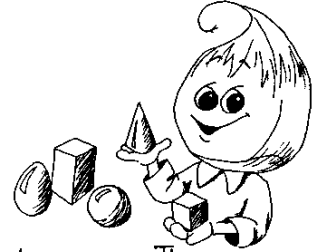
1. the class model tree
2. the student measured tree
3. Charlie's American chestnut tree

Who's the Tallest of them All?



Describe how the height of these trees compare to the American chestnut tree?

Shape of a Tree



What to know:

Each kind of tree provides us with a different geometric shape crown. The crown is that part of the tree which includes the main trunk, all the branches and the leaves. This shape outline, called a silhouette is easy to see when you stand a distance from the tree. Some basic tree shapes include cone-shaped, square, rectangular, oval, and circular. If you are a tree expert, only a quick glance is needed to identify it. The shapes, however, help in identification only if the tree is growing "out in the open" away from other trees. Some trees grow next to buildings which cause a change in the natural shape. Man frequently prunes trees to take a desired shape. Trees growing in heavily forested regions compete for sunlight and mineral nutrients. These factors can alter their shape. If this happens, the expert uses color and texture of bark, and shape and margin of leaf characteristics for identification. Remember, the shapes of trees are open to interpretation. Most importantly, look at trees; see what their shape is really like.

What to learn:

Recognize that tree species have geometric shapes/silhouettes that aid in identification.

Words to learn:

bark bonsai crown margin prune silhouette texture
rectangle square oval circle triangle

What to use:

chalkboard overhead projector

What to do:

1. Review the geometric shapes studied in math. List all of them on the board. Circle the 5 shapes used in this lesson (square, rectangle, triangle, circle, and oval).
2. After completing "Get In Shape," classify the trees according to their basic shapes. Lead a discussion about what students discovered.

Other things to do:

1. Go outside and observe the shapes of trees. Place them in the silhouette categories. (Remember that this is open to individual interpretation.) Make a graph to illustrate tree shapes found.
2. While outside, locate trees whose shapes have been altered by people or nature. (Examples are trees and shrubs that have been pruned, tree branches that have been cut for power lines and phone lines, trees growing against buildings, and trees crowded together.)
3. At home, look for and draw as many tree shapes as possible.
4. Have a speaker come to the class to speak about "bonsai".
5. Go "tree watching" with an expert; this may include a landscape artist, an environmentalist, or a horticulturist.
6. Cut a tree-shape-hole in a poster board. Look at trees to see if they fit the cut-out tree shape.
7. Compare the shape of young trees to the shape of old trees (of the same species).

Name _____

Get in Shape

Directions:

- Using the examples below, draw the outline of the shape on the crown of each tree.



Answer Key for . . .

Get in Shape



White Spruce
(triangle)



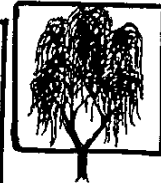
Sugar Maple
(oval)



Lombardy Poplar
(rectangle)



White Oak
(square)



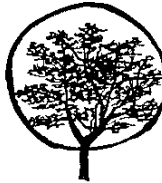
Willow
(square)



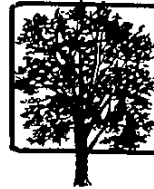
Red Oak
(oval)



American
Chestnut
(rectangle)



Butternut
(circle)



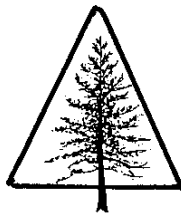
Boxelder
(square)



Beach
(rectangle)



White Ash
(rectangle)



Tamarack
(triangle)



Sweetgum
(rectangle)



American
Elm
(triangle)



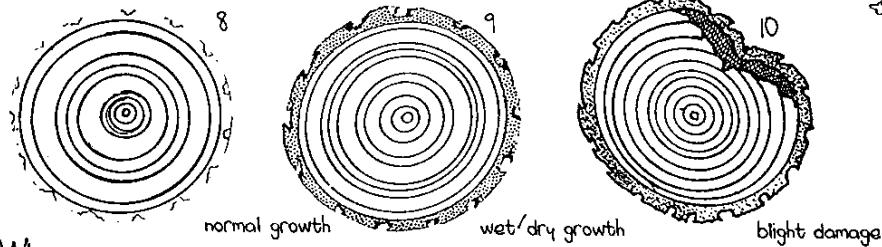
Black
Locust
(square)

Age of a Tree

What to know:

Tree growth results from a combination of water, sunlight, location and temperature. Growth of a tree can be seen by looking at rings in a woody stem cross section. In a good growing season, the rings will be wider. In a poor growing season, the rings will be closer together. Trees grow two rings (one light and one dark) every year. The light ring is generally wider as a result of better growing conditions in the spring. The dark ring is narrower due to less favorable summer growing conditions. Some trees do not show growth rings clearly. Each ring is produced by a thin layer of cells called the cambium. The cambium is located just under the bark. The wood remains compact in the central area of the tree stem. The bark which protects the tree, cracks as the tree expands in diameter and becomes rough.

Some stem cross sections may show irregularities. These may include branches growing out the side of the stem or damage to the tree. For example, American chestnut might show blight damage.



What to learn:

Discover the age of a tree by counting the number of tree rings. (If this stem was cut at 1.5 meters above ground level, then add 5 years growth since it takes the tree that long to reach 1.5 meters and to start having rings visible. The 1.5 meter height is the forestry norm for determining age of a tree from ground level.)

Words to learn:

blight	cambium	circumference	cross section
knot	grain lines	lamine formica	
compact	growth rings	longitudinal section	

What to use:

tree stem cross-section samples hand lens

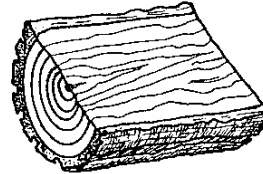
What to do:

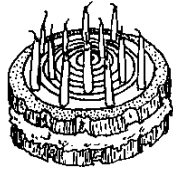
1. Discuss the background information with your children. Ask them how they might determine the age of a tree. (Remember, each year's growth has both a dark and light ring. Begin counting from the first outside ring and count toward the center. Assume that the first ring is the current year.)
2. Allow children to explore features which appear on the stem cross section.
3. Complete the activity "How Old Are You?"
4. Complete the activity "How Old Is Charlie?"



Other things to do:

1. Invite children to look at other pieces of wood available, wooden furniture, including wood grain laminate formica. These wood pieces will most likely be longitudinal sections of the stem. Therefore, the rings will appear as grain lines.
2. Have children look for dark spots and other irregularities. These may be caused by branches (knots), disease, or physical injury.
3. Look for examples of wood which do not show the year growth rings.
4. Go for a walk. Examine trees for damage to the bark and wood, and look where branches are growing on the tree. Draw a cross section of this tree.





Name _____

How Old Are You?

Directions:

1. Use a hand lens, examine a tree ring sample and then sketch what you see below.



1. How many rings did you count? _____

2. How old is your tree? _____

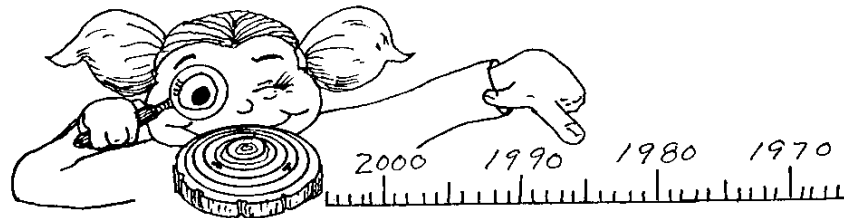
3. When do you think this tree began to grow? _____
(assume that this tree was cut this year)

4. Was this tree already growing when you were born? _____

5. If the tree was already growing, find the ring that represents when you were born. Label this ring on your sketch .

6. Did you discover both wide and narrow rings? _____
What do you think caused the differences? _____

7. Did you observe any dark spots? _____
What do you think caused them? _____



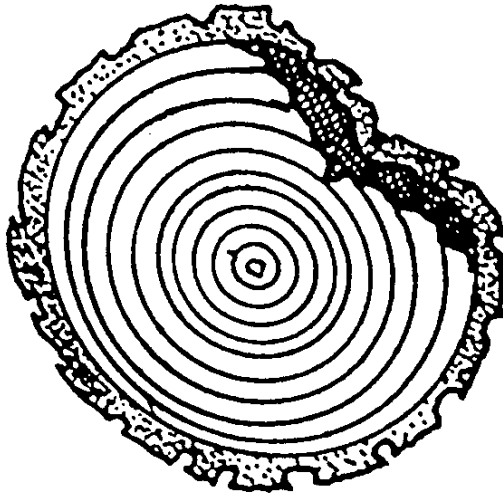


Name _____

How Old Is Charlie?

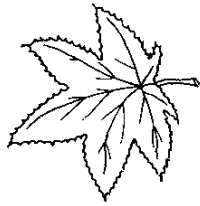
Directions:

1. Using this sketch of an American chestnut tree cross section, answer the questions below.



Begin counting the rings just below (inside of) the bark. Each year the cambium layer of cells (discussed on p. 17) produces one cell layer of bark (which you cannot see) and a tree ring (which you can see). So, the youngest tree ring is the one that you see next to the tree's bark.

1. How many rings did you count? _____
2. How old is this tree? _____
3. Find the place where the blight affected the tree. How old was the tree when the blight first attacked it? _____
4. How old was the tree when it died from the disease? _____
(If this tree had not been affected by the blight, it is possible that it could have lived to be 600 years old!)
5. Label the ring on this tree when you were born. How old were you when the blight first affected the tree? _____



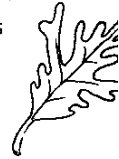
Leaves of Trees



What to know:



Leaves have special characteristics that help us to identify each tree that you see. All leaves are either simple or compound. Simple leaves have one leaf per stem. There are two kinds of compound leaves. Pinnately compound leaves have more than one leaflet attached in alternate or opposite manner along the leaf stem, or petiole. Palmately compound leaves have all leaflets attached at one point on the petiole. This stem is attached to the limb of the tree. Find this information illustrated on the leaf characteristics chart.



When you look at the outside edge of each leaf, you are looking at the leaf's special margin. Some leaves have a very "smooth" edge; other leaves have a "wavy" edge; and yet others have a "toothed" edge. These edges may be further classified by whether they do or do not have lobes. This information also appears on the leaf characteristics chart.



Now look more closely at the lower leaf surface so you can find raised "lines." These "lines" are veins which appear in three main categories: parallel, pinnate, and palmate. When all veins point in straight lines equal distance from the main vein, it is called parallel. If all veins come from the main vein at equal angle and are somewhat parallel with each other, it is called pinnate. When all veins radiate out from one central point at the leaf/stem point of attachment, it is called palmate. See the leaf characteristics chart.

What to learn:

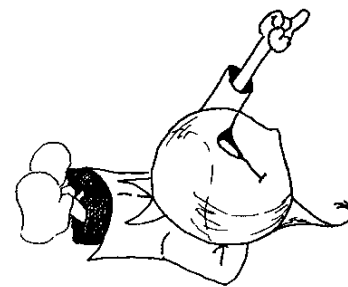


To classify all leaves by type, margin, and vein structure.
To use this information to identify American chestnut leaves.



Words to learn:

compound	lobe	margin	palmate
parallel	petiole	pinnate	simple
smooth	toothed	vein	



What to use:

leaf characteristics chart laminated leaves
freshly collected leaves hand lens



What to do:

1. Go outside to collect leaves or have students bring leaves from home. The collection should be as fresh as possible. Bring it to class in reclosable plastic bags, ironed between waxed paper, or sealed between plastic wrap.

2. Allow the students to observe their leaves. Using the Leaf Characteristics chart, classify them according to type, margins, and vein structure. (Suggestion: Make a transparency of the Leaf Characteristics chart or provide a copy of this chart to each child.)



3. Carefully examine the following laminated leaves with your children: American chestnut, beech, horse chestnut, and Chinese chestnut. Caution: lamination may distort the characteristics of the leaves. Use the information provided on the "Leaf It To Charlie" activity to help them distinguish between the laminated leaves.



4. Complete the activity "Leaf It To Charlie."
5. Now is a good time to use the laminated leaves and discuss the similarities/differences between the American chestnut and horse chestnut or Ohio buckeye. (Teachers: Please stress the fact that a horse chestnut (buckeye) is not a chestnut!)

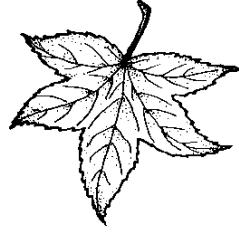
6. Investigate leaves from your collection to find any that fit these descriptions.



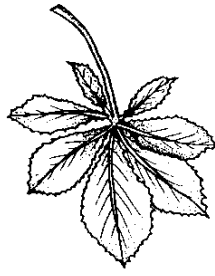
Other things to do:

1. Identify the leaves using field guides.
2. Use leaves to make rubbings, prints, and collages.
3. Give collected leaves onto Venn diagrams to illustrate the overlapping leaf properties.
4. Use leaf rubbings to construct an American chestnut tree on a large bulletin board. Add chestnuts (which contain facts about these trees) to the tree.

Leaf Characteristics



simple

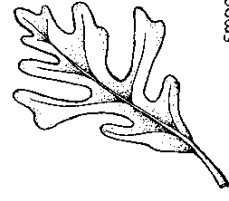


palmately



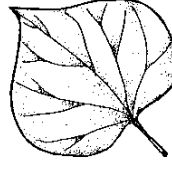
pinnately

compound

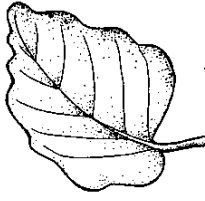


smooth

with lobes



without lobes

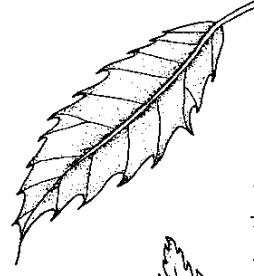


wavy



toothed

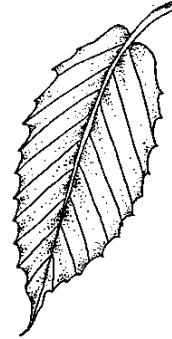
with lobes



without lobes



palmate



pinnate

Types

Margins

Veins



Name _____

Leaf It To Charlie

Directions:

1. Write the letter of the leaf on the blank next to its description.

Description:

Leaves:

American chestnut

simple pinnate leaf

dimensions: 15-20 cm. (6-12 in.) long

4.5-5.5 cm. (1.7-2.2 in.) wide

shape: long, slender, and long tapered tip

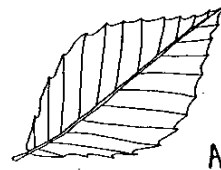
margin: serrated with sharp pointed curled teeth

smooth edge and tapered at base of leaf

other: thin when held up to light; bright green on

top with dull finish; lighter colored on bottom

lacks hairs between veins



Chinese chestnut

simple pinnate leaf

dimensions: 14-20 cm. (5.5 -8 in.) long

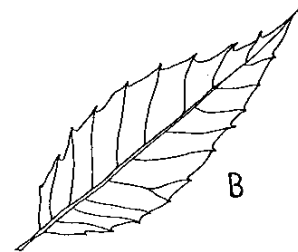
5- 7 cm. (2-2.7 in.) wide

shape: oval and broader nearer tip

margin: serrated with small shallow pointed non-curved teeth

smooth edge and often rounded at base

other: thick dark green on top with a shiny finish; hairy along mid-vein



Beech

simple pinnate leaf

dimensions: 5 - 15 cm. (2-6 in.) long

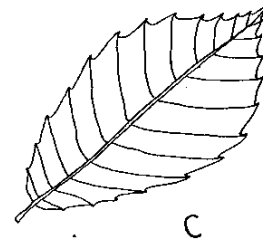
2.5 - 6.4 cm. (1-2.5 in.) wide

shape: wide with tapered ends

margin: serrated with small shallow teeth

smooth edge and tapered at base

other: papery thin; light green in color with dull finish; hairy along margin



Leaf It To Charlie

Directions:

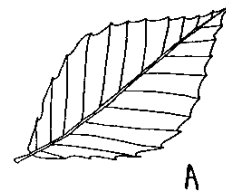
1. Write the letter of the leaf on the blank next to its description.

Description:

Leaves:

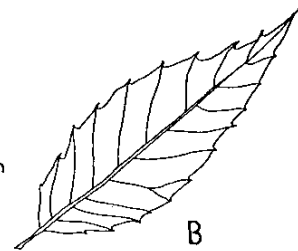
American chestnut _____B_____

simple pinnate leaf
 dimensions: 15 -20 cm. (6-12 in.) long
 4.5- 5.5 cm. (1.7-2.2 in.) wide
 shape: long, slender, and long tapered tip
 margin: serrated with sharp pointed curled teeth
 smooth edge and tapered at base of leaf
 other: thin when held up to light
 bright green on top with dull finish
 lighter colored on bottom
 lacks hairs between veins



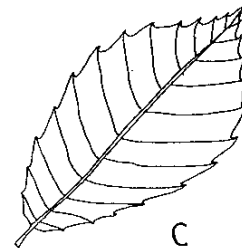
Chinese chestnut _____C_____

simple pinnate leaf
 dimensions: 14-20 cm. (5.5 -8 in.) long
 5- 7 cm. (2-2.7 in.) wide
 shape: oval and broader nearer tip
 margin: serrated with small shallow pointed non-curved teeth
 smooth edge and often rounded at base
 other: thick dark green on top with a shiny finish
 hairy along mid-vein



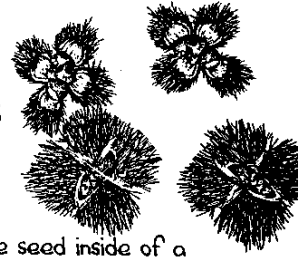
Beech _____A_____

simple pinnate leaf
 dimensions: 5 - 15 cm. (2-6 in.) long
 2.5 - 6.4 cm. (1-2.5 in.) wide
 shape: wide with tapered ends
 margin: serrated with small shallow teeth
 smooth edge and tapered at base
 other: papery thin; light green in color with dull finish
 hairy along margin





Nuts and Burs of Trees



What to know:

A nut is the fruit of some trees. Each nut contains a single seed inside of a hard, shell-like covering. The nut is sometimes covered by a fleshy coat called a bur. This covering usually becomes hard at maturity. Representative tree examples which show enclosed nuts include walnut, beech, and hickory trees. The acorn from an oak tree, however, is an example of a nut that is only partially covered by a bur. Children commonly call this partial bur the acorn's "cap." In the case of the American chestnut tree, three nuts are enclosed within each bur. It is not likely that you will find a bur that is unopened. However, if you look inside of an open bur you will be able to see marks where the three nuts were attached to the bur wall. Bur coverings have many different textures. Some are smooth, some are fuzzy and sticky, and others are spine-covered. The American chestnut is an example of a bur that is very spine-covered.

The American chestnut seed has been enjoyed by people since colonial times. From the mid-1800's, roasted chestnuts sold by street vendors were a popular item. However, once American chestnut trees become infected by the blight and died, the quantity of nuts available for consumption declined. Both European and Oriental chestnuts were imported in order to satisfy the demand.

The nuts of American chestnut trees have always been part of wild animals' diet, and therefore become part of the foodchain. These animals included bear, deer, wild turkey, squirrels, birds, mice and the extinct passenger pigeon.

What to learn:

1. To learn to recognize the bur and nut of an American chestnut tree.
2. To learn the importance of the nut of the American chestnut tree as a food source for people and animals.

Words to learn:

bur nut seed

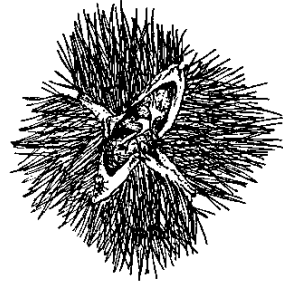
What to use:

Burs and nuts from the kit. CAUTION:
THE BURS ARE VERY SHARP! Use
tongs to pick up the burs!

Nuts: American chestnut, beech, horsechestnut.

Lewis Leaf Chart poster.

Purchased mixed nuts (in the shell).



What to do:

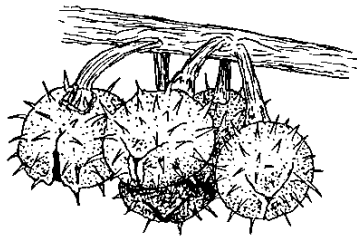
1. Using the background information and the poster, discuss the characteristics of the nut and burr of the American chestnut tree.
2. Do the activity "Going Nuts."
3. Discuss the nut from the American chestnut tree as a food source.
Taste nuts, purchased from the store. If you buy chestnuts from the store, they will be the European or Oriental variety.

Other things to do:

1. Using mixed nuts (must be in the shell) from a grocery store, classify them by as many characteristics as possible.
2. Research the name of the nut, the plant it comes from, and where the plant is grown.
3. Collect and/or try recipes that use chestnuts as an ingredient.
4. Find songs or poems that refer to the chestnut.
5. Play the American Chestnut and Wild Turkey game (see section entitled "Still more things to do . . .").
6. Collect nuts and burs from other trees; identify them.



Beech



Ohio Buckeye





American chestnut

Name _____

Going Nuts

Directions:

-  1. Use a hand lens to examine the American chestnut bur and nuts and the other burs and nuts. Draw what you see.
-  2. List characteristics of the American chestnut bur and nut.
3. Now, look at the other two samples. Draw each bur and nut. List their characteristics.

American Chestnut

Beech

Horsechestnut

Characteristics of bur

Characteristics of bur

Characteristics of bur

Characteristics of nut

Characteristics of nut

Characteristics of nut



Disease of an American Chestnut Tree

What to know:

Diseases are caused by bacteria, viruses, fungi and other agents. The American chestnut tree blight is caused by a fungus. The fungal spores are transferred from tree to tree by birds, insects and the wind. Once the fungus begins to grow in the cracks of the bark, it forms an orange colored canker (blister) on the surface. Below the bark surface, thread-like strings grow in the vascular tissue. This tissue is what allows water and mineral nutrients to move from roots to leaves and transfer of manufactured food to other parts of the tree. When the strings plug vascular tissue, the tree begins to die. At first, only a few small branches show the effect of this choking process; eventually the entire tree dies. Because the fungus is prevented from growing below ground by other bacteria, American chestnut tree roots continue to send up new stem growth each year, even after it has been attacked. As a result of learning this, tree scientists cover small cankers above ground with mud. One process to prevent the spread of the disease is called mud-packing. However, to cover an entire tree with mud packs is not practical. The chestnut tree fungus first arrived in the United States in 1904. By 1950, the blight spread across the natural growing range of the tree. Today, research to prevent the blight is being conducted in the United States, throughout Europe and in Oriental countries.

(View the video "Biological Powerhouse" for more information on current research.)

What to learn:

- To learn what a fungus is and grow one.
- To illustrate how the fungus damages an American chestnut tree.
- To show the speed and distance of the spread of the disease.

Words to learn:

blight canker fungus mold mud packing
spores vascular bundle

What to use:

a slice of bread (Better results occur with bread not containing preservatives.)

disposable pie pan, paper towel, plastic wrap

3 beakers or jars

3 celery stalks

red food coloring (mixture: 50% water, 50% food coloring)

plasticine or modeling clay

What to do:

1. Discuss what a fungus is and how it affects the American chestnut tree from the background information.
2. Do the fungus experiment, "It's All Around Us"
 - A. Put a wet (not dripping) paper towel in the bottom of a pie pan.
 - B. Place a slice of bread on top of the paper towel.
 - C. Cover it with plastic wrap. (Keep the bread moist)
 - D. Put in a dark place for at least three days until mold begins to grow.

CAUTION: Keep mold covered when not observing it. Although not harmful, be careful when looking at the mold. Wash hands with soap and water if you accidentally touch it. Try not to breathe or blow on the mold. You could spread it into the air and get it into your mouth and nose.

- E. With a hand lens, examine the mold for thin threads spreading over the surface. These threads will spread and twist in all directions, forming a soft web. You will see threads with little, dark round sacks on them. These sacks hold spores. Spores are the mold's way of making new cells. When the wind or an insect carries the spores to some damp food, they open and a new thread starts to form. It continues to grow and a new colony is formed.



- F. Do the activity page after the mold has grown.

3. Discuss what a stem is and how the fungus effects this system in the American chestnut tree.

4. Do the celery experiment, "Up, Up and Away."

A. Control- Set up a control experiment. Cut the bottom off a piece of celery. Place it in a jar or beaker of water to which red food coloring has been added.

B. Test 1- Cut the bottom off a second stalk of celery. Also cut a notch about 16 cm. (6 in.) up the stem.

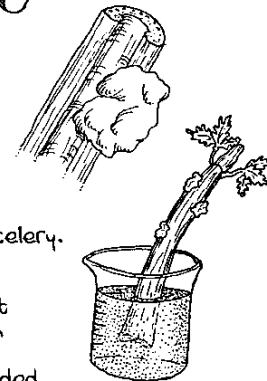
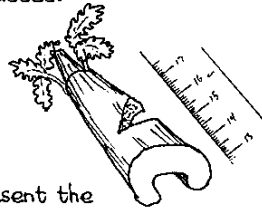
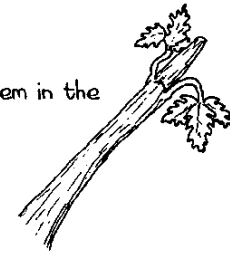
Using modeling clay to represent the blight canker cover the notch. If the clay does not stick, you may need to dry that portion of the celery. Place stalk in jar or beaker of water to which red food coloring has been added.

C. Test 2- Cut the bottom off a third stalk of celery. On this stalk cut three or more notches at different levels, cover each with a clay blight canker. Place the stalk in a jar or beaker of water to which red food coloring has been added.

D. For best results, set up several of these in early morning and make observations throughout the day. Observe one the next day.

E. Do the activity page when you observe the experiment.

5. Discuss the spread of the blight from the background information. Do the activity sheets.



Other things to do:

1. Write to other states' departments of environmental conservation to find out what, if anything, they are doing about the blight.
2. Write to the research centers for information.
3. Design a survey about the American chestnut.

Name _____

Flight of the Blight

Directions: The solid line shows where the American chestnut tree originally grew. List the states where the trees grew.

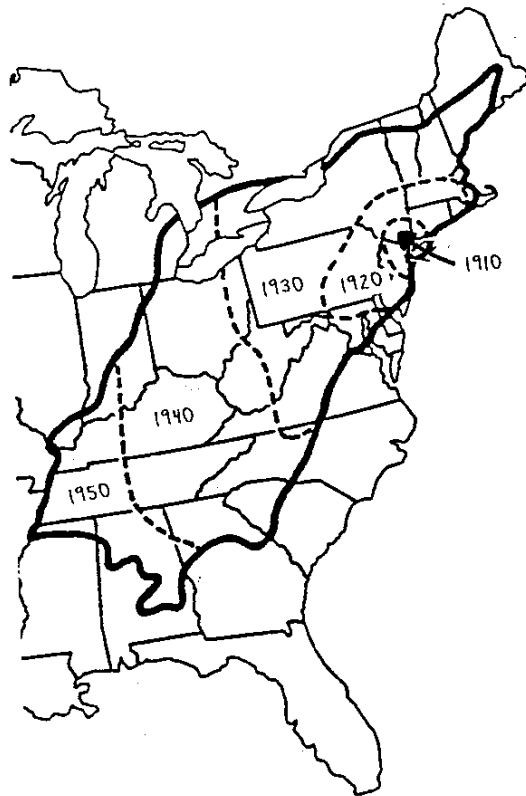
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____



Directions: The solid line shows where American chestnut trees grew. The dotted lines show the spread of the blight over ten year periods. Using the key, lightly color these areas:

- 1910 yellow
- 1920 orange
- 1930 red
- 1940 green
- 1950 blue

Be sure to color in the entire area outlined by the dotted and solid lines.



1. Where did the blight start?
2. When did the blight reach where you live?
3. In the natural range, were any states not affected by the blight?

Name _____

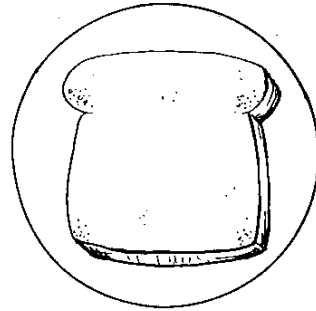
It's All Around Us

Fungus is all around us. It floats in the air or is carried to new places by animals. If the conditions are correct for a particular fungus, it will start to grow. The purpose of this experiment is to grow bread fungus on bread. This growth is a model of how the American chestnut tree fungus grows in cracks on the bark of the American chestnut trees.

Directions:

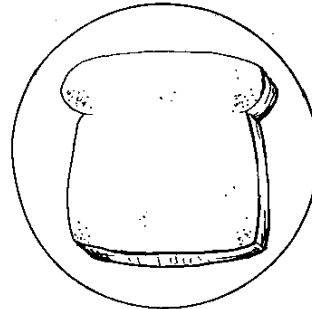
1. Draw a colored picture showing how the bread looked on the day you started your experiment.

Date started _____



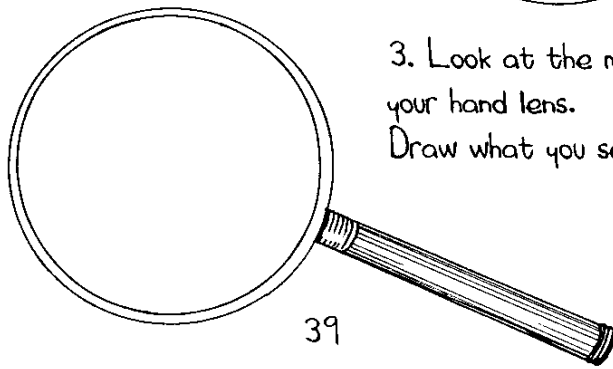
2. Draw a colored picture showing how the bread looks today.

Today's date _____



3. Look at the mold through your hand lens.

Draw what you see.



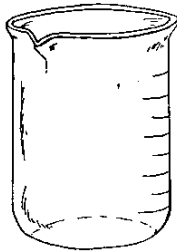
Name _____

Up, Up and Away

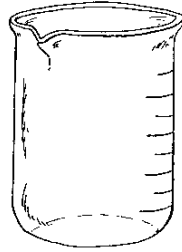
The "strings" in celery are called vascular bundles. They carry water and nutrients up the stem to the leaves. This same process happens in trees. The purpose of this experiment is to observe the flow of water up the stem when the stem is damaged (notched). This damage is the model of how the blight damages the American chestnut trees. Try it for yourself and see what happens.

Directions:

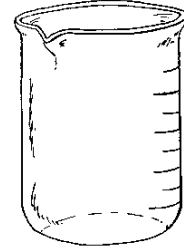
1. The day after you set up the experiment, draw how the celery looks in each beaker. Be sure to use color in your drawings.



Control



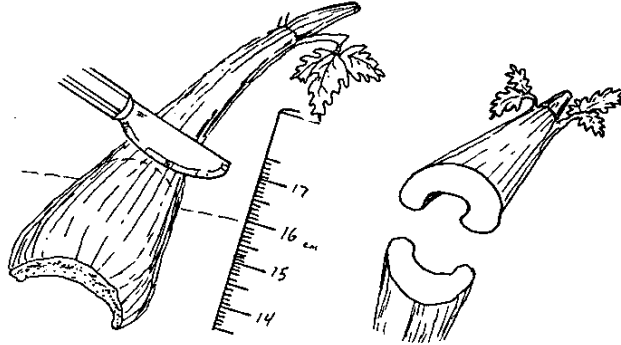
Test 1



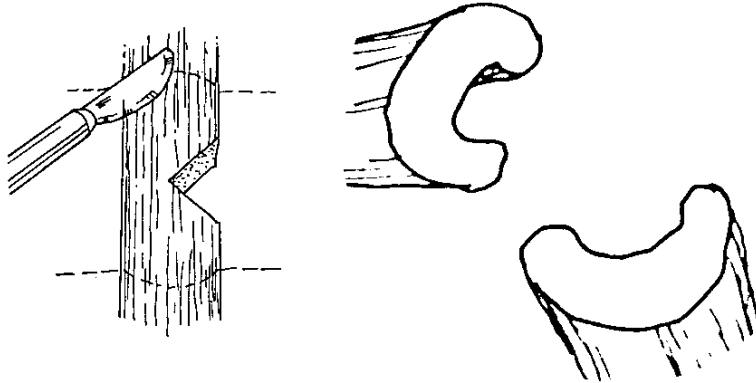
Test 2

2. Carefully remove one stalk of celery at a time.
Observe how the red liquid has traveled up the stem.

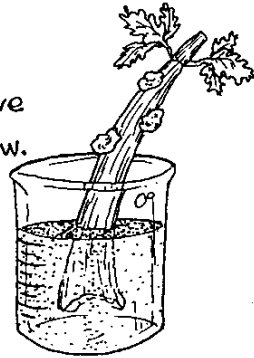
Control celery- Make a slice at 16 cm. (6 in.) up the stem. Using colors, draw what you see on the celery cut surfaces.



Test 1- Remove the clay. Slice the celery 1 cm. below and above the notch. Draw what you see. What do you think happened?



Test 2- Remove the clay. Slice the celery 1 cm. above and below the notches. Record your observations below.





Planting of an American Chestnut Tree



What to know:

American chestnut trees that you see today are susceptible to the blight. However it is expected that experimental genetic research will produce trees for the future that are not susceptible to the blight. Those seeds planted now will become the trees needed for cross pollinating with the disease resistant trees currently being developed. They will also provide new seed sources as older blighted trees produce fewer viable nuts. Thus, the seeds of today will become the trees of tomorrow, helping to ensure future generations of American chestnut trees. It is important to remember that the American chestnut tree does not self pollinate. That means pollen from flowers on one tree cannot pollinate flowers on the same tree. Because of this, trees must be planted close enough together so that the pollen can be easily transferred from one tree to another by wind, insects and birds. This activity is planned for the spring semester.

What to learn:

1. To plant American chestnut seeds
2. To record the growth of the seeds.

Words to learn:

biodegradable	blighted	cross pollination
disease resistant	genetic research	girdling
resprout	seedlings	shade tolerant
susceptible	tree protector tubes	viable

What to use:

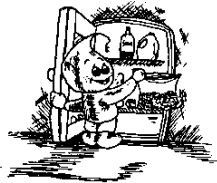
- 8 clean milk cartons
- gravel
- potting soil
- 4 American chestnut tree seeds

What to do before chestnut seeds arrive:

1. Discuss reasons for planting American chestnut seeds. Use information provided in the What to know and other sections of this book. Have students begin keeping a journal with notes, measurements, drawings and/or photos.
2. Collect one 2 liter (1/2 gal) paper milk carton for each nut to be planted. Use clean water only, rinse out cartons. Let cartons air dry.
3. Use a sharp pointed object (awl, large nail, or screwdriver), punch eight (8) drainage holes (two (2) on each side) along the bottom of the box at 1 cm (1/2 in) as indicated. To keep carton from disintegrating, place them on plant trays with drainage channels or on flat trays covered with gravel to collect excess water that drains from the holes.



What to do when chestnut seeds arrive and I'M NOT READY !



If necessary, chestnut seeds may be stored in a refrigerator for up to one (1) week. Place them in a sealed bag filled with moist (not saturated) sphagnum moss.

What to do when chestnut seeds arrive: I'M READY !

4. Put earth, potting soil, or a mixture of both into a large bucket or in a plastic-lined waste basket. Add a small amount of water and mix until all soil is dampened. Then fill each milk carton with soil up to 5 cm (2 in) from the top.
5. Place one chestnut seed on its flat side on top of the soil in each carton.



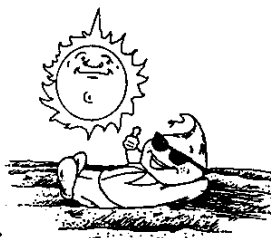
Cover each nut with about 4 cm (1.5 in.) soil. About 1 cm (1/2 in.) of space will be left in the carton. A thin layer of peat moss may be added on top of the soil to help retain surface moisture.



6. Water sparingly. Soggy soils may cause the seeds to decay. Once the seeds germinate, the seedlings (young plants) can also be killed by overly wet soils.

What to do for Spring Recess:

Newly planted seeds and seedlings can go without watering for about two (2) weeks. Ensure that pots with seeds/plants are not in direct sunlight and are well watered the last day before break. So . . . planting may occur at any time after seeds become available. Seed delivery usually occurs around March 1.



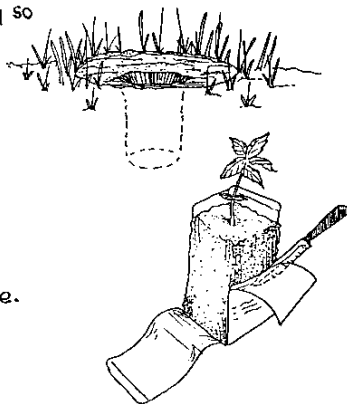
What to do when Transplanting American chestnut seedlings:

When seedlings are about 20 cm (8 in.) tall (usually about four (4) months old), they can be planted in their permanent site. The following information will be useful to you when selecting an optimal location.

- American chestnut trees can be found in either wooded areas with adequate overhead sun or out in the open. They can be quite shade tolerant.
- The soil should be well drained, but moist. Clay soils are not good for growing Chestnut trees.
- Seedlings must be planted in groups of two (2) or more as they are not self-pollinating. The minimum space between trees is 4.5 m (15 ft.) and the maximum distance is 12 m (40 ft.). **OPTIMUM SPACE BETWEEN TREES IS 6 m (20 ft.).**

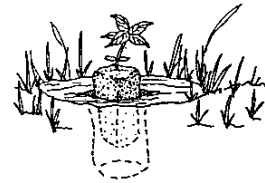
What to do when transplanting seedlings to outdoor environment:

1. Dig hole deeper and wider than is necessary so root system can spread out.
2. Remove grass (sod) in a 90 cm (3 ft) diameter circular area around the hole.
3. Carefully slit sides of milk carton so when placed in hole the box can be easily moved from root ball. Try to keep the soil around the roots. Remember: milk cartons are not biodegradable.



4. Place the root system in the hole so that the root crown is about 4 cm (1 1/2 in) below the original ground surface.

5. Partially fill the hole with soil. Tamp down and dampen soil. Fill hole completely. Tamp down gently with your foot. Water thoroughly.



What to do for seedling protection from animals:

Mice, rabbits and deer are serious problems. They love the taste of your chestnut trees almost as much as they do young apples. Plastic tree-protector tubes are effective for protecting young seedlings against all animals. Planting tubes can be purchased at garden supply stores; they will protect trees from girdling by mice or rabbits and screening will protect taller trees from deer. Count on it! If animals are present they will find and damage unprotected trees. When the trees are older (about 6 years) the pests usually cease to eat them. If a tree is eaten-off, don't abandon it; it will resprout. Chestnuts are very good at this.

Other things to do:

1. Compare the journals of two types of trees, possibly using displays, charts, Venn diagrams, or use other ways to display information.
2. Continue to monitor the progress of the tree growth, if possible.

Some more things for your students to do . . .

(provide additional activities if you can)



Survey your parents, grandparents and other senior citizens to determine their knowledge of the American chestnut tree.

Write letters to other states (east of the Mississippi River) to discover what they are doing about American chestnut tree reforestation; keep a journal of data collected; construct a map.



Make a leaf collection.



Complete library research on how trees are used (illustrate on a tree silhouette).

Discover what animals use the American chestnut tree for a home.

Write "poet-tree"

(Haiku, cinquains, diamante, free).

Write jingles about the American chestnut tree; sing them.

Write "raps" about the American chestnut tree.



Collect recipes which use chestnuts; cook and have a feast.

Complete art projects

(collages, sponge painting, other).



The American Chestnut and Wild Turkeys

(Adapted from a lesson by Peter Miranda)

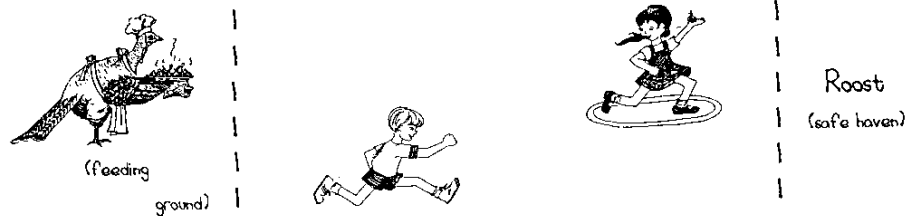
This activity was designed to help students understand the importance of the American chestnut to the once abundant turkey populations supported by its nut crops.

What to use:

- 4 chestnuts (European) for each student
- 1 lunch bag or other container for each student
- 4-6 hula hoops
- 2 pieces of rope
- 3 or more colorful bandannas or strips of cloth

NOTE: The number of hoops and length of string depend on the size of the playing field since they are used as safety zones at each end of the playing field. Other suitable markers may be used to define these boundaries.

Setting: This is a game similar to "Fox and Chickens". It should be played outdoors or in a gym. It has been designed for a class of 25. Materials should be adjusted to the number of actual participants. Set up the room as shown below so there is a safe zone at each end with 4-6 ft. behind each zone.



What to do:

1. Ask if any students are familiar with chestnuts. Determine whether they mean American chestnuts or buckeyes. Discuss the difference and tell them that the American chestnut was once an abundant tree and an

important food source for wildlife (especially wild turkeys) and people. Tell them that this game is going to provide them with data to help them understand how important the American chestnut was to the wildlife in the forest.

2. Explain the playing field as follows:

- a. The inside of the hoops and behind the boundaries are places where the turkeys are safe from predators.
- b. One end zone is a roosting site for turkeys.
- c. The other end zone is the feeding ground where turkeys can find American chestnuts.

3. Choose 3 students to be foxes (predators of the turkeys).

Give each fox an arm band to identify them as predators. Everyone else is a wild turkey and will start each round from the roosting site.



4. The object of the game is for each turkey to start from the roost, cross the playing field, gather only one chestnut at a time and return to the roost without being captured by a fox. The foxes capture turkeys by tagging them.

The rules are:



- Foxes can only hunt outside the safety zones or hoops.
- A turkey can not be captured as long as at least one foot is inside a safety zone.
- Captured turkeys are out of the game.
- A fox may capture as many turkeys as it can but must capture at least 2 to survive.
- Once a turkey has collected 2 nuts, it is a survivor and can remain in the roost.
- A turkey can only gather one nut at a time. This means it must make 2 trips to the feeding ground and back in order to survive.
- 4 rounds of the game will be played, each will last 5 minutes, at the end of which a tally will be made of the survivors.

Any turkeys not captured and not in their roosting site with 2 chestnuts starved to death.

5. Time should be allowed for 4 rounds of the game and predators may change places with a turkey at the end of each round. Before each round, the teacher should distribute a food supply into the feeding ground. Each round should start with the following number of chestnuts, foxes, and turkeys.
- Round 1 2 chestnuts for each turkey plus 5-10 extra, 3 foxes, and all of the turkeys.
- Round 2 Same number as in round 1
- Round 3 5-10 fewer chestnuts than 2 times the number of turkeys, 3 foxes and all of the turkeys
- Round 4 10 chestnuts, the same number of foxes and turkeys as survived round 3.
6. At the end of each round, the data should be recorded on data sheets similar to those in figure 2.
7. After the game is played, provide each student with the following:
- a copy of the data table (figure 2)
 - a graph outline similar to that in figure 3, with the points on the y-axis adjusted to accommodate the data collected by the students
 - instructions to plot the data and draw a line connecting the points
 - an explanation that the reason for the decrease in the number of chestnuts after round 2 and 3 was that the chestnut trees were dying due to a disease. As the trees died, the number of chestnuts produced decreased.
 - instructions for the students to write a description of the chain of events that took place as the chestnut trees "died out" during the course of the game.
8. Have students discuss their reports, providing them with details of the story of the decline of the American chestnut and how the American Chestnut Foundation is working to restore it in the forests.



The American Chestnut and Wild Turkeys

Directions: Record the numbers as requested in the spaces below.

Round	Number of Chestnuts Game beginning	Number of Turkeys End of game	Number of Foxes End of game
1			
2			
3			
4			

Figure 2. Data collected from the American Chestnut and Wild Turkeys game.

Directions: Plot the "number of turkeys" data collected above on the graph below.

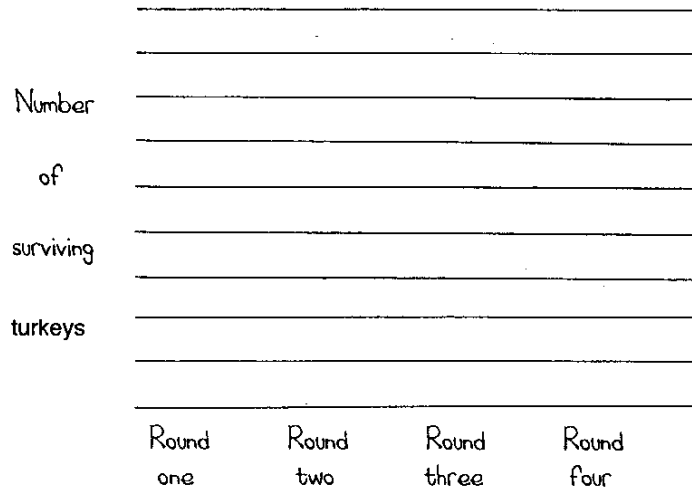
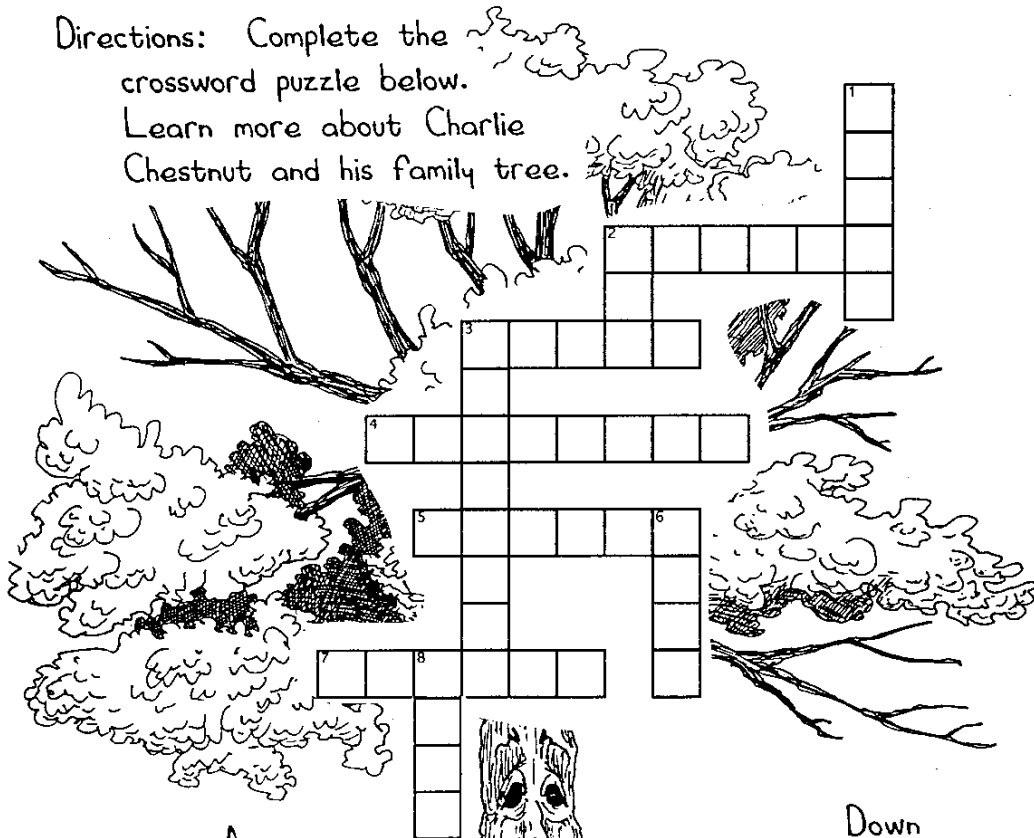


Figure 3. Surviving turkeys in the American Chestnut and Wild Turkey game.

An American Chestnut Crossword Puzzle

Directions: Complete the crossword puzzle below.
Learn more about Charlie Chestnut and his family tree.



Across

- 2 fungus disease
- 3 how blight spreads from tree to tree
- 4 tree on the rebound
- 5 fungus disease
- 7 edge of leaf

Down

- 1 distance around tree trunk
- 2 fleshy coat of nut
- 3 young tree
- 6 plant with a wood stem
- 8 tells age of tree

Charlie Chestnut's Secret Words

Directions: Help Charlie unscramble these letters and find a Chestnut related word.

- 1 t n u -- -- --
- 2 r e t e -- -- -- --
- 3 f l a e -- -- -- --
- 4 u g n f s -- -- -- -- -- --
- 5 g b i h l t -- -- -- -- -- --
- 6 k b r a -- -- -- --
- 7 s n h e c t t u -- -- -- -- -- -- -- --
- 8 s i s e e d a -- -- -- -- -- -- --
- 9 w r g o -- -- -- --
- 10 g i e n e l s d -- -- -- -- -- -- -- --

An American Chestnut Crossword Puzzle

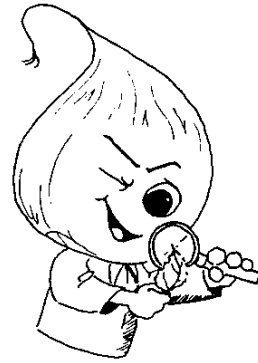
Answer Key

Across

2. blight
3. spore
4. chestnut
5. blight
7. margin

Down

1. girth
2. bur
3. seedling
6. tree
8. ring



Charlie Chestnut's Secret Words

Answer Key

- | | |
|-----------|--------------|
| 1. nut | 6. bark |
| 2. tree | 7. chestnut |
| 3. leaf | 8. disease |
| 4. fungus | 9. grow |
| 5. blight | 10. seedling |



Search for Words about The American Chestnut Disease

Directions: Look at the wordlist provided. Find each word in the letter box. The word may go up, down, diagonal; it may read forward or backward.

I	Q	X	O	K	J	S	C	I	V	X	V	F	U	N	D	I	T
L	F	G	F	C	F	S	G	N	I	L	D	E	E	S	O	R	N
E	L	B	A	D	A	R	G	E	D	O	I	B	V	M	J	Y	A
D	W	X	R	A	E	C	Z	M	T	C	N	L	K	I	A	D	R
D	I	S	E	A	S	E	R	E	S	I	S	T	A	N	T	I	E
C	A	N	K	E	R	H	M	Q	C	G	F	A	E	X	E	D	L
F	H	R	I	C	H	L	K	A	N	E	P	V	R	P	T	E	O
A	U	A	M	C	P	D	C	I	Z	Y	M	C	Z	Y	W	K	T
T	J	N	X	R	F	W	L	X	C	P	Y	I	U	Q	T	U	E
X	H	U	G	B	I	D	F	O	D	G	J	V	U	G	V	N	D
O	M	I	U	U	R	Z	B	Q	H	C	M	I	O	C	Z	I	A
N	L	U	V	I	S	S	H	Q	E	Q	S	C	E	D	Z	V	H
B	L	I	G	H	T	Y	I	V	F	K	Q	C	M	P	K	V	S
G	N	I	K	C	A	P	D	U	M	Y	P	P	P	X	R	K	N
V	A	S	C	U	L	A	R	B	U	N	D	L	E	A	R	W	D
Y	M	E	V	H	T	O	S	B	J	I	U	I	Y	Z	I	N	L

Words to find:

VASCULAR BUNDLE

BIODEGRADABLE

DISEASE RESISTANT

SHADE TOLERANT

SEEDLING

BLIGHT

GIRDLING

MUDPACKING

CANKER

FUNGUS

Search for Words about Leaves

Directions: Look at the wordlist provided. Find each word in the letter box. The word may go up, down, diagonal; it may read forward or backward.

H	K	C	H	B	H	E	U	H	U	H	F	Y	O
Q	S	O	L	T	H	L	L	Q	W	T	C	X	T
M	I	M	O	O	O	Q	U	O	V	I	K	H	Z
F	M	P	S	M	B	O	L	P	I	T	W	Z	S
G	P	O	D	S	U	E	M	G	S	T	M	N	T
J	L	U	F	A	E	L	T	S	B	T	E	F	W
D	E	N	F	F	O	E	T	A	M	L	A	P	L
Y	G	D	L	E	L	L	A	R	A	P	H	F	H
N	I	G	R	A	M	H	Z	N	Q	E	D	S	U
E	T	A	N	N	I	P	Z	V	L	Y	Y	N	J

Words to find:

COMPOUND

SMOOTH

LOBE

PARALLEL

MARGIN

LEAF

PINNATE

SIMPLE

PALMATE

PETIOLE

Search for Words about Trees

Directions: Look at the wordlist provided. Find each word in the letter box. The word may go up, down, diagonal; it may read forward or backward.



Words to find:

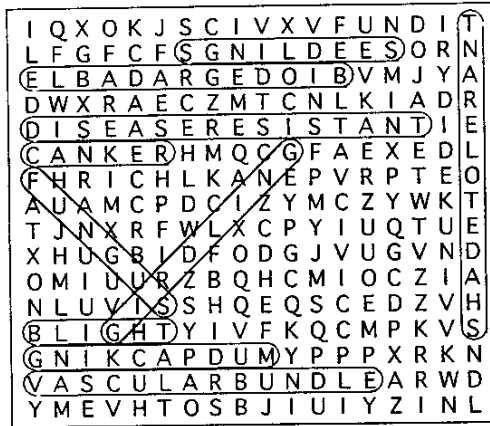
CIRCUMFERENCE
CROSS SECTION
GROWTH RINGS
GRAIN LINES

SILHOUETTE
CAMBIUM
CROWN
GIRTH

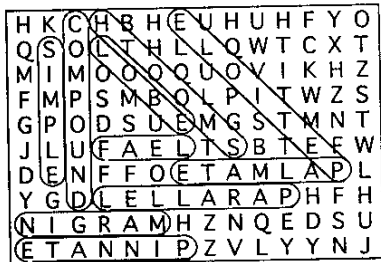
KNOT
BARK

Answer keys

Search for . . .



Words about The American Chestnut Disease



Words about Leaves



Words about Trees



Early signs of American chestnut blight as it affects the tree may not be easy for you to see. However, when leaves turn color before the fall season and they fall, leaving bare branches, closer examination may show other symptoms of the disease. You may find orange splotches on the trunk and small shoots (stems) may begin to grow upward from around the base of the tree. Color this picture.

Words to learn . . .

Key

(*) words from activities

(no *) words from video

bark* covering of tree trunks and limbs outside of the wood; usually rough on older tissue, smooth on young growth; outside of cambium layer.

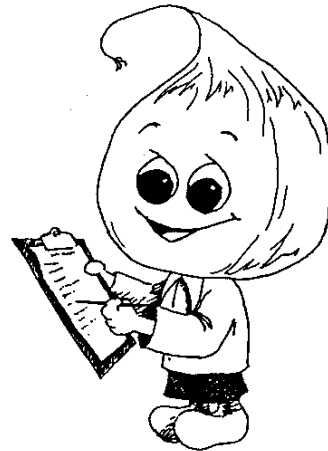
Beech bark disease a fungus which attacks beech tree bark causing death of the tree.

beneficial useful; American chestnut wood was used for rail fences and furniture; the tree provided food for wildlife and for man.

biodegradable* material that breaks down naturally in the environment.

biological powerhouse the American chestnut influenced the environment in many positive ways: took in carbon dioxide, produced oxygen, and released water to the atmosphere.

blight* a fungus which plugs the water and food carrying vessels in the American chestnut tree; this causes the tree to die.



bonsai* a special type of dwarf tree caused by special trimming of the roots and stems; planted in small pots.

botanist a person who is trained as a specialist in the understanding of plants

bur a fleshy coat which covers a nut

cambium* layer of cells between the wood and the bark; it produces both of these tissues.

canker* a blister-like rough bark section; may have orange spots along the trunk of an American chestnut tree.

cash crop any plant that can be grown and then sold for money or for exchange of goods; American chestnuts may have been considered as a cash crop.

circumference* the distance as measured on the outside of a circle or ring.

compound leaf* a leaf that has a main stem or petiole with small leaflets extending from the sides or the end.

cross pollination* a process where pollen is transferred from a flower on one plant to a flower on an entirely different plant of the same species.

cross section* the flat view of a stem that you can see when you cut through the circumference.

crown* that section of a tree above ground which bears leaves; provides the tree with its respective silhouette.

diameter the distance from the edge of a cross-section through the center to the opposite edge of the cross-section.

disease resistant* a plant, in this case the American chestnut, that has the ability to prevent diseases from infecting the body.

distinguished to separate out due to a special set of circumstances; to have special characteristics.

dormancy a body or organism that is presently in a suspended state; a period of inactivity.

Dutch elm disease a fungus disease spread by a beetle; this disease killed most American Elm trees.

ecosystem the interactions of all living things with their environment within a community.

fungus* an organism that gets its food from other organisms; in the chestnut blight, the fungus gets its food from the tree and kills the tree in the process.

gene a tiny structure which helps to pass characteristics (what things look like) from generation to generation.

genetic research* investigations that examine how characteristics of an organism may be changed; chestnut researchers expect to produce a blight resistant strain of tree.

germinate the process where a seed opens; a root comes out; the seed coat is pushed off when the leaves come out.

girdling* a condition where the fungus forms a canker which surrounds the tree trunk; this stops all flow of water upward and food downward in the trunk.

girth* the distance around the trunk of a tree.

grain lines* marks that you see in the wood of cabinets, tables, shelves or other wooden objects.

growth rings* circular lines that you see when looking at a tree stump or end of a log; a light colored ring next to a dark colored ring represents one year of growth.

hybrid the combination of a genetic characteristic from one organism with the same type of characteristic of another organism to form a slightly different characteristic in new offspring.

identification use special features or characteristics to find the name of a structure or organism.

imported brought into the United States from another country.

isolated set aside from the rest of a group of organisms; not in contact with a group of organisms.

knot* generally a dark circular spot found in the grain of wood which tells that a limb or branch extended from the trunk of the tree at that point.

lamine formica* a man-made (synthetic) imitation of wood which is glued to a lower quality of wood.

life span the time from an organism's birth until its death.

lobe* the extending structure of a leaf; it may be pointed or round in shape.

longitudinal section* a lengthwise cut through a log, tree trunk or stem which goes from outside edge to outside edge.

majesty regal or royal; awesome looking.

margin* the edge of a leaf

mature of an age where the organism has all of the characteristics of an adult.

mold* a type of fungus; an organism which does not carry on photosynthesis; these organisms consume their host or once living matter.

mud-packing* covering the canker with mud; bacteria and other microorganisms found in the mud attack and kill the American chestnut fungus; not a practical way to destroy the fungus on every tree.

Native American* an individual who has his/her origins in North American.

palmete* 1. a type of compound leaf where all leaflets extend outward from an endpoint of the petiole like a hand with fingers; 2. a type of leaf vein structure where all veins extend outward from the petiole attachment point to the leaf.

parallel* a type of leaf vein structure where all veins run in straight lines alongside the mid / main vein.

parasitic a situation where one organism lives on and at the expense of another organism; oftentimes the host dies in this relationship.

petiole* the stem of the flattened structure of a leaf (blade) which attaches the leaf to the limb.

pinnate* 1. a type of compound leaf where all leaflets extend along the petiole in either alternate or opposite arrangement; 2. a type of leaf vein structure where veins extend from the mid/main vein at equal angles.

pollen the "grains" of genetic material which move from the anther or male part of a plant to the pistil or female part of the plant so that seed production may occur.

pollination the act of moving the pollen grain from the male plant structure to the pistil or female plant structure.

propagation increasing the number of off-spring.

prosper to increase or to gain.

prune* to cut off or shape by trimming.

range the distribution or natural area where an organism lives.

ravaged damaged or destroyed; no longer looks like it did under normal circumstances.

resistance the ability to fight off or prevent from happening.

resprout* the ability of an American chestnut to send up new stems with leaves surrounding the base of the dead tree trunk; looks like a bush.

seedling* a young plant which recently emerged from a seed.

self-sterile a condition where transfer of pollen from one flower to another flower on the same plant does not result in fertilization of the seed.

shade tolerant* the ability of an organism to live within the shade its entire life.

significant very important.

silhouette* the outline shape of an organism.

simple leaf* one leaflet attached to the petiole.

smooth margin* the edge of a leaf which lacks spines, teeth or lobes.

spores (fungus)* microscopic size objects produced by fungi which spread through the air; like a seed, they allow a new organism to begin developing when they reach proper growing conditions.

stigma the sticky tip part of the pistil (female flower part).

style the tube-like structure of the pistil (female flower part).

susceptible* an organism which is able to be easily attacked by an invading organism; the American chestnut's bark (cracked) allows for blight spores to enter the tissue and cause harm.

texture* the feel of a surface; smooth, rough, sandy . . .

toothed margin* the edge of a leaf that looks like edge of a saw blade.

traits characteristics which make an organism look and act as they do.

tree protector tubes* plastic tubes to slip over American chestnut seedlings to prevent animals from browsing the leaves.

vascular bundle* the cell tissue in a plant that allows water to flow from the root to the leaves and the tissue that allows manufactured food to travel to other parts of the plant, including the stem and roots.

vein* the structure you see on the lower surface of a leaf which contains the vascular bundle.

verification that you are able to find the same information again; you confirm previously gained information.

viable* able to germination; able to grow.

virtually in nearly all situations.

vital so important that without this other things cannot happen.

What else do I need to know . . .



Two video tape programs: *The Biological Powerhouse* and *The Life and Times of Charlie Chestnut* are available for teachers to use with their children. *The Life and Times of Charlie Chestnut* is especially appropriate for children in grades 3-5. *The Biological Powerhouse* is more appropriate as teacher background and for upper grade children.

Seed orders can be made at any time; seed delivery will only be made between March 1 and April 15. A special order form is included in this curriculum guide. Each seed packet contains 10 seeds. When seed is in stock, turn around time from request to receipt of order should only be a few days.

Questions about the American Chestnut Foundation can be obtained by writing to:

New York State Chapter
American Chestnut Foundation, Inc.
c/o Buffalo Museum of Science
1020 Humboldt Parkway
Buffalo, NY 14211
716-896-5200

The American Chestnut Foundation, New York State chapter is pleased that you are using this activity guide to help youngsters learn more about a tree species that is on the rebound.

More books about Trees . . .



A Tree Is Nice by Janice Udry

Be a Friend to Trees (1994) by Patricia Lauber; HarperCollins; NY

Freddie, the leaf by Leo Buscaglia

Horton Hears a Who

Important Trees of Eastern Forests by the Forest Service (US Department of Agriculture)

Nature (through science & art) by Susie Criswell (1994); TAB Books; Blue Ridge Summit, PA

Project Learning Tree (PLT) Activity Guide (1987) by the American Forest Council

project WILD (1992) by the Western Regional Environmental Education Council

Protecting trees and Forests (1991) by Felicity Brooks; EDC Publishing; Tulsa, OK

The Giving Tree by Shel Silverstein

The Last Forest (1973) by Laurie Glick; Young Readers Press, Inc. (Simon & Schuster); NY

The Lorax by Dr. Suess

Trees (April 1996); a special premier issue of Dragonfly; a magazine for young investigators;
National Science Teachers Association; NSF supported

Trees of Your State (NASCO Nature Study Aids, Fort Atkinson, WI)

What Tree is That? by The National Arbor Day Foundation; Nebraska City, NE



As you teach the unit (or parts of the unit), introduce these and other special books that you are familiar with to help your children gain a better understanding about trees.



Seeds for classroom use . . .

A \$30.00 fee provides you with A Tree On The Rebound activity guide with reproducible pages and Kit Materials with class set of viable seeds for the first year. The fee includes newsletters and other educational correspondence. Please check if this is your first year in the program ().

Chestnut Seed Order Form

Name: _____

School: _____

Street: _____

City: _____ State: _____ Zip: _____

Work Phone #: _____-_____-_____

Number of seed packets requested:

_____ 10/pkt _____ 20/pkt _____ 30/pkt

For successive years, an annual fee of \$10.00 is required to help defray the cost of seeds, newsletters, and postage. Please state here () the number of years you have completed this program.

***Remember:** Trees must be permanently planted outdoors in groups of two (2) or more as they are not self-pollinating. They must be planted no farther apart than 40 feet. Please plan accordingly when ordering seeds.

Date seeds will be needed: _____

(available between approximately March 1 and April 15)

Send order to: New York State Chapter
American Chestnut Foundation, Inc.
131 California Street
Williamsville, NY 14221

Meet the authors . . .

- * **Don Birdd** is a Science Educator at Buffalo State College and Museum Education Associate at the Buffalo Museum of Science, both in Buffalo, New York. His science teaching experience spans thirty years at all age levels--nursery through adult education. Don worked with a writing team from the New York Chapter of the American Chestnut Foundation to create a childrens' video "The Life and Times of Charlie Chestnut."
- * **Sandy Falsioni** teaches at Truman Elementary School in the Lackawanna City School District, Lackawanna, New York. She is the Science Mentor for her building. Sandy uses the American chestnut as the focus of teaching a plant unit to young children. She was a 1996 NEWEST award recipient, jointly sponsored by NSTA and NASA.
- * **Barbara Ann Newton** teaches at Springville-Griffith Institute Middle School, Springville, New York. Barbara is involved in several environmental programs, including those at the Roger Tory Peterson Institute. She has presented programs about the American chestnut at professional meetings, detailing her efforts with children. Barbara is a member of the New York Chapter American Chestnut Foundation writing team which created a childrens' video "The Life and Times of Charlie Chestnut."
- * **Dianne Tiede** teaches at Sidway Elementary School in the Grand Island School District, Grand Island, New York. Dianne is the coordinator of Eco-Island, an environmental education center which is open to students in the Grand Island School District. Developer of the education program, she has created the hands-on activities found throughout the center. She has always taught a plant unit; now this unit will have a focus on the American chestnut.

Meet the artists . . .

- * **Jim Gielow** is a senior Fine Arts major at Buffalo State College. He works as a graphic artist at Buffalo State's Ferguson Planetarium, currently working on the visuals for the next in-house produced program. Jim completes free lance assignments for individuals and groups.
- * **Kristina Laurendi** is enrolled in her senior year at Buffalo State College where she will earn a Bachelor of Fine Arts degree in painting. In addition to completing free lance assignments of wall sized murals in public elementary schools and for religious organizations, Kristina has worked for and continues to serve as a volunteer at Buffalo's Albright-Knox Art Gallery.