4-H FORESTRY PROGRAM Unit A

TREES

member's manual

Contents

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Acknowledgements

This educational material has been prepared for 4-H use by the National 4-H Forestry Development Committee composed of representatives of the Cooperative Extension Service of the U.S. Department of Agriculture and State Land-Grant Universities. It is published by the National 4-H Council with technical and financial assistance from International Paper Company.

Special appreciation for technical assistance is extended to Michael Bolin, University of Illinois; Joseph Buhaly, Washington State University; Vernon H. Burlison, University of Idaho; Clyde D. Chesney, North Carolina State University; Dr. Pete W. Jacoby, The University of Arizona; Dr. John F. Kundt, University of Maryland; Dr. R. T. Marks, Extension Service, U.S.D.A.; Dr. Cecil Mayfield, Auburn University; Will A. McElfresh, Virginia Polytechnic Institute and State University; Dr. Kemp L. Swiney, Extension Service, U.S.D.A. and George D. Walker, University of Georgia and to Herman Hossfeld, International Paper Company. Principal author for this unit was Vernon H. Burlison. Special recognition also is given to Barbara M. Parramore, Raleigh, North Carolina, principal editor.

The National 4-H Forestry Program consists of three units. Unit A-Trees xplains what trees are, how they grow and why they are important. Unit B-Forests--is about trees as a part of the forest. Unit C-Forestry-is concerned with how people manage trees and other forest resources so they will produce wood, protect soil and water supplies, provide wildlife shelter and recreational areas. The most logical way to use this program is to start with Unit A and take the lessons in order through Unit B. Then, select those lessons in Unit C in which you have the most interest.

A1 What a tree is and how it grows

Unit A will help you to know how trees differ from other kinds of plants. You will know how they grow and reproduce. You will learn differences between trees so you can identify them. Get a notebook or recordbook. In it, keep a neat, complete and accurate record of all that you do in your 4-H forestry project. In your record, include the date you started and the date you finished each thing you did. Write a clear description of what you did and your results.

Meeting 1
WHAT IS A TREE?

A tree is a woody plant. It usually has a single stem or trunk and branches. It grows at least 20 feet (six and a half meters) tall. A well-defined crown or tree top is present when a tree is fully grown. Trees that are all the same kind are grouped together. A single grouping is called a species.

A shrub is also a woody plant. But it is different from a tree in the following ways: A shrub has several or many stems. Usually it is less than 20 feet (six and a half meters) tall. Shrubs form a clump and do not have a well defined crown.

Most *species* that are trees are always trees. Most shrubs are always shrubs. However, under certain bad conditions, some trees may take on a shrub-like appearance. And, under very good conditions, some shrubs may become tree-like.

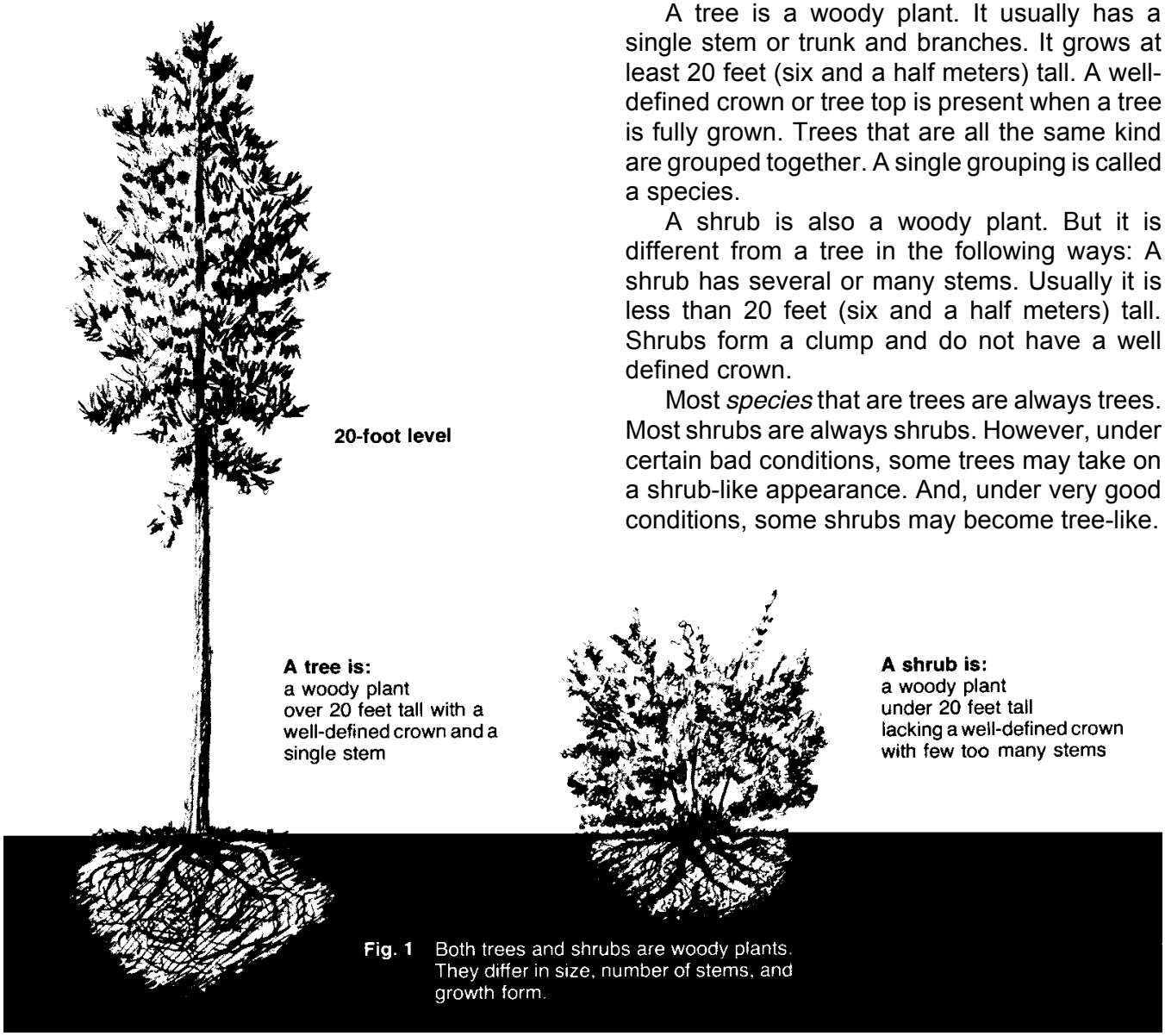


Fig. 1 Both trees and shrubs are woody plants. They differ in size, number of stems, and growth form.

Things to do

1. In a park, woodland or forest, take a walk with someone (club member, friend, member of the family). Select some plants. Decide whether each plant is a tree or a shrub.
2. Make a poster or three-dimensional exhibit The poster should clearly show others what a tree is and how a tree differs from a shrub.

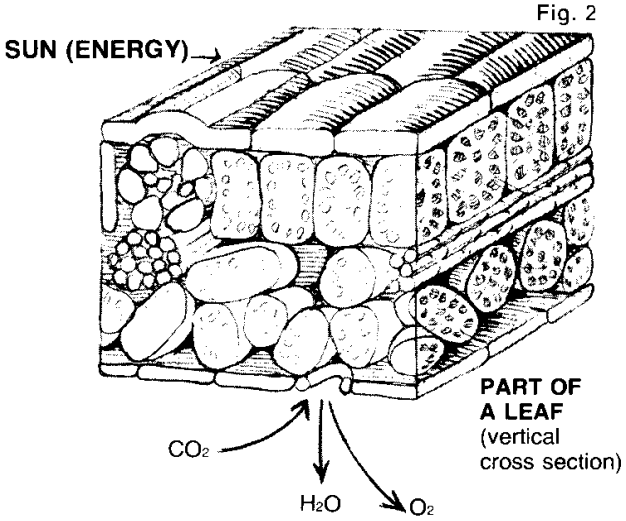
Parts of a Tree

There are three main parts or sections of a tree: the crown, the trunk and the root system. (See Fig. 2)

Crown:

The crown is the part of the tree that bears limbs or branches. The crown includes the twigs, buds, leaves, flowers and fruits. Sometimes, we may use the term live crown for the living branches. Dead crown is used for the part with dead branches. Sometimes, trees grow close together. Then, the upper branches may cause such dense shade that the lower part of a tree's crown will be dead and the upper part alive. Tree insects, diseases, old age and fire also may cause trees to have dead portions in their crowns.

Fig. 2



Leaves take in air through very small openings called *stomata.* Through a process called *photosynthesis,* leaves make food from water, soil nutrients, and carbon dioxide from the air. Light and heat from the sun furnish energy for this process. Leaves give off moisture and oxygen.

Trunk:

The trunk is the main stem or *bole of* a tree (See Fig. 3). In some trees, the trunk continues to the top of the crown. In others, the trunk divides into branches not far above the ground. Generally, coniferous trees have a central trunk that extends up through the crown. The trunks of many *broadleaf trees* divide into large branches if the broadleaf trees are not growing close together. We use trunks of trees to make lumber,

Buds at tips of branches and top of tree get longer, adding new growth to twigs and leader, thus increasing crown width and height.

Fig. 3

Root hairs take up water and dissolved mineral nutrients from the soil. The nutrient solution is transported in the sapwood (xylem cells) of the roots, trunk, and branches to the leaves.

plywood and many other products. The stem, bark, branches and leaves can be made into some kinds of paper and particle board.

Roots:

We seldom see the root systems of trees. Some tree species develop a large main root that goes rather deep into the ground. Examples are the ponderosa pine and black oak. Side roots are called laterals. These divide many times until they are reduced to the size of hairs near the ends. A deep central root of a tree is called a *taproot.* Some trees have no main or central root. Examples are the Engelmann spruce and American elm. They have several roots of nearly equal size. These roots come from the bottom of the trunk at or just below ground level. Usually, none of these roots go deeply into the ground. If they do, they are not over two feet (60 centimeters) long. This root development is called shallow or *spreading* roots.

There is more to a tree than what meets the eye. The trunk of each tree has several parts. Each has its own job to do. The leaves of a tree are its food factory. The large roots of a tree are its anchor; the very fine roots gather moisture and nutrients.

Trees growing on moist land usually have shallow roots. These trees reach shallow soil moisture. Trees that grow on dry land usually have taproots. The upper soil may be dry for long periods. The long roots grow toward moisture underground. A few species have both kinds of roots. These have a shallow root system when growing on moist land. But they develop deep roots, sometimes a taproot, when located on dry land.

The roots of trees serve two main purposes:

1. Large roots hold or anchor trees firmly. Roots help protect them from blowing over or uprooting in ice, snow or strong winds. Roots also support trees in flood waters. Trees with taproots are more windfirm than trees with spreading roots. The large tree roots may be called *anchor roots*.

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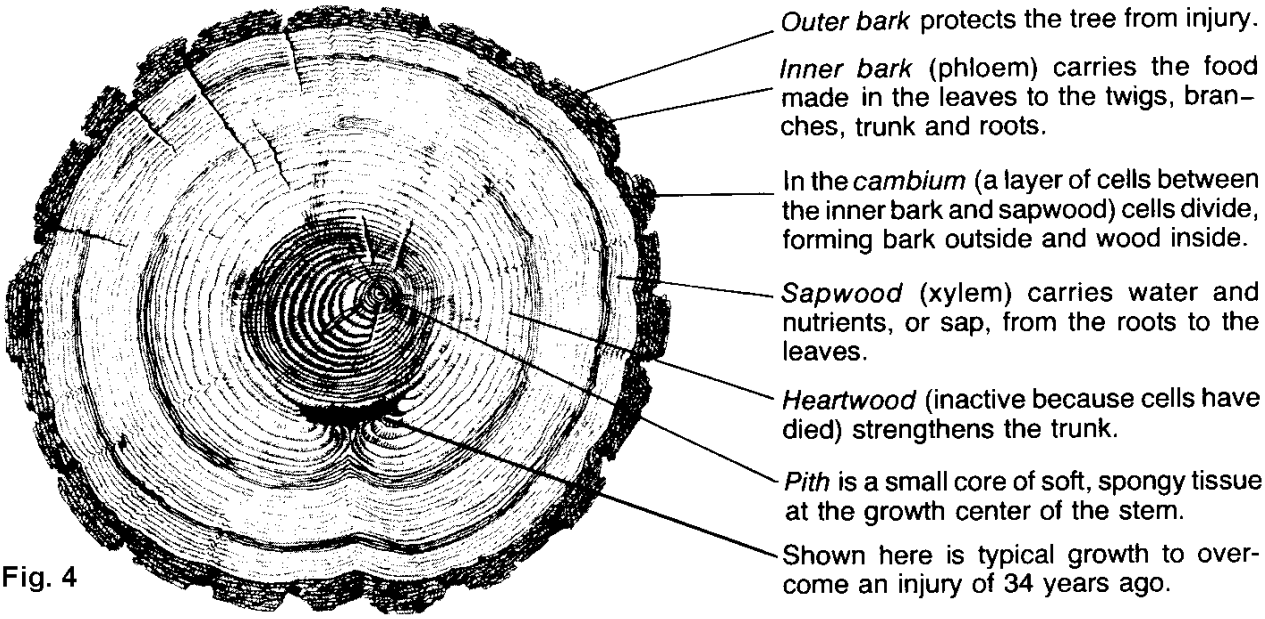


Fig. 4

The buds, cambium, and root tips are the growing parts of a tree.
A tree has breathing pores over its entire surface (leaves, twigs, branches, trunk, and roots) through which it takes in oxygen.

2. Very small roots are called *feeder roots.* These absorb moisture and small amounts of dissolved mineral nutrients from the soil. These feeder roots help in the food-making process for the leaves. The very finest divisions of the roots are called *root hairs.* These are near the tips of the feeder roots. The roots of a tree may spread widely. Sometimes, the roots spread out farther than the edge of its crown. But usually the roots cannot go as deep into the ground as the crown grows above the ground. The roots of a tree are about one,tenth of the tree's total weight.

A tree will be hurt if its roots are mistreated. Roots may be harmed by compacted soil, prolonged flooding and deep burying. Roots can be hurt from exposure to sun and wind. Roots don't like being dug up, heavily pruned or broken.

Things to Do

3. Cut a cross-section of a tree stem or large branch. Label the parts and give the function of each part.

4. Give an illustrated talk on how a tree grows.

Meeting 2
How Trees Grow During Four Seasons

In seasonal climates, trees grow only part of the year. Their growth starts in the spring when the average daily temperature becomes warm enough. Not all kinds of trees begin their spring growth at the same time. Some trees, such as willows, start growth while the nights are still quite frosty. The black locust and other trees wait until warmer weather arrives. We first see the buds burst in the spring. Then, tree growth is usually fast for six to eight weeks. Growth continues on through the summer, but is slower because of hotter weather. Less water or moisture slows growth, too. In some places, the weather is warm year round. There, tree growth may be controlled by wet and dry seasons.

Cells are the building blocks of trees. The cells in the buds and root tips get longer. This growth adds length. The twigs, branches and roots get longer. The tree gets taller. Under the tree bark is a layer called the cambium. The cells in the cambium layer divide which makes new growth inside and outside the cambium possible. The new cells become bark cells when outside, and wood cells inside the cambium.

As the tree becomes older, the bark becomes thicker. As it grows, the stem, twig, and root become larger around. Cell division in the cambium really adds a thin shell of new wood. This covers all the tree's living wood. This new wood covering is called an annual ring. Each annual ring has two parts: the springwood and the surnmerwood.

New wood cells and new bark cells are added by this cell division (See Figs. 4 and 5). When this happens, the tree gets larger around. The wood growth is called an annual ring. Trees usually have good growth conditions in the spring. Then, the cell divisions in the cambium go on at full speed. Fast growth continues until lack of moisture or hot temperatures slow it down. Through the summer, cell division in the cambium continues, but at a slower pace. This change in how fast the tree grows each year is what causes two parts of the growth ring. The springwood (or early wood) is formed during the early, rapid growth period. It is less heavy or dense than the surnmerwood (or late wood). The greater density of the surnmerwood is due to thicker cell walls. Due to its greater density, the surnmerwood usually is darker in color than the springwood. In some species, the annual rings may be very difficult to see. Examples are the yellow-poplar, aspen and cottonwoods. This is because their springwood and the summer wood look very much alike.

Check the Glossary of Terms with your leader. A science book or encyclopedia will help you learn some of these new words.

Things to Do

5. Make an exhibit that shows the growing parts of a tree - the buds, root tips and cambium. Also, show the meaning of: terminal bud, leader, whorl and internode.

6. Visit a park, woodland or forest and identify as many as you can of the following: seedling, pole, terminal bud, determinant growth, current growth, sapling, leader, mature tree, indeterminant growth, crown.

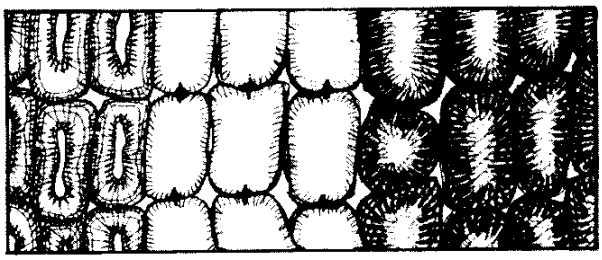
7. In early spring before new growth starts, plant three very similar tree seedlings in pots. Let them stand several days to see that they survive the transplant. Then, stand one upright. Place the second one in a horizontal position. Turn the third upside down. Keep them all watered. Note how they react as new growth develops. Try to find an explanation for what happens.

8. With the aid of a microscope or a 10-power magnifying glass, closely examine very thin cross sections of five of the following: inner bark, rootlet, bud, sapwood, softwood, leaf stem, cambium, leaf, heartwood, hardwood.

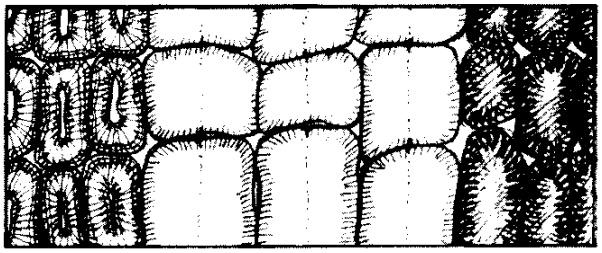
9. Determine the average height growth of 10 small vigorous trees of about the same size. Measure or estimate the leader growth by each tree during the last complete growing season. Express the average, current-height growth in inches or centimeters (1 inch =2.54 centimeters).

Fig. 5

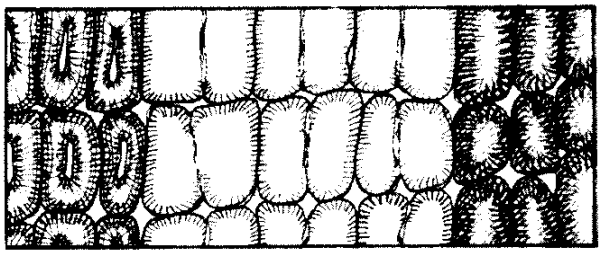
Cambium cells enlarge and divide during the growing season. New wood cells and new bark cells are added by this cell division activity of the cambium, resulting in diameter growth of the trees. (Pressure pushes out bark.)



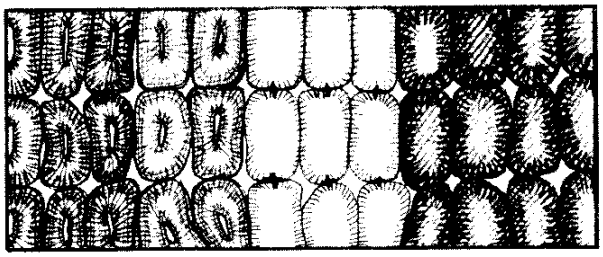
1. Cambium cells live between wood and bark cells and are visible only with a magnifying glass.



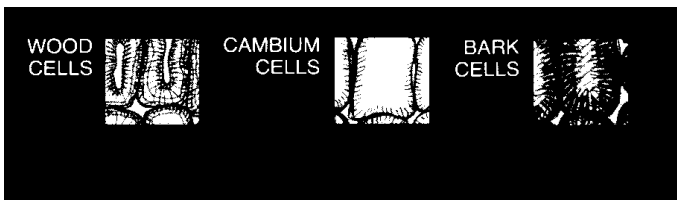
2. Cambium growth widens tree trunks, limbs, and roots.



3. Then cambium cells divide, forming wood cells toward the center of the tree and bark cells toward the outside.



4. The new cambium cells begin the growth process again.



Meeting 3
Finding The Age of a Tree

You may figure out a tree's age while studying how a tree grows. The pattern of growth rings also tells much about the tree's past. A tree's growth history is recorded in its annual rings. Let us look at various ways to tell a tree's age and read its growth history.

Ring Count

Trees add a growth ring each year. In most species, these growth rings are easy to see. We may look at a cross-sectional surface of the tree bole. The top of a fairly recent stump shows growth rings. On a stump, we can count the annual rings. We start from the pith and count to the inner bark. Then, we have the number of years the tree lived after it reached the height of the stump. We can get the total age of the tree. We estimate how many years it took the tree to grow to stump height. Then, we add this number to the count of annual rings to get the age of the tree when it was cut. (See Fig. 4)

There is also a way to count growth rings without having to cut down the tree. This is by use of an *increment borer.* Foresters use this tool often. The increment borer is an auger with a hollow tube. It bores into a tree. A core of wood is forced into the tube. The core can be removed to show the growth rings. These are counted to determine the tree's growth. Again, years are added to the count to allow for growth to the height of the boring. We usually add five to seven years. Taking a core from a tree does very little damage. (See Fig. 6)

Annual growth is reduced during periods of stress. Then, the rings will be narrow and appear crowded. During favorable periods, growth is increased and the rings are much wider. The record in the annual rings shows the tree's growth responses to changes. The most recent annual rings tell us how the tree is progressing at present.

Things to Do

10. Estimate the ages of five trees by counting annual rings on the stumps.

11. Estimate the current ages of five -trees by counting annual growth rings on cores obtained by use of an increment borer.

12. Find five young coniferous trees that grow one set of side branches each year. Estimate their current ages by making whorl counts. Or, estimate the current ages of five deciduous trees by counting terminal bud scale scars.

13. Write a life history for a tree. Base the history on what you can assume has happened

as shown by the pattern of its annual growth rings.

Other Things to Do

Here are some other interesting things you can do in this lesson. Try some of them.

14. Using an increment borer, determine the average diameter growth rate of 10 trees about the same size. Express the average growth rate in the number of years it took to make the last two inches of diameter growth. (NOTE: In your sampling, count the number of growth rings in the outer inch of wood on one side of the tree). Why may trees of the same size have different ages? Ask an adult to help you with this activity.

15. Make a poster or 3-dimensional exhibit that shows the growth stages in the life of a tree. Before constructing it, list some important points to include in the exhibit.

16. Find an evergreen tree that has a color difference between the upper and lower sides of the leaves. In the early spring, before the tree has started growth, gently twist the end of a twig so that the undersides of the leaves are turned upwards. Carefully secure the twig in that position. Note what happens when the new growth develops on the twig. Try to find a way to explain what happens.

17. Demonstrate that a tree gives off moisture from its leaves during its growth processes. A clear plastic bag may be useful.

18. How would you demonstrate that trees must have light for growth? Try your idea and record the results.

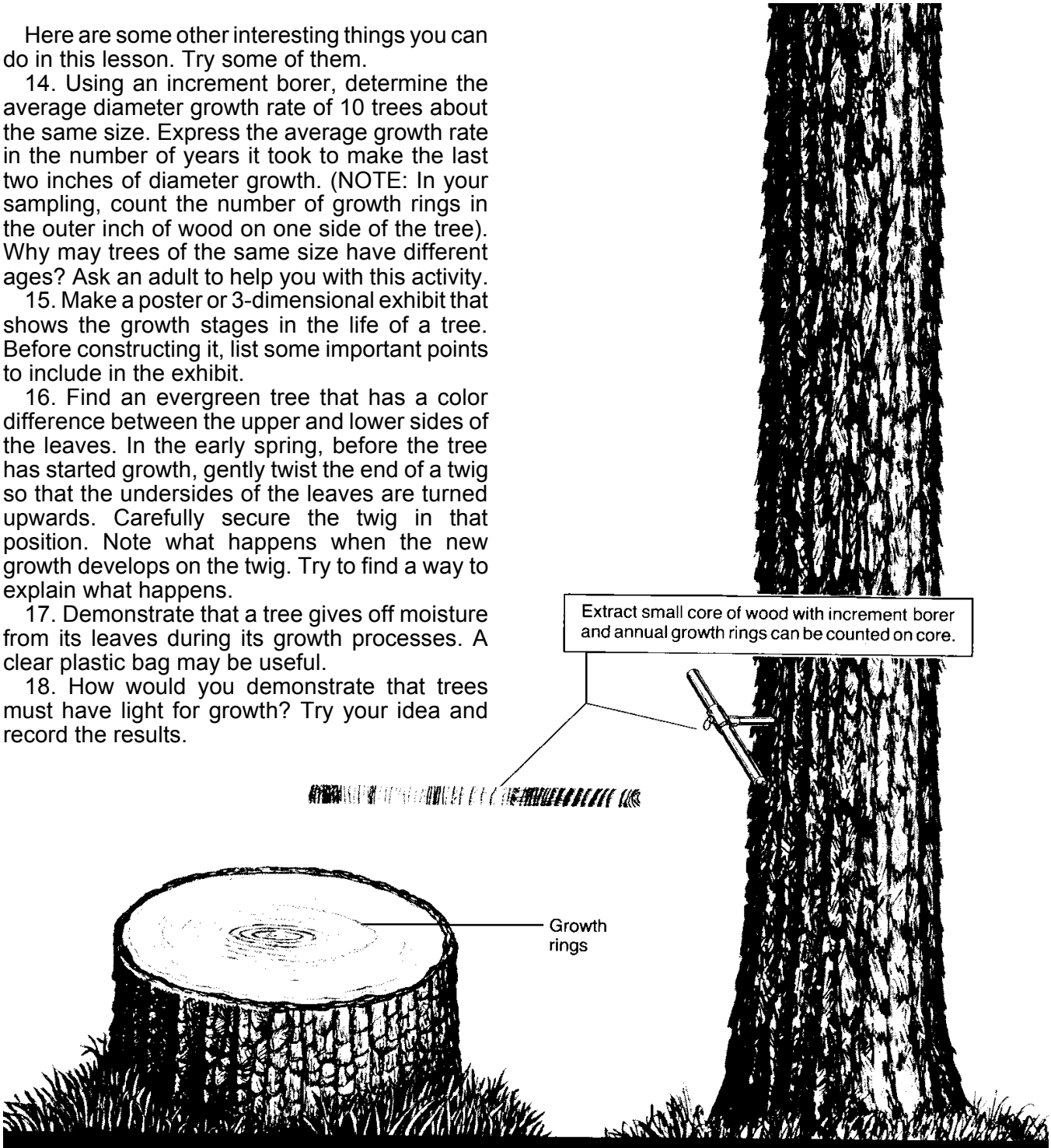


Fig. 6

A count of the annual growth rings in a stump or a log will give the age of the tree's stem at that point. An increment borer can be used to find the age of a standing tree.

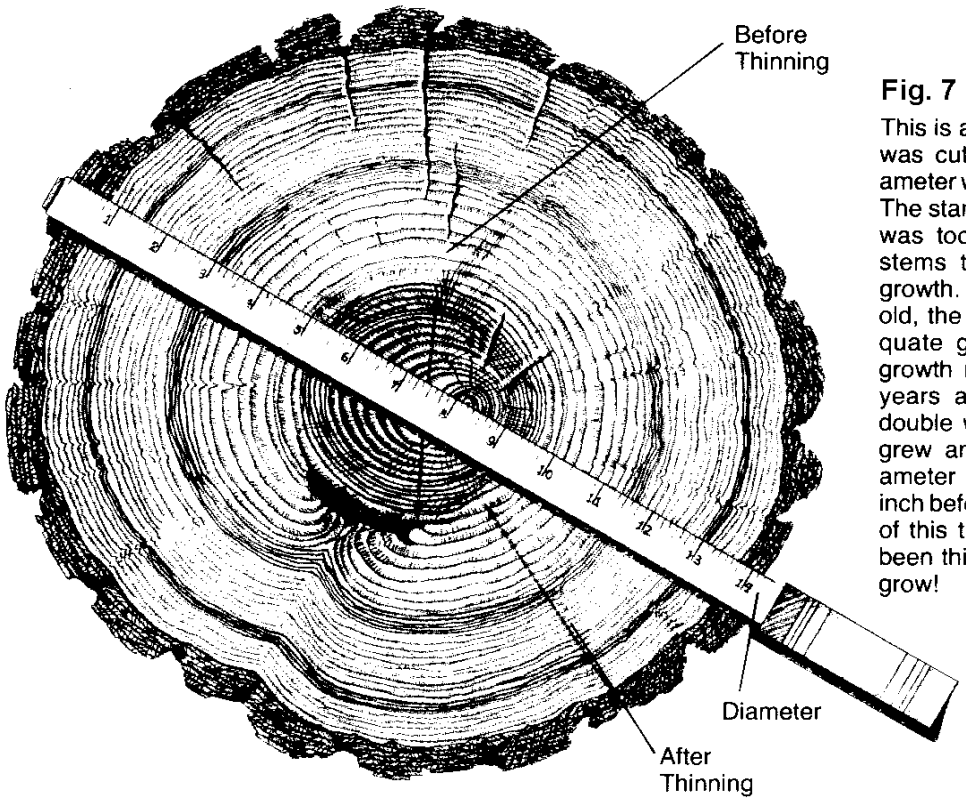


Fig. 7

This is a cross-section from a tree that was cut at 40 years of age. The diameter was 14-inches outside the bark. The stand where this tree was growing was too thick (i.e., it had too many stems too close together) for good growth. When this tree was 25 years old, the stand was thinned. With adequate growing space, the diameter growth rate of the tree during the 15 years after thinning was more than double what it was before thinning. It grew an average of 0.47 inch in diameter afterwards compared to 0.22 inch before. Imagine what the diameter of this tree might be if the stand had been thinned when the tree started to grow!

A2 How Trees Reproduce

Trees reproduce in several ways. Some ways are natural and some are artificial. Reproduction of trees by seeds is a natural way. Reproduction by grafting is artificial. This lesson is about the ways that trees reproduce.

Meeting 4
Natural Reproduction

Seeds - Trees bear fruit containing seeds. These seeds may grow into trees. Cones, beans, and nuts are tree fruits. As the fruits ripen, the seeds develop. Each tree seed contains an *embryo, which* will grow into another plant just like its parents.

When tree fruits are fully grown we say they are mature. The seeds may be released in various ways. Sometimes fruits with the seeds enclosed fall to the ground. Seeds of some species are very fight. They may be plumed or have wings. Seeds with wings may be carried long distances by the wind. Seeds that are too heavy for the wind roll downhill. These seeds are scattered by gravity, animals, birds and sometimes by water.

A tree seed settles on the ground. There it will germinate and grow if conditions are good. Some tree seeds mature in spring or early summer (as in willows, cottonwoods, and some elms). These seeds begin to grow quickly after settling in a good spot.

Seeds of most trees do not mature until late summer or early fall. These do not begin to grow untfl the next spring. Seeds of pines, spruces, oaks and ashes are examples. The seed has a covering. The covering or seed coat in some trees lets moisture through easily. Such seeds will germinate quickly. Others, such as the black locust, have hard seed coats, and will not grow unless the seed coat is broken or weathered. Moisture may be shut out for a long time.

Sometimes, we help scratch the seeds. Scratched seeds have been washed in acid. Or they may be tumbled with hard objects to make the seed coats thinner. Then the seed coats will let in moisture. Seeds of most conifers need a period of cool, damp weather before they germinate. The seeds may be mixed with a small amount of moist sand and kept in the refrigerator for six weeks or longer. Nature does this naturally on the ground over the winter.

Things To Do

1. You can learn more about seeds by germinating some where you can watch them. Select two or more kinds of tree or shrub seeds. Find some garden or crop seeds, such as beans, corn squash or peas. Check Figure 8 for the set-up and follow these instructions: Collect your materials (seeds, glass container, paper towels, moist peat moss, sawdust or garden compost to fill the container and water). A quart-size wide-top jar makes a good container. Use more than one jar if you want to experiment with more than four kinds of seeds. Line the container with paper toweling. Fill the container with peat moss or other material. Pour in enough water to fill about one inch in the bottom of the container.

Place the seeds between the paper and the glass just below the level of the peat moss or other filler. Put the container in a window where it will be warm and get some sunlight. Keep the inside material moist, but not wet Watch for first signs of growth in the different kinds of seeds. Observe the development of roots and leaves. Keep notes on what happens. Give the date of each observation note.

2. Collect at least five different kinds of tree or shrub seeds. Make an exhibit or chart to show how they might be scattered in nature. Show the action of wind, water, animals, birds and gravity.

3. Grow some tree seedlings. Germinate some of the tree seeds you collected. Remember, some must be treated six weeks or more, or over winter before germination. Keep a record on the germination time needed. Observe and write down the development of the tree seedlings for six weeks. If you have space where you can plant your tree seedlings, plant them so they will have the opportunity to become trees.

4. Stratify some seed of a forest tree species at least 6-8 weeks. (Stratify means to put the seed in a cool, moist place much like winter conditions.) Your leader, a forester or teacher may suggest seeds that need to be stratified or weathered.

5. Plant a sample (25, 50, or 100 seeds) of your stratified seed. At the same time, plant an equal sample of unstratified seed of the same species. Compare the germination rates of the two samples. Which started to grow first?

6. Make a graph comparing the germination rates of the stratified and the unstratified seed samples. Count the number that germinates at five day intervals.

Sprouts may grow into trees. Tops of some trees may be killed by fire or removed in logging or land clearing. Some stumps or roots have the ability to start new growth. The new stems that start from stumps or roots are called sprouts. If the sprouting starts from the wounded part of the tree, the new growth is called a stool shoot. If the sprouting starts from a hidden bud on the trunk or stump (that is, below the cut or wounded area) the new growth is called a coppice sprout or coppice shoot.

Many broadleaf trees will sprout quickly. Most conifers will not sprout at all. Most willows and poplars develop many sprouts. Black locust also produces strong sprouts on young stumps. Aspen trees will reproduce by sprouts when all the trees are cut. Redwood stumps also develop many sprouts. Redwood sprouts usually will grow faster than seedlings of similar age. Some species sprout naturally from the roots even though the parent trees are not harmed. These are trees such as quaking aspen, white poplar, black locust, honeylocust and bitter cherry.

Suckering is another form of new growth. It is similar to sprouts. It is not actually reproduction. *Suckers* grow on some species when the crown is severely hurt. The crown may be reduced by pruning or by natural causes. This new growth comes from buds hidden in the bark. The buds remained hidden because they were shaded and branch growth takes place in the crown. Branching may occur on some species when long-shaded tree trunks are suddenly exposed to sunlight. Very few species of conifers will develop these lower branches on older trees. But grand fir and shortleaf pine ar e two that will. Some species grow suckers much more quickly

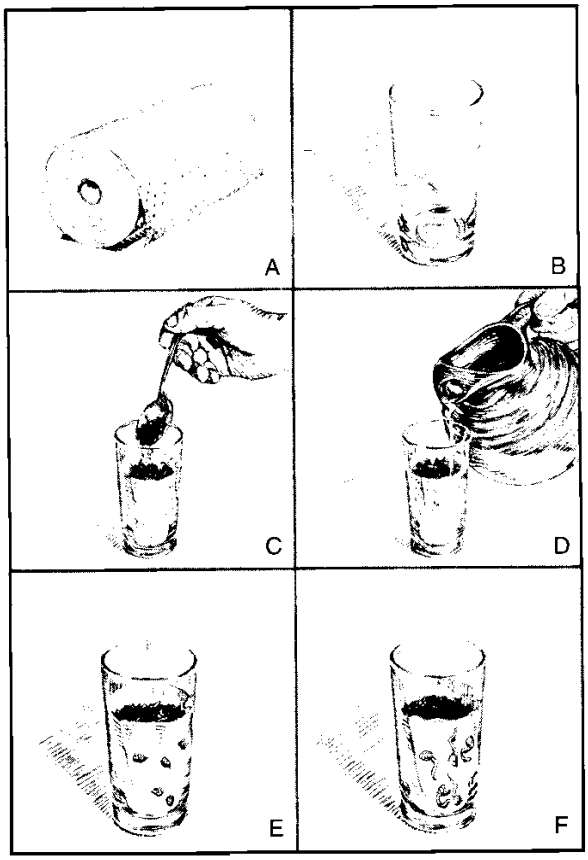


Fig. 8

than others.

Layering - A low branch may get covered by leaves, needles or soil near its tip. Roots may start at the covered point. The growing branch tip looks like the parent tree. In time, it may become a separate plant. Layering is like sprouting. It is not an important method of reproduction for trees. Layering is sometimes used by foresters to start new plants. The new plants will be exactly like the parent plant (See fig. 9).

Things To Do

7. Look for examples of sprouts and suckers along a city street, or in an orchard, park, or woodland. See if you can find both coppice sprouts and stool shoots. Take pictures or make sketches for your record.

8. If there is a wooded area, cut off a broadleaf sapling near the ground in late winter or early spring if you can obtain permission. Check the stump every month to see what progress it makes in sprouting.

9. If you can obtain permission, severely prune the top of a broadleaf sapling or a shrub in late winter or early spring. Then check it every month to observe the development of suckers or new branches.

10. In a park or woodland, look for a natural example of layering.

11. In the fall, cover a foot-long section of a broad leaf tree or shrub near its tip with soil. During the next growing season, check to see if the branch *layered.* Did it develop roots where it was covered?

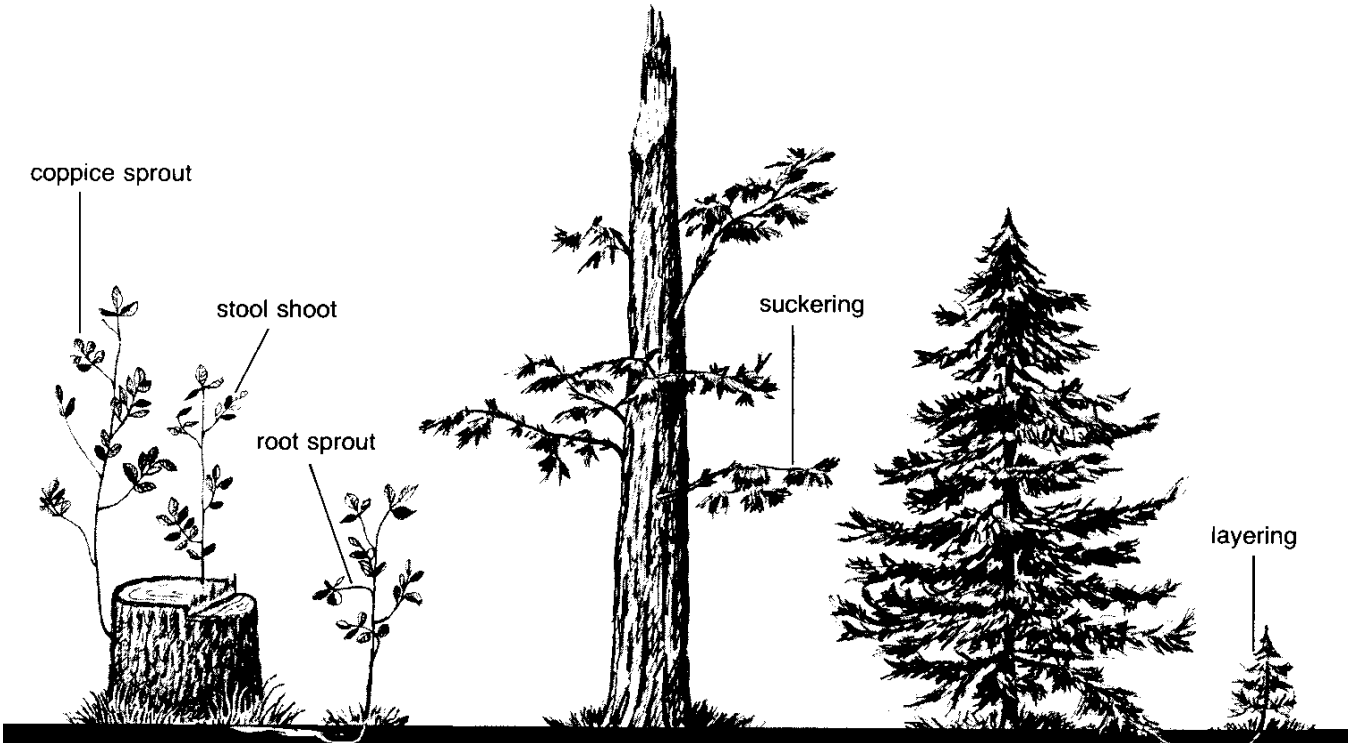


Fig. 9

Meeting 5
Artificial Reproduction

Cuttings - Most trees that *will* sprout will also grow from cuttings. A cutting is a short piece of a strong branch or stem of the past season's growth. Usually, a cutting is made about 9 to 11 inches or 25 centimeters long. It should be long enough to contain five buds. It is then planted with three buds under the ground and two above.

The buds above ground are to ensure a new stem. Roots develop at the buried buds and base of the cutting. Cuttings are a means of *artificial reproduction* of some kinds of trees and shrubs. Willows and poplars frequently are grown from cuttings. This is because the seed of these species are very light, difficult to handle, and short-lived. Cuttings from those trees quickly form roots and grow well. (See Fig. 10).

Things To Do

12. Make some cuttings. Plant them in a rooting medium made of 4 parts peat moss, 4 parts sand, and 2 parts top soil. Keep medium moist and observe the cuttings' development for eight weeks.

13. If you rooted a number of cuttings, plant them for a private or public purpose. Trees may be planted for beauty, shade, screen, wind protection and wildlife habitat. Obtain permission before you go on land that belongs to someone else.

Budding and Grafting - Another artificial means of reproducing trees is to select a bud or a strong twig. This is called a *scion.* Graft or attach the scion to another plant called the host. Many methods are used. Only the main ideas will be given here. If you are interested, there are Extension Service bulletins on grafting. **Information can** be found in almost any public library, too.

Two kinds of trees or species have to be nearly alike for grafting. Even within the same species, there will be some trees that are not enough alike. Tissues of the host tree and of the graft have to grow together. The host rootstock or tree must be able to unite with the tissues of the grafted scion from another tree.

The host tree should be trimmed for grafting just before the graft is made. The scions from another tree should be as fresh as possible. Never allow them to become dry. Match the inside bark edges on the scion and the host as carefully as possible. Give the new graft some protection against the weather. This is needed until the scion has united its host. (See Fig. 11)

Things To Do

14. Arrange to visit a nursery, park, orchard or estate. Study the different methods of artificial tree production that are used. Ask a nursery worker, horticulturist or gardener to explain why artificial reproduction is used. Ask them to demonstrate budding, grafting or other reproduction techniques.

15. Graft a bud from one tree to the rootstock of another. Observe it to see if it lives. Or, using the wedge graft technique, graft a scion from one tree to another. Observe it to see if the graft is successful and the scion lives. Some trees can reproduce in still other ways. A piece of fresh bark with the cambium still attached from the lower trunk of some trees will start new growth. In a few species, the leaves have the ability to root and start new plants. Root sections of several deciduous species will sprout and grow if kept in moist soil.

None of these methods are really important in natural tree reproduction, but are like insurance for those species that have the ability.

Cuttings are pieces of strong young branches that will take root if given good care. They need to be planted in moist soil. They should be kept well watered during the first growing season. Willows and some other species will root in water, but the roots are not as sturdy as those which develop in a soil mixture.

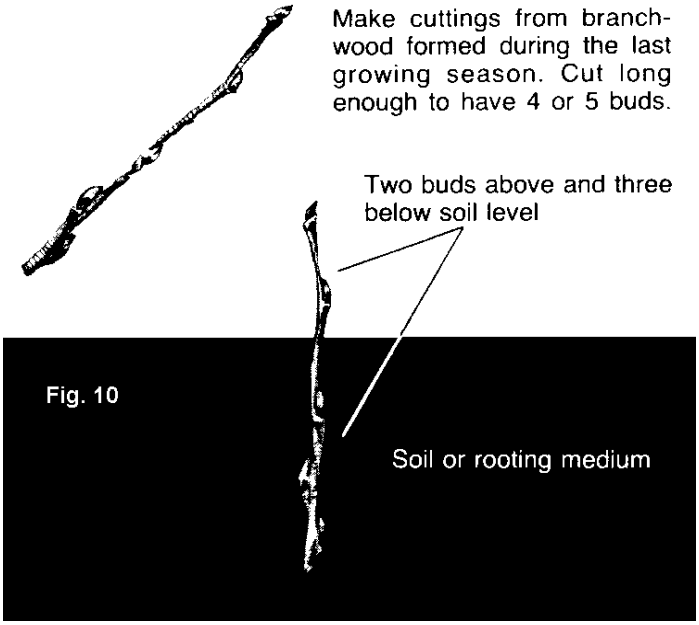


Fig. 10

Other Things To Do

Here are some other interesting things that you may wish to do in this lesson. Try some of them.

16. Collect the fruits (cones, nuts, pods, samaras, etc.) of at least five different kinds of trees and make a display to show the differences among them.

17. Make a poster or a 3-dimensional exhibit that illustrates the different ways trees can be reproduced both naturally and artificially.

18. Establish your own home forest-tree nursery.

19. Plant the seedlings produced in your nursery for some private or community purpose, such as Christmas trees, windbreaks, roadside beautification or reforestation.

A3 Tree Identification

This section will help you learn how trees differ. By these differences you will find out how to identify trees that grow in your own area. In your notebook or recordbook, record all that you do in your 4-H Forestry project.

Meeting 6
How We Identify Trees

Each kind of tree has several characteristics. These help us identify it. After you become familiar with a particular species, you will not have to make a close check to tell what it is. You can recognize a close friend at some distance, right? Soon you will be able to name trees as you ride by in a car or bus.

Each kind of tree has some dependable ways by which it can be recognized. Therefore, it is not a tiring study each time you want to identify a tree. The following characteristics are most often used in tree identification. They are in the order of their usual value in everyday identification.

Leaves help us identify trees. Leaves have size, shape and color. We look at the arrangement of the twig, margin, thickness and vein patterns. Leaves may be rough, hairy, stiff or sharp. We may taste, smell or feel leaves to identify them.

Fruits help in identification, too. These are fruits such as cones, berries, nuts etc. Fruits have size, shape and color. They may be husked or bare, armed or unarmed, fleshy or dry. Fruits may have one seed, few or many seeds. And, fruits may have taste.

Bark may be described by color, thickness, roughness, smoothness, scaliness, stringiness and patterns of ridges and furrow. We may look for the presence or absence of lenticils and resin blisters on the bark.

Buds on trees have size and color. They are arranged on the twigs in different ways. Buds may be rounded, sharp, resinous, smooth, single scale or have few or many scales. Buds may burst into flowers and twigs. This twig arrangement on the stem is a key to identification of some species.

Twigs have color, are smooth or hairy and maybe stout or slender. They may have leaf scars and pith. *NOTE:* Twigs are quite helpful in wintertime identification of deciduous trees.

Growth habit - The shape of the crown is a helpful aid in identifying trees. Crown density, branching patterns and colors are useful too. The long, dense spire-like crown of the high-mountain fir, the umbrella-shaped crown of American elm and the drooping leader of young western hemlock are examples of growth forms

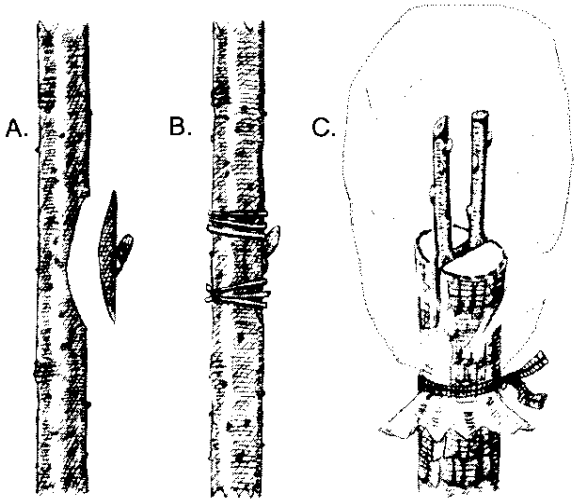


Fig. 11

a. With a sharp knife, shave a bud scion off the tree to be reproduced. Make a very simple cut on the stem of the host or rootstock.
b. Place the scion in the cut so the cambiums match and bind with the rubber band.
c. This is a method of grafting called *wedge grafting.* Cut two scions, making the bottom ends wedge-shaped. Split the end of the rootstock and insert scions so as to get the best cambium match. Use grafting wax, a coating compound, or a plastic bag to protect graft from drying out.

that identify the species. Some trees are known by their habit of **growing** in a certain location.

Flowers - All trees excepting some hybrids have flowers. On many species, the flowers are small and of brief duration. They aren't much help for everyday field identification. The flowers of some trees help identify them. These are black locust, buckeye, redbud, magnolia and dogwood.

Wood - Any species of tree can be identified by the characteristics of the wood alone. However, a microscope or hand lens is needed to identify wood. Wood characteristics are not used very often in everyday tree identification.

Things To Do

1. Make a display that shows how to identify trees. Show three types of leaves, three types of twigs, and three types of fruit which are useful in identifying trees.

2. Collect and exhibit 10 different kinds of tree leaves. Write out and point out for the viewers the differences in leaf margin, base, tip and form.

3. Collect and exhibit 10 different kinds of tree fruits. Write notes to point out their differences. First divide them into groups; some may be nuts, some legumes, some samaras. Then, show the differences within the groups, such as size, seed covering and other characteristics.

4. Collect and make an exhibit of twigs from 10 different trees. Point out twig characteristics that enable one to identify the tree from which it came.

5. Identify 10 different kinds of trees. Learn at least three good identifying characteristics for each tree. Also, learn the accepted common name for each species you identify.

Meeting 7
How Trees Are Classified

Trees can be divided into two large groups by types of leaves. These groups are *broadleaf and conifer.* Broadleaf trees have thin, flat leaves. Maples, lindens, oaks and cottonwoods are examples. Most conifers have leaves that are quite narrow and long. Such leaves commonly are called needles. Others have small scalelike leaves and some are awl-shaped or short and pointed like the end of a pin. Pines, firs and spruces are examples of conifers with needle-like leaves. Arborvitae or white-cedar and junipers such as red cedar mostly have scalelike leaves but some trees may have awl-shaped leaves. Sometimes, the scalelike and awl-shaped leaves are found on the same tree.

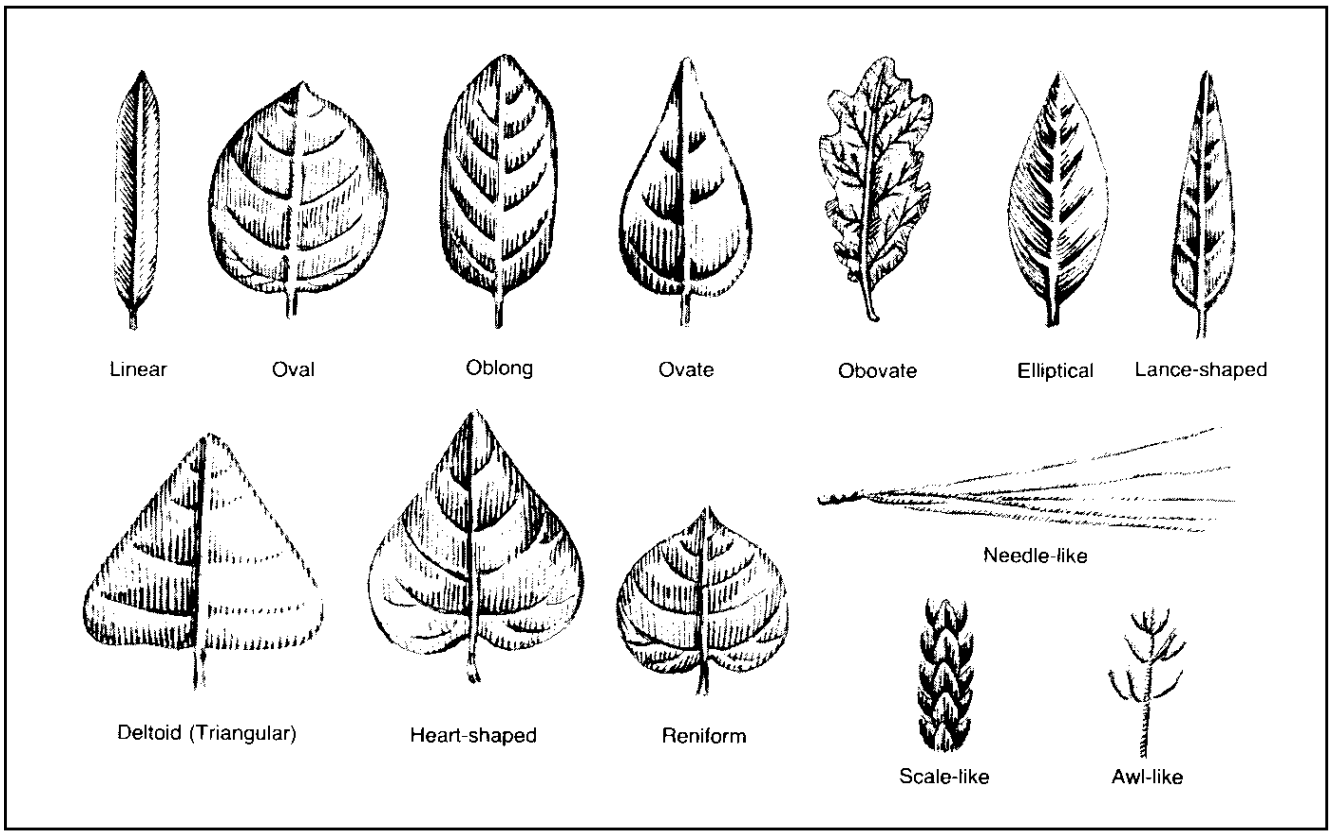


Fig. 12 - Shapes of leaves

Usually, the wood of broadleaf trees is more dense than that of conifers. Because it is more dense, it is harder. This has led to the use of two other terms for classifying trees: *hardwoods* and *softwoods.* All broadleaf species are called hardwoods and all coniferous species are called softwoods. This does not mean that the wood of any broadleaf tree will be harder than the wood of all conifers. For example, the wood of aspen (a broadleaf tree) is not as hard as the wood of western larch, a conifer. Figures 16 & 17 show how the structures of hardwood and softwood are similar and yet different.

Trees also are placed in two large groups on the basis of leaf-holding. Trees that shed their leaves during fall or winter are called deciduous. Trees that hold their foliage through two or more growing seasons are called evergreen. Most conifers are evergreen and most broadleaf species are deciduous. Therefore, the word *evergreen is* used sometimes to mean conifer or

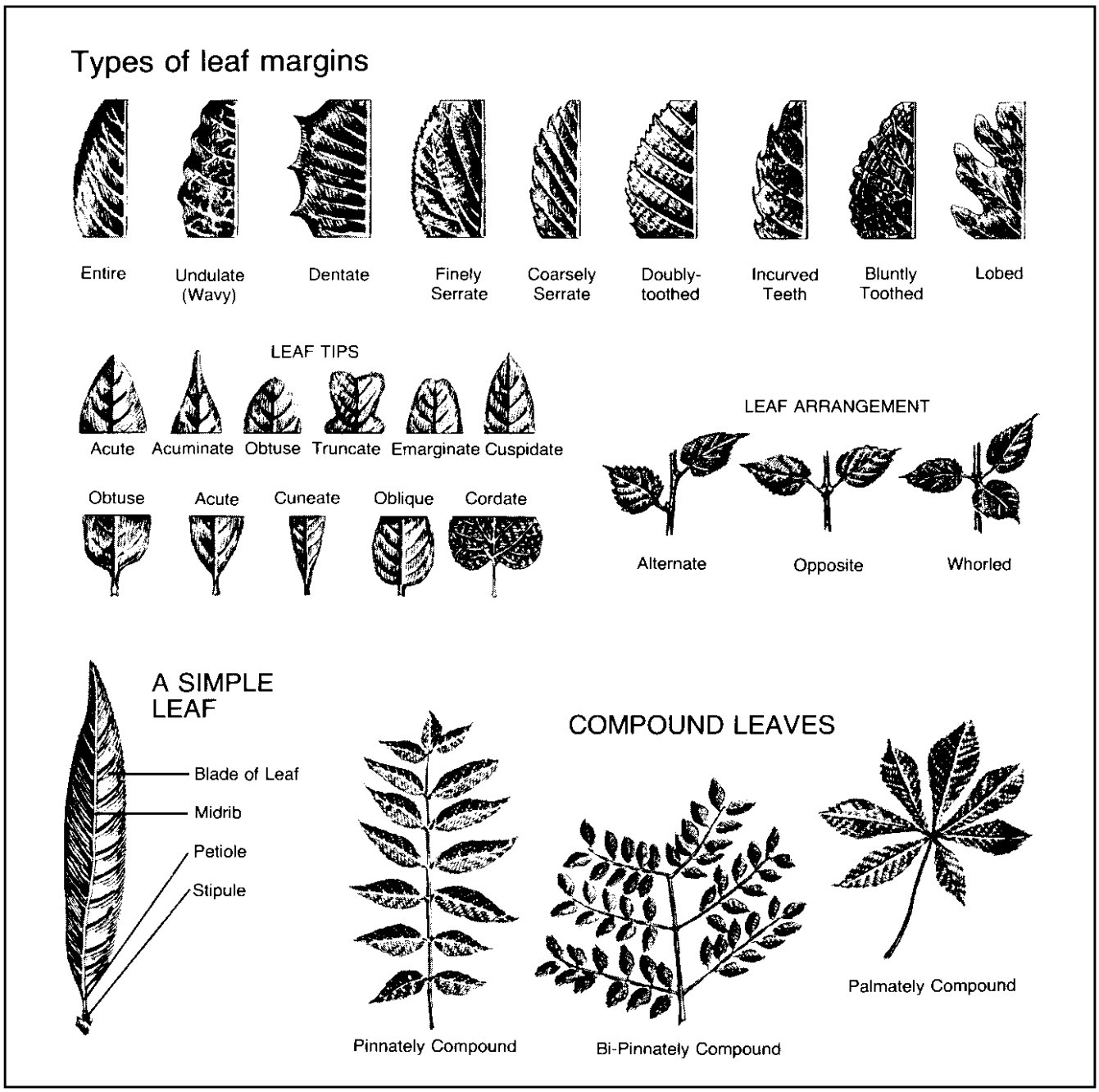


Fig. 13

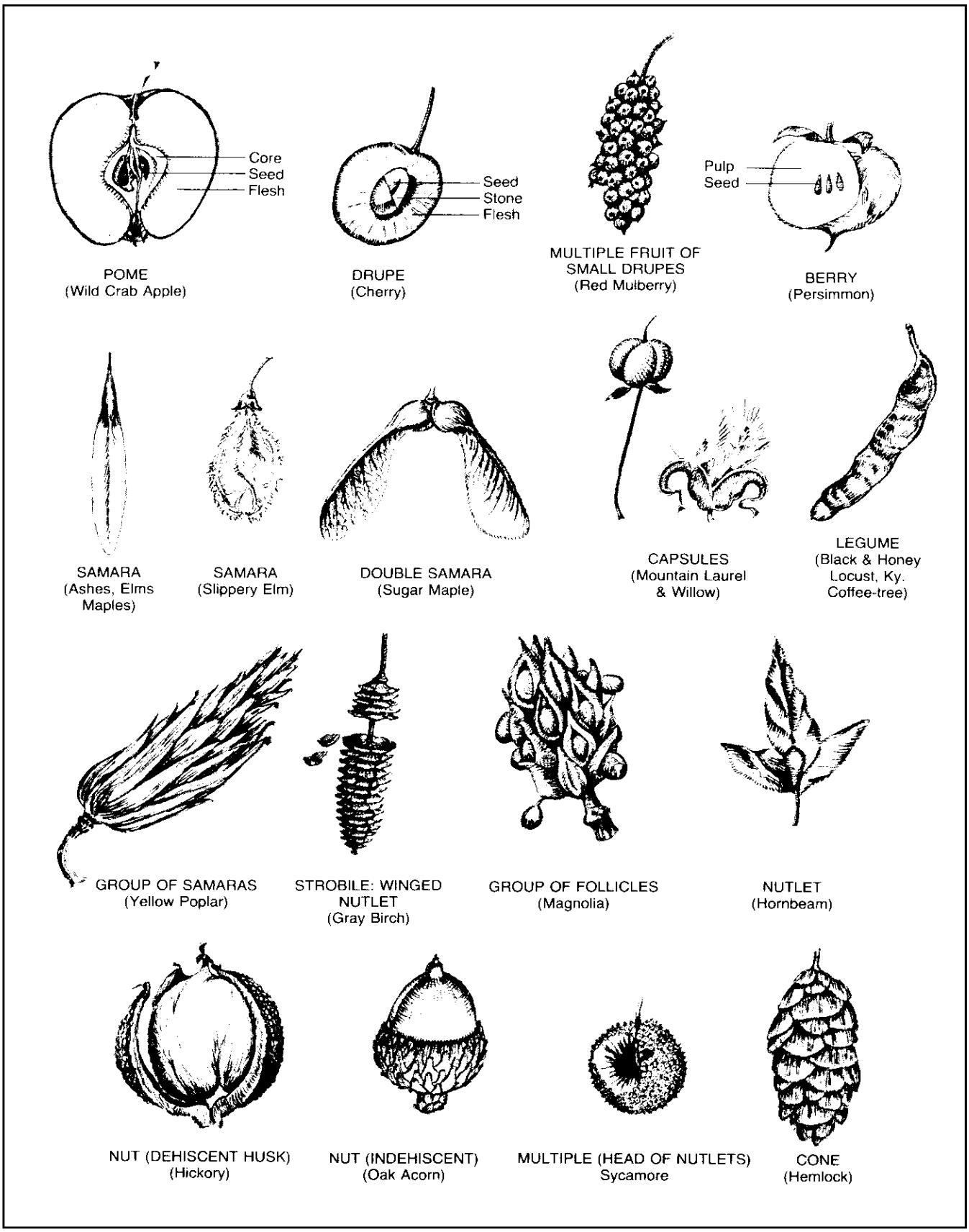


Fig. 14 - Types of tree fruits. The type of fruit a tree bears is often used to identify the tree.

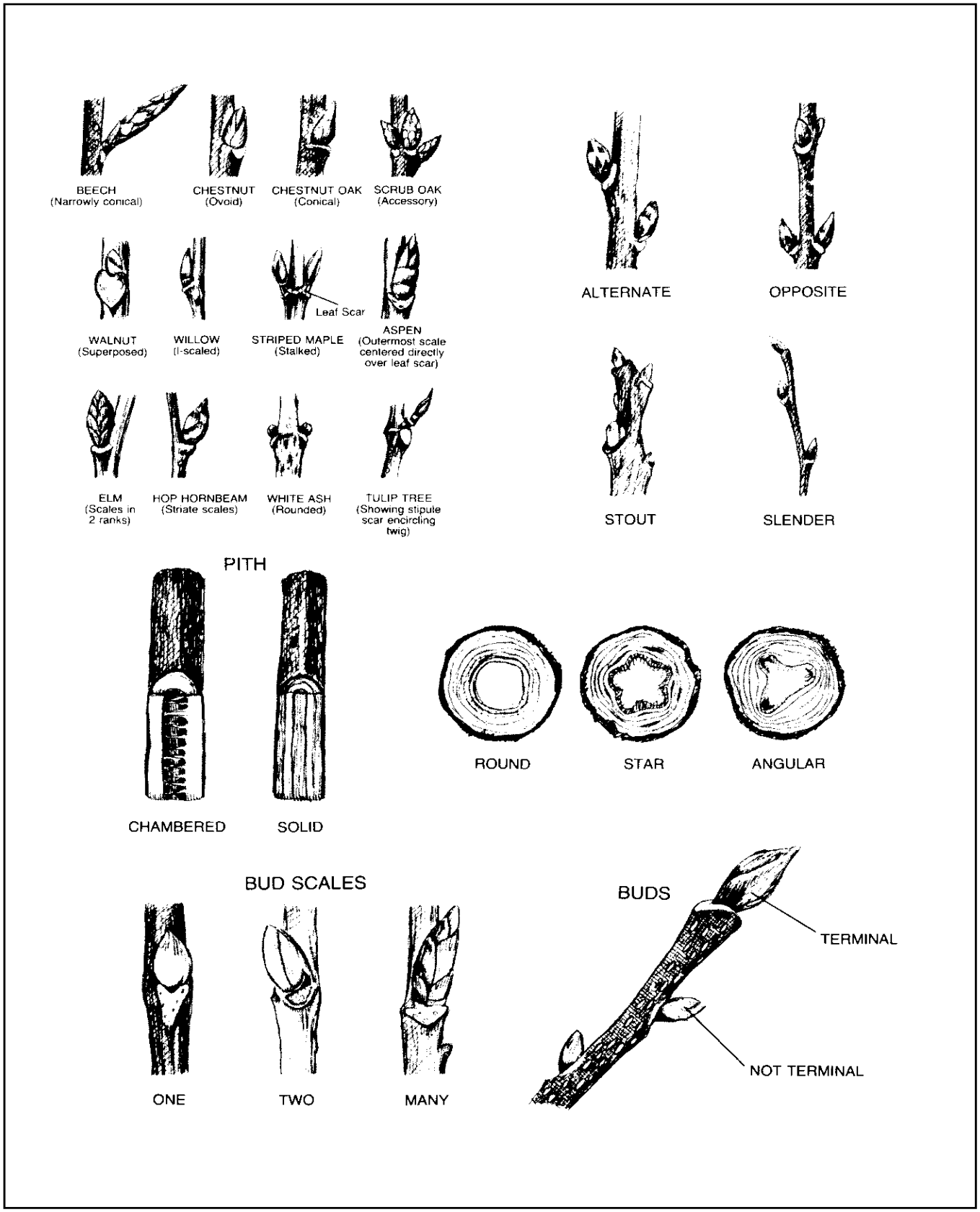


Fig. 15 - Types of tree buds. Knowing bud characteristics is especially helpful during the when there are no leaves on deciduous trees. Leaf scars are also useful aids.

softwood. And, deciduous may be used to mean broadleaf or hardwood. However, this is not accurate usage because there are some conifers that are deciduous (western larch, tamarack, and baldcypress). There are some broadleaf trees that are evergreen (live oak, laurel).

Trees that have similar characteristics and show close relationship to each other are called a species. Closely related species form a *genus. All* the genera (plural for genus) that are closely related make up a family. This is a scientific system of classifying trees and all other plants. The system of plan is given below.

Within the broadleaf group:

FAGACEAE, Beech family.

Example of genera: *Fagus* L., beech; and Quercus L., oak

Examples of species:

Fagus qrandiflora Ehrh., American beech *F. sylvatica 1.,* European beech

Quercus velutina Lam., black oak

Q. garryana Dougl., Oregon white oak

NOTE: Scientific names of plants and animals are always set in italics or underlined. If a second species of a genus is named, the generic name need not be repeated but can be abbreviated by its first letter, as shown above for *Fagus sylvatica L.* and *Quercus garryana* Dougl. The initials, abbreviations or names that follow a scientific plant name indicate who first described the species.

Within the coniferous group:

PINACEAE, Pine family

Examples of genera: *Abies* Mill., fir; and *Pinus* L., pine.

Examples of species:

Abies balsamea (L.) Mill, balsam fir

A. procera Rehd., noble fir

Pinus echinata Mill., shortleaf pine

P. monticola Dougl., western white pine

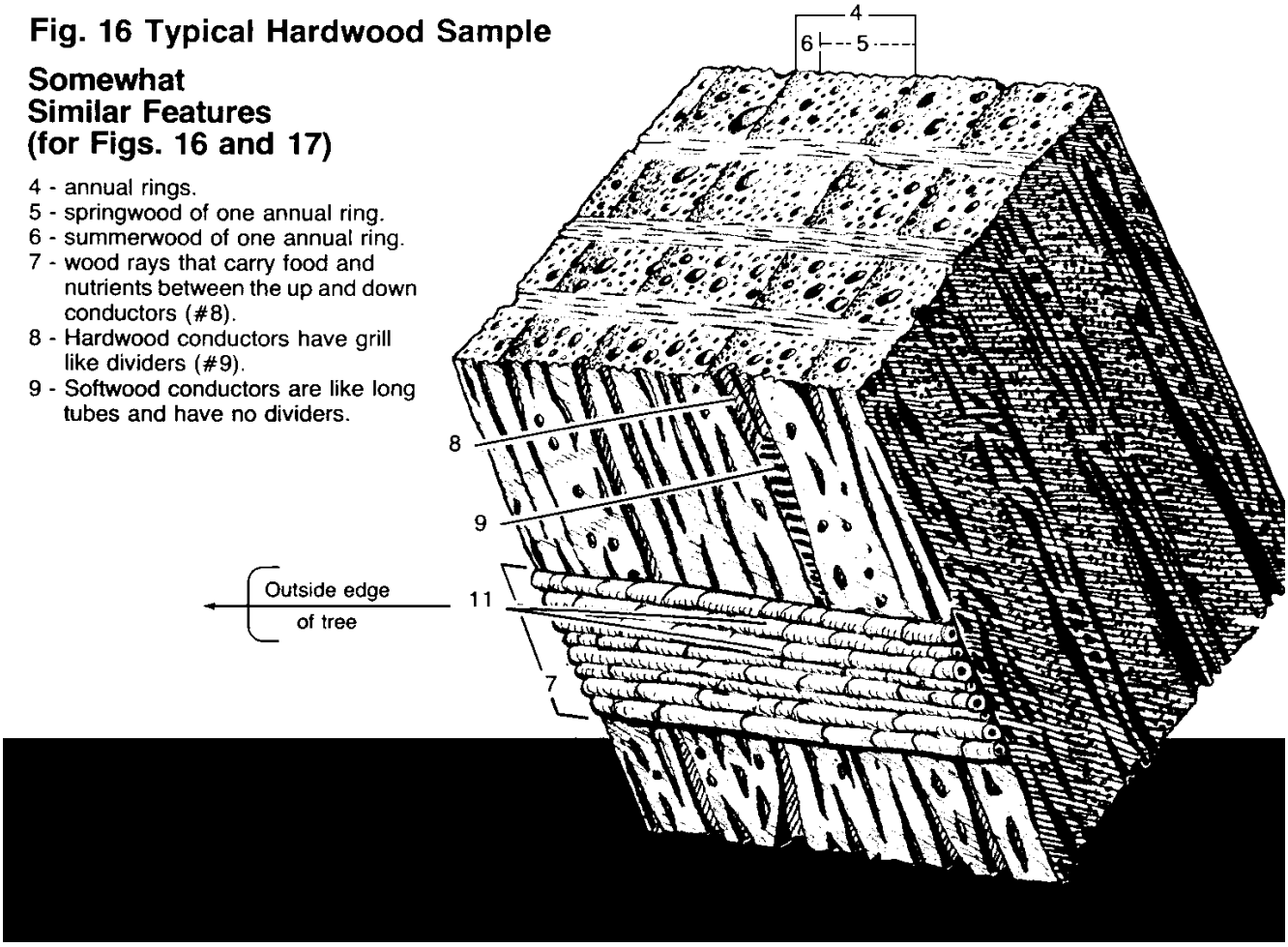
Common names for trees sometimes cause confusion. For example, balsam fir is the accepted common name for *Abies balsamea* (L.) Mill. But, balsam fir is also used by many people as a common name for *A. concolor* (Gord., and Glend.) Lindl, which is white fir, for *A. grandis* (Dougl.) Lindl., grand fir, and for *A. lasiocarpa* (Hook.) Nutt. var *lasiocarpa*, subalpine fir.

The same common name may be applied to more than one species. Also, there are many examples where several names are applied to the same species. For example, *Pinus banksiana* Lamb. is a species that ranges south from Canada into the Great Lakes region and the New England states. It has the accepted common name of jack pine. But, jack pine also is

Fig. 16 Typical Hardwood Sample

Somewhat Similar Features (for Figs. 16 and 17)

4 - annual rings.
5 - springwood of one annual ring.
6 - summerwood of one annual ring.
7 - wood rays that carry food and nutrients between the up and down conductors (#8).
8 - Hardwood conductors have grill like dividers (#9).
9 - Softwood conductors are like long tubes and have no dividers.



called scrub pine, banksiana pine, black pine, and gray pine.

There is usually a good reason for using a local tree name. For example, people in the northern panhandle of Idaho have seen abandoned fields taken over by *Pinus contorta* var. *latifolia* Engelm. This tree is known as the Rocky Mountain lodgepole pine. It grows "thick as hair on a dog's back." People in Idaho use the name of the "dog hair pine."

The scientific naming of plants was developed so that each kind of plant would have only one name. This was to avoid the confusion caused by calling two or more kinds of trees by the same name. Having several names for one kind of tree can be avoided. We should learn to use the scientific names.

For example, you can learn to identify *Juniperus virginiana* L. Then, no matter where you go or whom you might see, anyone else who knows *Juniperus virginiana* L. would know the same tree species that you do.

Scientific names are taken from Latin. Sometimes Latin is called a dead language because it is no longer the spoken language of any people. Therefore, it will not be changing with use. People all over the world can learn the Latin (scientific) names for trees. They know the names will stay the same. Other plants and all animals have scientific names, too.

Things To Do

6. Visit parks, woodlands or forests. Practice identifying trees and shrubs as broadleaf or conifer. Try learning five new trees in each group.

7. Make an exhibit that will show the major differences between broadleaf trees and conifers. Also, have the exhibit display some major groups of available broadleaf trees (e.g., oaks, hickories, maples) and conifers (e.g. pines, arborvitae, junipers).

8. Make a display that shows three important differences to separate hardwoods from softwoods.

9. Give an illustrated talk that points out the confusion and misunderstanding that can result from use of common names for trees.

10. Give an illustrated talk or prepare an exhibit to show how scientific names for trees overcome the difficulties often encountered in the use of common names.

11. Learn the scientific names for 10 trees that grow in your area.

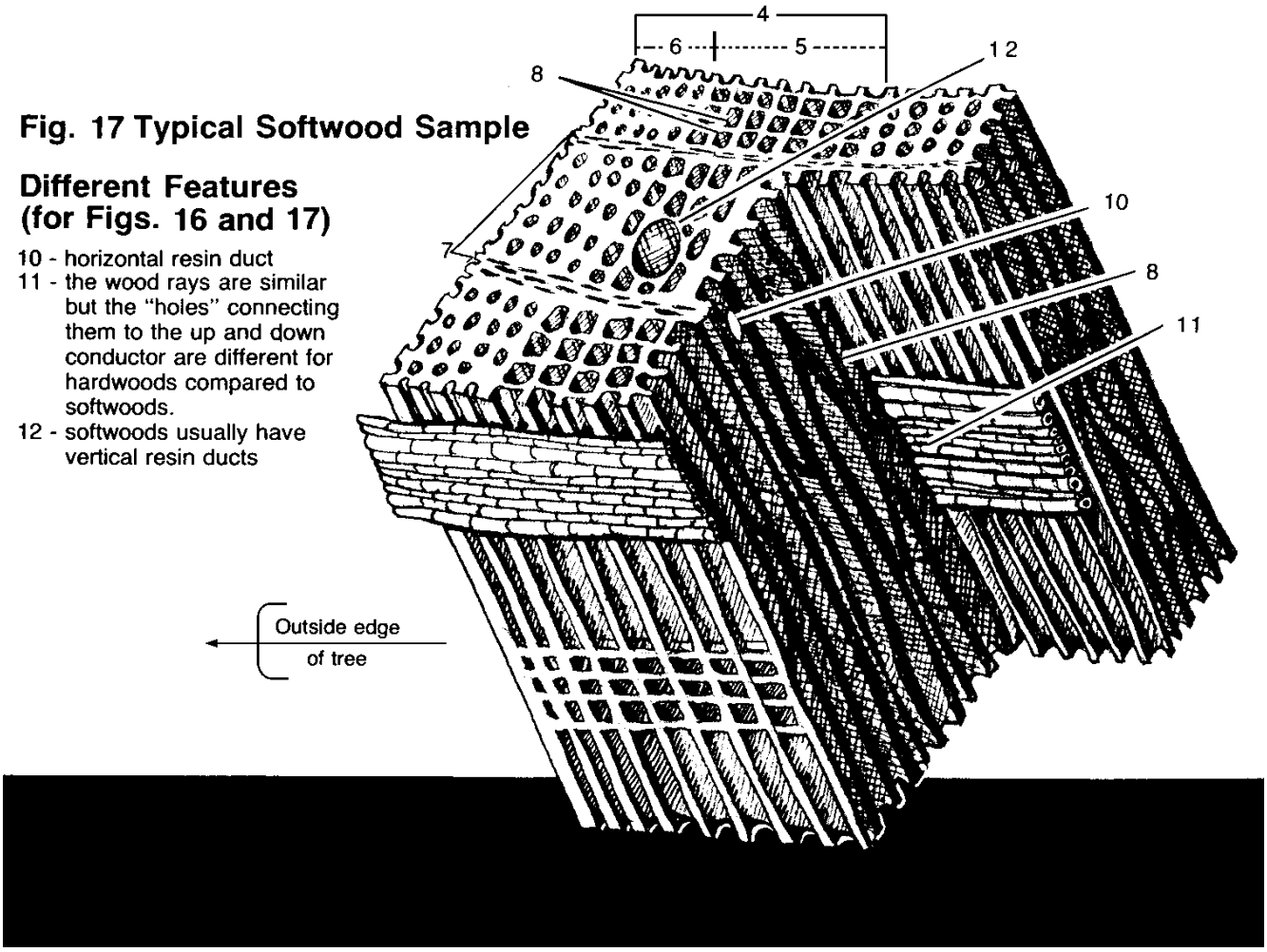


Fig. 17 Typical Softwood Sample

Different Features (for Figs. 16 and 17)

10 - horizontal resin duct
11 - the wood rays are similar but the "holes" connecting them to the up and down conductor are different for hardwoods compared to softwoods.
12 - softwoods usually have vertical resin ducts

Meeting 8
Making a Collection of Tree Mounts

Make a good collection of tree identification mounts. It will help you stay well acquainted with your tree friends. It also will enable you to help others learn about trees and what they do for people.

There are five steps in making a collection of high quality tree identification mounts:

1. Gather good materials
2. Keep them fresh before pressing
3. Press them to retain fresh, natural appearance
4. Mount them securely and attractively
5. Protect them against breakage

Gathering materials - A collection of mounted tree parts can become an identification aid. It has the highest value if each mount presents as many identifying characteristics as possible. So, in addition to leaves, you may collect fruits, flowers, bark and twigs whenever possible. Try to collect other tree parts that are very helpful in identifying the species. For example, Douglas-fir's distinctive cone parts, called bracts, are an especially helpful identification aid. For trees with cones, a whole cone need not be mounted. You could use half a cone. Or, you may take a cone apart and get only some of the scales for mounting. Identification aids that are hard to get or bulky can be sketched on the mount card to one side of the leaves.

Collect leaves in the early summer after they are fully grown. Too young and too small leaves may not be of the size that is representative of the species. Also, pressed young leaves turn dark because of their high moisture content. If collecting is delayed until later summer, find leaves that have not been damaged by sun, insects, diseases or pollutants. Avoid damaged leaves. Leaves from suckers, sprouts and seedlings usually are oversized and do not truly represent the species.

Twigs of deciduous species should be collected in winter or early spring. This is while the trees are bare. Flowers should be collected when fully developed. Also, fruits should be mature or nearly so. Select mounting materials that appear to be most representative of the species.

You may use 81/2" x 11 " (22 cm x 28 cm) paper or cards to make your mounts. The sizes of the specimens you select should fit the size of the mounting sheet. Large flowers or fruits, thick bark or heavy twigs may be better sketched than mounted. This is due to the difficulty in mounting such bulky objects. Sometimes it is better to make fairly thin crosssections or longitudinal sections of cones, nuts, twigs or bark. Then, use these sections on the mounts.

Keeping Your Materials Fresh - Leaves and flowers are your main concern. A good way to keep such materials fresh is to have a press that you can carry along on collecting trips. Then as you collect materials, put them in the press before they wilt.

If you go collecting before you have a press, use one of the following methods to help keep your materials in good condition until they can be put to press:

*Take along one or two magazines and some paper towels. Carefully place specimens between paper towels in the magazines. Keep them there until they can be pressed. This method is improved if two pieces of stiff cardboard are used for support. Keep the magazine(s) between the cardboards. Use two or three strong rubber bands to hold the packet together.

*Cut several pieces of cardboard 9" x 12" size (or 24 cm x 30 cm). Place paper towels or sheets of newspaper between them. Put collected specimens between the towels or newspaper. Hold the packet together with two or three stout rubber bands.

*Use a covered cardboard, plastic or light metal box of convenient size. Place specimens on a moist sponge or newspaper in the box as they are collected. Keep the box in the coolest surroundings possible until the specimens can be placed in a press.

Pressing Specimen for Natural Appearance - The first condition is a satisfactory press. An easily made press is the cardboard press described under Keeping Your Materials Fresh. Use corrugated cardboard and cut the pieces so that all corrugations run the same direction. If possible, obtain enough blotting paper to have at least one sheet for each plant that is expected to be in the press at any one time.

Put the plant specimens between sheets of newspaper. Then, place a blotter between each two plants. Insert a cardboard every third or fourth plant. Use large rubber bands or straps with rubber sections inserted to hold the press packet together. When the press is loaded, place it where it will stay dry and warm and will have good air circulation around it. Place the press on a hard surface with considerable weight on top. About 50 pounds or 25 kilograms is recommended. This weight can be anything handled easily. Use weights such as a box of rock, sand, bricks, wheel weights or metal scrap.

Another press is the wooden frame press. The

inside of a wooden press can be identical to the cardboard press described above. The wooden frames with good binders take the place of the weight. The best binders are adjustable canvas straps with attached binding devices. A press can seldom be clinched tightly enough with string, rope, or rubber band binders. With these, use additional weights on the press.

Place fresh plant materials in the press. Read carefully the section about keeping tree leaf specimens fresh. You may go on a collecting tour and be unable to take your plant press. If so, do your collecting as late in the tour as possible. That will give your plant materials less time for wilting before you get them into your press.

The next step is placing each specimen in the press carefully. A specimen's arrangement cannot be changed after it is pressed. Do not fold leaves. Make them lie flat. If they are all attached to a twig, be sure at least one is turned so that its under surface shows. Avoid putting bulky twigs, flowers and fruits in the same press with the leaves. If bulky parts need to be pressed, place them in a second press. Twigs and many tree fruits need not be pressed. They may be cured or dried out by keeping them in a dry place.

Remember, each specimen should be placed between sheets of newspaper. It is best to place each between blotters. Use a piece of corrugated card board every third or fourth

Fig. 18

Compare the size
and longevity of
MAN to

Largest land animal-Elephant
12 feet tall

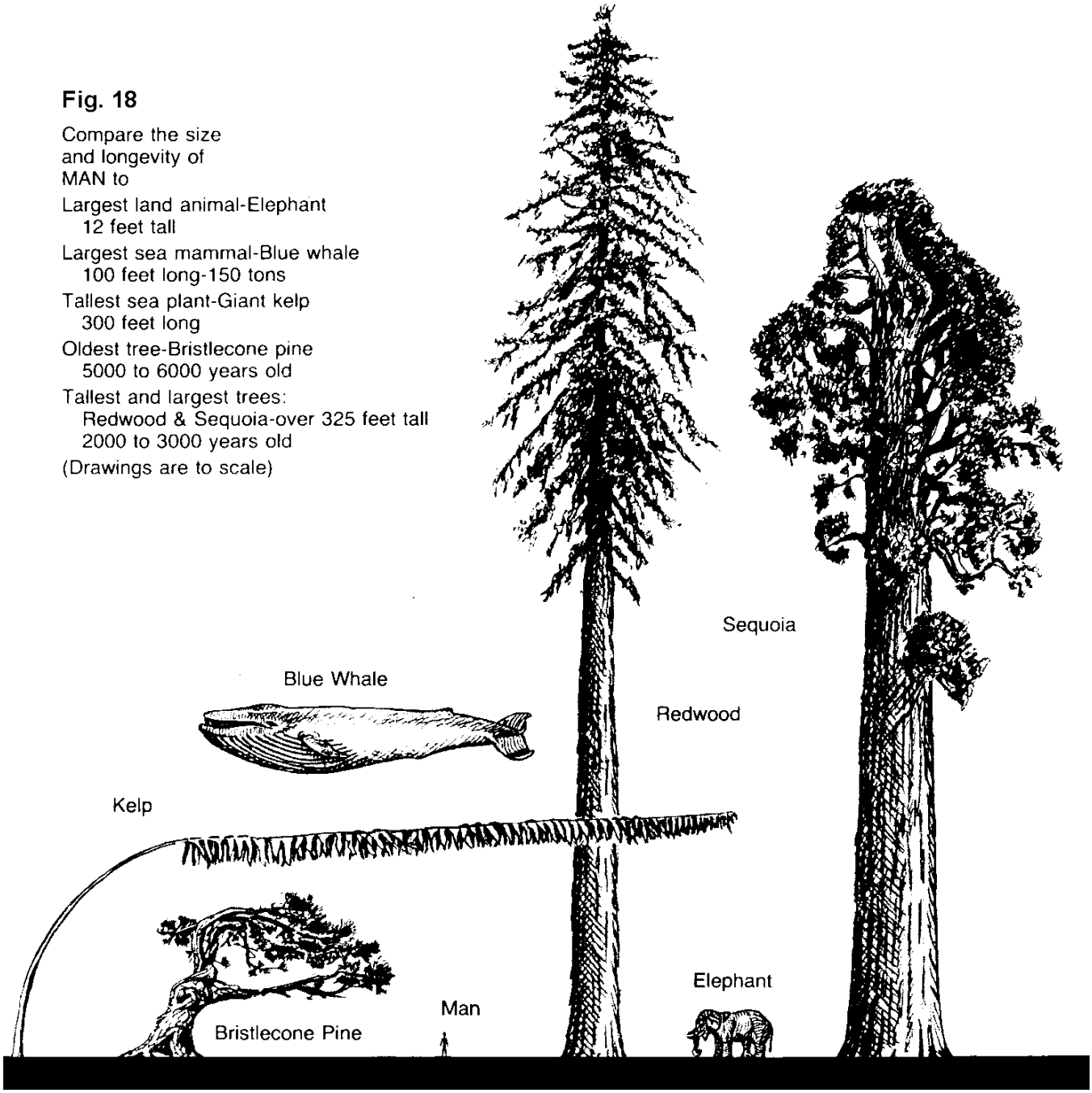
Largest sea mammal-Blue whale
100 feet long-150 tons

Tallest sea plant-Giant kelp
300 feet long

Oldest tree-Bristlecone pine
5000 to 6000 years old

Tallest and largest trees:
Redwood & Sequoia-over 325 feet tall
2000 to 3000 years old

(Drawings are to scale)



specimen. Be sure to use enough binder pressure or weight to press materials flat. This keeps leaves from wrinkling.

Allow a week to ten days for pressing. A good idea is to open up your press two days after putting in the specimens. If you have extra blotters, then change the blotters in your press. If not, then carefully change the newspaper sheets. Let your blotters dry as much as possible while the press is open. In pressing, the moisture in the plants is absorbed by the papers and blotters. If the papers and/or blotters are not changed, some of the leaves may turn black. One change of papers or blotters is usually enough, unless you are pressing some fairly large specimens with succulent leaves or fruits.

Mounting the Pressed Specimen - Pressed specimens are to be attached to the mounting cards. A good way is to spread a common white glue on the back or underside of each specimen. With the glue surface downward, place the specimen in the exact position desired on the mount card. Lay a sheet of wax paper over it. Place on top of the wax paper a 11 pound or 5 kilogram bag of sand. The bag should have enough slack in it to allow spreading over the entire specimen. A stack of books or catalogs might be used. Let the weight and wax paper remain until the glue has dried. Clear tape can also be used. Masking tape or rubber cement may be used on paper or cards, too.

Protecting the Mounted Specimens - Now you have collected, pressed and mounted specimens. Those are attractive tree identification aids. You need to protect them from damage that might result from being scuffed, crushed or bent. Follow these suggestions.

You may wish to purchase acetate or cellophane sheet protectors for notebook size or 8½ x 11 inch sheets. Usually two mounts can be turned back to back and still place them in one cover. You may use a plastic kitchen wrap to cover the mount but it is not quite as good. The wrap can be taped down on the back if it is not the kind that will stick to the card.

A stiff-backed 3-ring notebook cover gives good protection against bending and crushing. Flexible 3-ring covers are not as good as the stiff ones. Mounts may be bound with string, leather thongs or metal rings. If covers are made only of heavy paper or thin cardboard, such binding offers little protection.

Things To Do

12. Make a plant press.
13. Prepare an identification mount for each of 10 trees you have learned to identify.
14. Demonstrate how to collect, press and mount good materials to make a helpful tree identification aid.

Other Things To Do

Here are some other interesting things to do that are related to this lesson. Try some of them.

15. Make leaf prints of leaves from five different tree species. Use a method that makes a true leaf print rather than a mere leaf outline.
16. Make a special study of one tree species and report on it to your club.
17. Label different kinds of trees in a park or other area where visitors may easily see them.
18. Prepare a chart with a key of 10 common trees in your area.
19. Help your club plan and conduct a tree identification contest. Develop rules on how the contest will be run and scored. Participate in the contest.
20. If your county has a tree identification contest, take part in it. If there is no county contest, see if you and other members in your club can get one approved and perhaps sponsored.
21. Plan and conduct an educational program to get people of your community to identify the most common trees of the area. Perhaps a local newspaper would be willing to publish a series of articles from your club that would tell how to identify local trees. Tree identification exhibits may be places in store windows. Illustrated talks may be given before garden clubs, members of youth organizations, and other groups. Drawings, color slides and identification mounts (or a combination) may be used in these talks. As a conclusion to the program, the newspaper might agree to publish a tree identification contest (small sketches of identifying characteristics, plus some descriptive phrases) for 10 or 20 trees in the community and announce the results.
22. Construct a battery-operated display panel. People at a fair or other gathering can use the panel for testing themselves on tree identification. *(NOTE:* This is a device that displays mounted tree identification aids with electrically wired racks. Switch buttons and names of the species are displayed. People then see if they can identify trees. A correct identification gets a green light, an incorrect answer trips a buzzer or bell. Make the display to hold 10 specimens.)

A4 - Why Trees Are Important

This unit is about the reasons trees are important to people. When you have finished it, you will agree that the world would be a different place without trees. In your notebook or recordbook, keep a record of everything you do in this lesson. Include the date you started and the date you finished each thing you did. Give a clear description of what you did and the results you obtained.

Meeting 9
Trees Provide Beauty And Comfort

"Why are trees important?" Trees increase the everyday satisfactions we obtain from living. Trees are pleasing to our sense of beauty. This is because of their shapes, foliage colors, foliage patterns, flowers and seasonal differences. Trees add beauty. We like trees on home grounds, in parks and along streets and roadsides. Trees help us enjoy living. Trees are used to screen or hide unsightly areas from view. They also reduce the amount of dust and other pollutants in the air. Trees take in carbon dioxide and give off oxygen. Therefore, trees are a part of nature's process of air purification.

Trees improve our comfort through effects they have upon sun and wind. Perhaps you have felt the pleasant coolness of tree shade in contrast to the heat of the summer sun. When trees are planted in a correct arrangement, they break up strong winds. By doing this, they reduce the chill factor of cold days. They may decrease the drying effects of hot winds in summer. Crops do better in fields that are protected by shelterbelts or windbreaks. People like living in areas where trees offer shade and beauty. When planted in a proper arrangement and location, trees help reduce noise or unpleasant sounds. Also, the same trees may help reduce heating and airconditioning costs.

Trees provide added enjoyment because they attract birds and beneficial insects, such as honeybees. Many kinds of trees and shrubs have sweet smelling flowers. We enjoy their fragrance. Trees also provide many different kinds of edible fruits. These are pomes, drupes, nuts or berries. Some people have developed businesses of making and selling jams and jellies. These are made from wild tree fruits such as plum, crabapple, and wild cherry. Where they grow, rural people may gather quantities of black walnut, butternut, hickory nuts, beechnuts, and hazel nuts. These nuts are eaten and some are sold. The sugar maple grows in good stands, particularly in New York, Vermont, and New Hampshire. There, people take sap from the maple trees. Then they boil it down into a delicious syrup.

Things To Do

1. For your community, make a list of all the natural and planned uses you can observe of living trees.
2. Survey your community and make a list of the main tree species or at least 10 you find. Record what uses are being made of each. Put your final list in alphabetical order according to accepted common names of the trees, or according to scientific names.
3. Make a list of trees that you recommend for planting in your community. Give reasons for your choices, such as shade, beauty, windbreaks, wildlife habitat, and view or sound screens. Which one is best for each purpose?
4. On a hot day, take temperature readings at three levels: ground level, at 1 foot (30.48 centimeters) above ground level, and at about 3 feet 3 in. (1 meter) above ground level. Take the readings under heavy tree shade and in an open area under direct sunlight. Make the two readings at the same time if you can. You read the temperature in one location while someone working with you reads the temperature in the other location. Take three readings for each level, spaced a few minutes apart. *(NOTE:* Be sure to synchronize your thermometers). That means read both of them at the same time in the same location. If they vary, then take one as standard and correct the reading of the other. (For example, the first thermometer reads 95.7°F (35.38°C) while the second reads 95.2°F (35.27°C) at the same location. You can take the first as standard and add 0.50 to all the readings of the second thermometer. This will equalize later readings between the two locations). Do your readings show that tree shade effects air temperature on a hot day?
5. On a cold, windy day in winter take temperature readings. One should be at 3 feet (about 1 meter) above ground and another at ground surface out in the open where the wind is blowing unchecked. At or close to the same time, have someone take like readings on the protected or down-wind side of a dense windbreak. These readings may be 50 yards (46 meters) from the border inside a fairly dense woodland tract or forest. Compare the readings to see if the trees have any moderating effect on air temperature during a cold day. (NOTE: Before you start your official readings,

synchronize the thermometers as described in No. 4 above.)

6. On a windy day compare the wind velocity. Check the wind on the protected side of a windbreak or in a forest and compare the wind velocity in the open. You may be able to borrow anemometers or wind gauges from the Soil Conservation Service, the Forest Service, a college or school. A homemade wind gauge could show the differences. You should have at least two similar ways to measure so the two recordings can be done in the open and in the protected area about the same time. Record the wind velocity at one yard or one meter above the ground surface. Compare the anemometer records to see how much trees increase or decrease wind velocity.

7. If you can obtain the use of an audiometer, check the effect of trees on sound. Pick an area where you can go one direction in the open from a sound source and the other direction in a forest. Use a drum, a car horn or other suitable sound-maker. Then take readings on the loudness at given distances from the sound source in the open and in the forest. Compare the readings to see if the trees make any difference.

8. Tour a forested area with a wildlife manager or a forester. Look for examples of evidence that trees and shrubs are beneficial to many kinds of animals and birds.

9. Gather enough berries or other suitable fruits to make six small jars of jam, jelly or syrup. Make the product and evaluate it for flavor, consistency and color.

10. In a woodland or forest, identify and gather some edible nuts, such as hazel nuts, hickory nuts, black walnuts, and butternuts. Pinyon pine seed also will count. Gather two pounds or about 1 kilogram of a small nut, such as hazel nut. Gather four pounds or 2 kilograms of a large nut, such as a black walnut. Compare number of nuts in each group.

11. Make a study of some special product that is obtained from trees. Maple syrup, naval stores, and cascara sagrada are examples. Use your findings to give a talk before your club or your science class at school. Or, you may prepare a written report for your record book.

Land Use Values

Trees have other values. Special plantings reduce or prevent soil erosion by wind and water. Sometimes, tree and shrub plantings are made to control snow drifting. They may provide shade for livestock. Other plantings improve habitat for wildlife species, providing them with a better food supply, improved protection or both. Trees protect and improve the soil and shade streams, making the streams better homes for fish.

Trees improve the quality of water that comes from forested hills, mountains and valleys. Under a forest, great masses of tree roots help hold the soil in place. The mat of leaves, twigs, and other decaying materials that builds up on the ground under trees improves the soil quality. This absorbing mat also prevents rainfall from running off over the surface of the ground. Trees help the water soak into the ground. When the water comes to the surface later in springs, stream beds and lakes, it is clear and pure.

Things To Do

12. While it is raining or very soon after a hard rain, observe the soil surface in an open area. Look at the soil with little or no vegetative cover. Compare this soil with what you see on a protected soil surface under trees in a park or forest. Observe and write in your record book all the differences you can see.

13. Visit a land area where maintenance of good wildlife habitat is a major management objective. Find out how trees and shrubs help wildlife species.

14. Visit a land area that has watershed as its primary value. Learn how trees influence watersheds.

15. Give a demonstration or an illustrated talk. Explain why tree cover on a watershed usually means water of good quality.

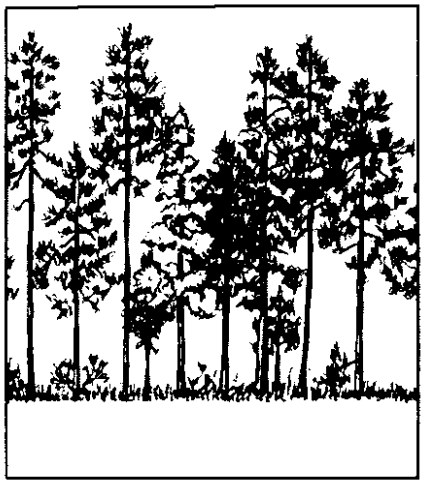
16. Prepare an exhibit or a demonstration. Show why water easily soaks into a soil that is protected by trees while it can easily run off an area where the soil has little or no cover.

Meeting 10
Trees Provide a Miracle Material - Wood

Wood is a quality material. It is used for many purposes. Wood is light in weight for its strength. It can be hewn, sawed, carved or fitted. And wood is very durable if kept dry. It can be treated to make it durable even under poor conditions that favor decay. Wood will burn, but it does not warp, twist, or crumble when exposed to heat. Wood can be treated to make it fireproof.

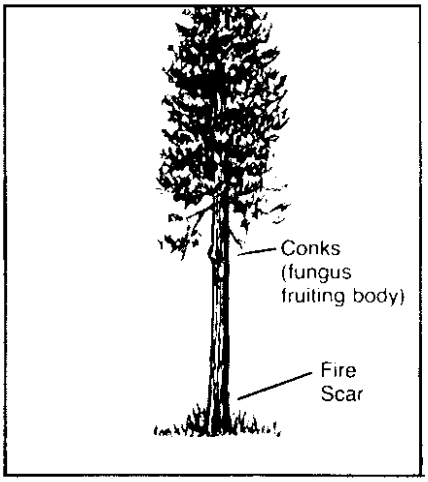
Wood is a good material for building homes. It has a high heat and electrical insulation values. Wood inside houses gives most people a warm, friendly and comfortable feeling. Wood also can provide fuel for fires in a home or in a camp.

Bug-Kill. Red brown foliage stands out.

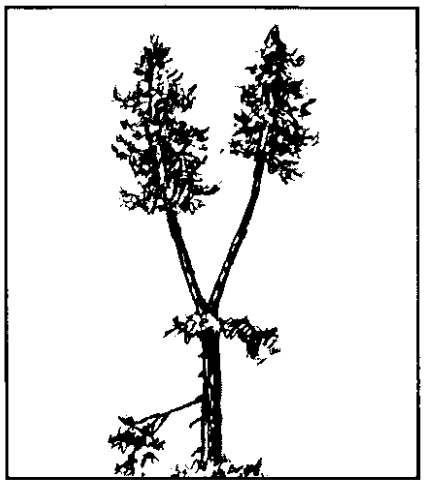


Crop trees. Vigorous well-formed trees spaced widely enough for good growth.

Cull tree. Conks and fire scar indicate extensive decay.



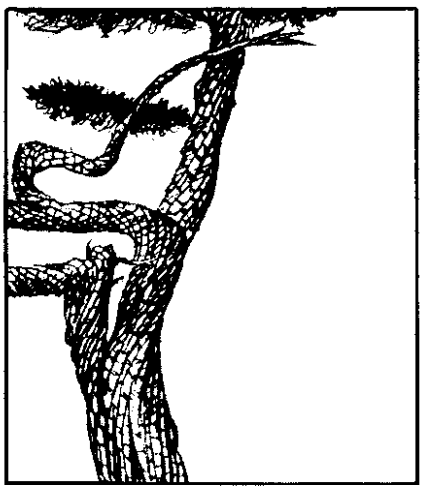
Schoolmarm



Seed trees left to provide seed for an area that has been logged.

Spike top

Spiral Grain



Widow-maker

Wolf Tree

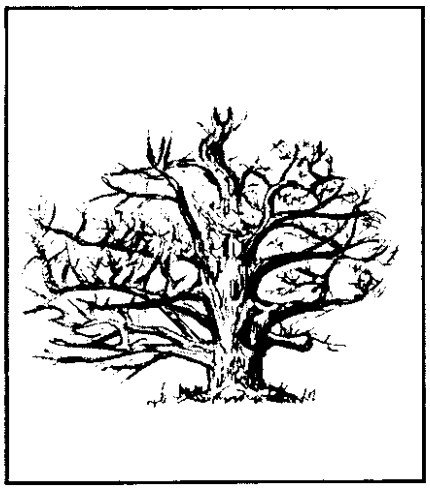


Fig. 19 Illustration of trees to which wood terms are applied.

Wood is the raw material for things that increase our living comfort. It is used for decorative items, papers, fabrics, plastics and medicinal products. In processing wood, many by-products are reclaimed. These include oils, acids, gums and tars, plus wood waste in many forms. Waste products may become fuel, particle board, insulation, soil additive or a special "mud" used in the drilling process for oil. Wood is a renewable resource. It doesn't require large amounts of work or energy to make it useful to people.

Things To Do

17. Starting in your home and branching out to cover your community, make a list of the different uses being made of wood.

18. In your community, determine how important wood is as a home building material. If your community is large enough, count one or more groups of 100 houses each. Keep a record of how many wooden houses there are in each group of 100 houses. If your community is small, take a smaller group or count all the houses.

19. Compare the heat insulating value of the wood with that of aluminum, concrete or steel. Obtain a piece of metal or concrete and a piece of solid wood or plywood of equal thickness. With your leader's help, arrange the metal or concrete so it can have a candle, or other constant heat source under it. Place a thermometer on top of the material above the flame. Note how long it takes for the thermometer to show an increase of 10 degrees in temperature. Do the same with a piece of wood of the same thickness.

20. Visit a wood processing plant (sawmill, pulmill, furniture factory, particle board plant, post and pole plant or other). Find out what kind(s) of wood the plant uses, how it processes the wood, and what products it makes. Determine the economic impact of the plant upon the community.

21. Make a collection of wood samples from at least 10 different kinds of trees in your area. A good size for samples is 1 1/2 inch diameter by 6 inches long (about 5 centimeters by 15 centimeters). Cut away one face of each sample so that a longitudinal section is shown for half its length. Mount samples on a display board and name them. Show important uses of the wood of each species in the collection.

Meeting 11
Trees Provide Employment

Trees are important because they provide jobs for many people. There are nursery workers who grow trees for home and community use and for reforestation. There are landscape architects who design tree plantings to accomplish certain purposes. Or, they plan how existing stands of trees can be treated to protect or enhance certain values. (These include plans for forest clearcut areas that may reduce the natural beauty). Landscape gardeners fertilize, water, trim and take care of trees. Tree surgeons repair damaged trees, perform severe trimming or pruning jobs when needed and remove dead or dying trees. Foresters have the responsibility of meeting, in the best ways possible, the silvicultural and environmental needs of trees in cities, parks and forests. There are timber cruisers, loggers, mill workers, lumber brokers, and employees of manufacturing plants such as workers in a furniture factory. There are lumber yard employees, clerks in retail stores that sell furniture and other wood products, and Christmas tree growers. And, there are administrators, supervisors, service people and equipment suppliers that keep the thousands of tree and woodrelated workers on the jobs.

Things To Do

22. Find out approximately how many people in your community or county depend upon trees for their jobs. Examples may be in production, construction, or retail businesses. Offices of the U.S. Forest Service, the state forestry, conservation or natural resources department, the Soil Conservation Service, Cooperative Extension Service, forest industry and chamber of commerce are possible sources of information. Make a report to your club on your findings.

23. Talk to several people whose work is dependent upon or closely related to trees-nursery workers, landscape architects, foresters, loggers, and mill workers. Find out what they really do. From your present understanding of your ambitions and talents, do you feel you would like employment that is dependent upon or otherwise closely related to trees? List the main things that make you feel either fitted or unfitted for such work.

24. As accurately as possible, determine the economic value of trees to your community or county. How does your answer compare with values of agricultural crops, livestock, mining, recreation, manufacturing or other industries?

25. Take one type of tree related employment, such as forester, logger, mill worker or tree surgeon. Collect or draw pictures to make an illustrated story of the work a person with such a job does. You may wish to write a play, a news article or a radio program on your findings.

Other Things To Do

Here are some other interesting things to do that are related to this lesson. Try some of them.

26. Design an exhibit showing the effects of trees on the environment. These may include air temperatures, wind velocity, surface water runoff, soil erosion, water quality and wildlife protection.

27. Survey the needs for additional trees to be planted in your community.

28. Plant one or more trees at your home. Or, participate in a group tree planting project for community benefit.

29. If you live in a town, visit your mayor, city council or park department to learn what guidance is given to people who want to plant trees in the community. If there is no guidance offered, help establish a Community Tree Committee that would inform the community about:

*tree pests and other problems with growing trees in the community
*how to care for existing trees and shrubs
*needs for additional trees in the community
*recommended tree and shrub species to plant for different purposes
*how to establish young trees and care for them

Glossary of Terms

Anemometer
: An instrument for measuring the speed or forceof wind

Annual ring growth
: A layer of wood-including springwood and summerwood -grown in a single year

Artificial reproduction
: Means of reproducing trees through the use of cuttings or budding and grafting

Awl-shaped leaves
: Long, narrow leaves which taper to a fine point

Axis
: Main line of growth

Bole
: Trunk of a tree

Bracts
: A leaf from the axis of which a flower or floral axis arises; portion of Douglas-fir cone also

Broadleaf
: Trees having broad leaves instead of needles, often called hardwoods

Bud scale scars
: Scar left where terminal bud scale formed, often visible for several years

Cambium layer
: One cell thickness of tissue between the bark and wood that repeatedly divides to form new wood and bark cells

Conifer
: Trees and shrubs, mostly evergreens, including forms (as pines) with true cones and others (as yews) with arillate fruit

Crown
: The head of foliage of a tree or shrub-part of a tree bearing limbs or branches, including twigs, leaves, flowers and fruit

Cuttings
: A short piece of vigorous branch or stem of the past season's growth used in artificial reproduction of trees

Deciduous
: Trees that lose their leaves in the fall

Determinate growth
: Has terminal and lateral buds, forms buds for next year before the growing season is over

Drupe
: A one-seeded fruit which remains closed at maturity (cherry, for example)

Evergreen
: Trees which retain their leaves during the winter

Foliage
: The mass of leaves of a plant

Genus
: Closely related species form a genus

Genera
: Plural of genus; all genera make up a family

Germinate
: To begin to grow

Graft
: A method of reproducing a tree by joining the scion from one plant to the root-stock of a like plant called the host tree

Habitat
: A place or type of site where a plant naturally or normally lives and grows

Host
: The root-stock to which the scion is grafted

Hybrid
: The offspring of two different species or genera. Often has greater vigor than the parent stock

Increment bore
: A tool to help rate growth or tree age

Indeterminate growth
: Develops only lateral buds and never a terminal bud. Keeps on growing until cold or drought stops growth

Lateral roots
: Roots of nearly equal size growing from the bottom of the trunk at ground level or just below

Leader
: The primary or terminal shoot above the topmost whorl. Shows growth during most recent growing season

Legume
: Trees with bean-like seed pods such as black locust

Lenticles
: A pore in the stem of woody plants that is the path of exchange of gasses between the atmosphere and stem tissues

Natural reproduction
: The reproduction or growing of trees from seed

Naval stores
: Products such as tar, pitch, turpentine, pine oil and rosin obtained from pines and other coniferous trees

Over winter
: Period of time required for some seed coats to reach a point where moisture can penetrate to start growth

Phloem
: Inner bark. The principal or main tissue which carries food or sugar made in the leaves

Photosynthesis
: Process through which the leaves, with the aid of heat and light, make food from water, soil nutrients and carbon dioxide

Pith
: Small core of soft, spongy tissue at the growth center of the stem

Pole
: A young tree with a diameter of three to six inches (7-15 cm) in the small pole stage and a diameter of six to 12 inches (15-30 cm) in the large pole stage

Pome
: A fleshy fruit consisting of a central core with usually five seeds enclosed in a capsule and an outer fleshy layer

Radial
: Wood growth rings developing around a central axis

Resin blisters
: Lumps or blisters of a yellowish to brown natural organic substance formed by plant secretions

Samara
: One-seeded, winged fruit-ash, elm, maple

Sapling
: A young tree's period of growth from the time it reaches one inch (2.5 cm) in diameter and six feet (2 m) in height until it is three inches (about 7 cm) in diameter and 15 to 30 feet (4.5-9 m) in height

Scion
: A vigorous twig or cutting used in grafting to artificially reproduce trees

Seedling
: Stage in a tree's growth from germination to the point where it is no more than six feet (2 m) high and one inch (2.5 cm) in diameter

Sheath
: Annual layering of wood over the entire tree added by growth activity of the cambium. Top of each sheath shows height of the tree at the end of a given growing season

Silviculture
: The development and care of forests

Species
: Trees having similar characteristics and showing close relationship to each other

Springwood
: The part of the annual growth ring formed during the early part of the season's growth

Sprout
: New stems starting from stumps-or roots

Stomata
: Small openings through which the leaf takes in air

Stratify
: To store seeds in layers, alternating with moisture holding materials such as earth or peat

Sucker
: New growth as from buds hidden in the bark and previously shaded by other growth. May occur as a result of severe trimming of the crown

Summerwood
: The portion of the annual growth ring formed after springwood formation has stopped. Often called latewood

Tap Root
: A deep central or primary root growing vertically downward

Terminal Bud
: Growing at the end of a branch or stem. Buds below or behind are lateral buds

Whorl
: The layering or grouping of branches at the beginning of each year's growth

Xylem
: The water conduction, strengthening and storage tissues of branches, stems and roots