Agricultural Extension Service University of Minnesota 4-H Bulletin No. 74 1970

FOREST APPRECIATION

William R. Miles

MEMBER'S MANUAL

TABLE OF CONTENTS

William R. Miles is extension forester.

I. What is a Tree?

A tree is a woody plant that is at least 20 feet tall when fully grown. It usually has only one stem or trunk, with branches at the top. Trees differ in size and shape. Some grow short and squatty; others tall and slim.

Woody plants that have several stems growing up from the ground and that grow less than 20 feet tall are not trees but shrubs.

HARDWOODS AND CONIFERS

There are two main types of trees: hardwoods and conifers. Conifers are sometimes called evergreens because most of them keep their green leaves all year. Conifers are sometimes called softwoods, but this term is misleading because the wood of some conifers may be harder than the wood of some hardwoods.

Conifer means cone-bearing and refers to spruce, pine, cedar, tamarack, and hemlock. Conifers have needles or overlapping scales for leaves. The tamarack is the only conifer in Minnesota that sheds its leaves in winter.

You will want to learn how to tell whether a tree is a hardwood or a conifer.

Leaves are usually the easiest way to identify trees. Hardwoods, such as oak, poplar, and maple, have broad leaves. Most hardwoods are deciduous, meaning they shed their leaves in winter.

As you progress in this project, you will find that trees can also be identified by form and size, seeds, bark, and sometimes by flowers. We use our senses of sight, touch, taste, and smell in identifying trees.

ACTIVITIES

1. Leaf Prints. It is easy to copy brightly colored leaves with crayons or colored pencils. Place a sheet of thin paper or writing paper (not thick drawing paper) on top of the leaf. Next, holding the paper and leaf so they don't move, color the paper over the leaf. Use fast, slanting strokes as in shading. The shape and markings will be exact copies. The veins and leaf border will show as heavier lines. Different colors can be used to match the shades or markings. After you have colored over all the leaf, use scissors to cut out the paper leaf. Of course, green leaves can be copied in the same way.

Leaf prints can also be made with a stamp pad. Press the leaf, under side down, against the stamp pad, with a piece of paper on top to avoid inking your fingers. Then place the leaf, inked side down, on a sheet of white paper with another sheet of paper on top. Hold the leaf firmly and rub hard over it. When the upper sheet of paper and the leaf are removed, a printed copy of the leaf will remain. A scrapbook of leafprints with trees names is an interesting project for any boy or girl.

2. Oil Prints. Collect some colored leaves. Mix oil paints to match the colors of a leaf you want to print. Apply the colored paints to the under side of the leaf, copying the exact colors from the top (brighter) side of the leaf. Do this quickly before the paints dry. Place the leaf, painted side down, on a sheet of white paper with another sheet of paper on top of the leaf. Hold the leaf very steady, don't let it move, and rub hard on the top sheet of paper with your fingers. Remove the upper sheet of paper and the leaf. Let the painting dry. Your colored leaf print is finished. Mount the oil print in a frame for a wall hanging.

3. A Plastic Leaf. Collect some colored leaves and press in a plant press (described later) until dry. Obtain clear polyester resin from a hobby shop. Follow the instructions on the container and imbed the leaf in the clear plastic. Use for coasters, ash trays, or add a piece of wire and use as a wall hanging.

4. Ceramic Leaf Plaques or Dishes. Collect colored leaves and place in a plant press.

Roll out ceramic clay (buy this at a hobby shop) ¼-inch-thick and slightly larger than the leaf. Gently roll the leaf into the clay, under side (vein side) down.

Cut the clay from around the leaf edges with a knife or scissors. Smooth edges of clay with your fingers. Remove leaf, starting at the tip.

For a plaque, keep the clay leaf flat and add a piece of looped wire for a hanger. For a dish, shape the edges up and prop with balls of clay. Let the clay leaf dry 4 or 5 days.

Fire the clay leaf: pyrometric cone 0-4 for plaque; or 0-1 to the bisque for a dish. (These are described in library books on making pottery.)

Apply colored glaze the thickness of a postcard and desired colors to the clay leaf. Let dry 4 to 5 hours.

Fire the glazed leaf to cone 0-6.

(Thanks to Lucy Wessiling, teacher, Parkrose, Oregon for the method description.)

Accomplishment record:

II. How Does a Tree Grow?

PARTS OF A TREE

Trees have three main parts—roots, trunk, and crown.

Roots anchor the tree to the ground so that it can stand erect and absorb water and dissolved minerals and nitrogen that are used by the tree to make food. The minerals and nitrogen the roots obtain from the soil are called nutrients.

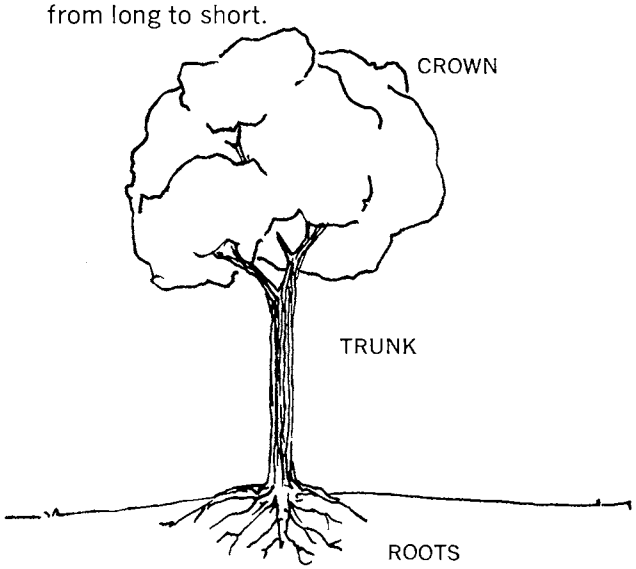
The trunk provides wood, supports the crown, or the upper portion of the tree, and serves as a passageway for the fluids to move up and down the tree.

The crown is made up of branches and leaves; it has the important job of making food for the tree. The leaves are tiny "factories" that manufacture food using water absorbed by the roots and carbon taken from the carbon dioxide in the air. These leaf "factories" get their energy, or fuel for the work of making food, from the sun. This process of putting the sun's energy to work is called photosynthesis.

WHERE GROWTH TAKES PLACE

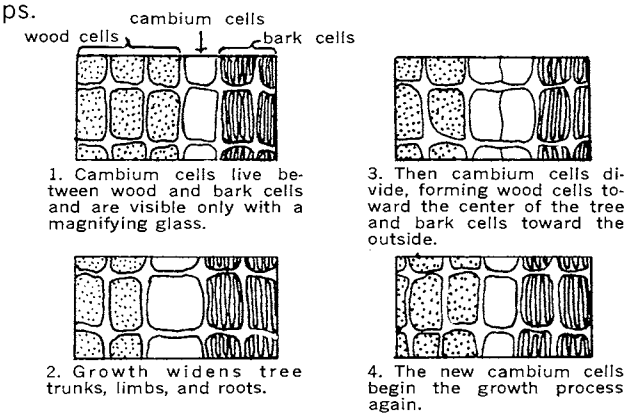
There are three different growing parts of a tree: the root tips, the cambium layer, and the buds. The root tips cause the roots to grow longer and spread out in search of more water and nutrients. The cambium layer is a thin single layer of cells just under the bark. Cambium is present in the trunk, limbs, and roots. The buds on the limbs cause each limb to grow, making the tree taller and wider. This also makes it possible for the limbs to spread out to receive more sunlight.

Wood is not solid material. It is made up of a lot of little fibers cemented together and visible only under a microscope or very strong magnifying glass. Fibers vary from long to short.



THE CAMBIUM STORY

The cells in the cambium layer divide during warm months to form new cells. Cells toward the outside of the tree form bark; cells toward the inside of the tree form wood. Growth that makes a tree larger in width takes place at the cambium layer. Growth that makes limbs longer and trees taller takes place at the branch tips.



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

2. 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.

FACTS ABOUT THE STEM OR TRUNK

There are many interesting facts about the tree stem or, as we commonly call it, the tree trunk.

Remember, we said it had two main purposes: to support the crown (to do this it must be strong), and to carry water and plant food from the roots to the top for use by the leaves. Then, when the leaves have manufactured the food (plant starches and sugars), these foods are carried down to the root system for growth or storage.

If the plant foods can be carried up and down the trunk of the tree and through the branches as a liquid, there must be many little tubes present. These tubes, or pipelines, are made up of many small sections called cells. They fit end to end to form long tubes. These cells can only be seen through a magnifying glass.

The ends of the cells are open, like a soda straw, but a row of material, called cellulose, must be formed around the outside or it would not form a tube or cell. A piece of wood, even as small as a pencil, contains millions of these cells.

By looking at the tree trunk, note tree growth from the center towards the outside. By looking closely at the top of a stump or the end of a log, you can see rings in the wood. These rings are caused by growing layers of wood; a new layer is added each year. Each layer is made up of a band of lighter colored wood called spring wood, and a band of darker wood called summer wood.

Usually the spring wood band is wider than the summer wood band. These rings, formed by the layers of wood, are called annual rings.

The tree's age can be learned by counting the rings on the stump. Remember, one light ring and one dark ring is 1 year's growth. Count only dark or light rings to learn its age.

The covering on the outside of the stump or log is usually rough and does not resemble the wood. This is called the outer bark. It consists of dead cells and serves only as a protective coat. Just inside the outer bark is a thinner, lighter colored layer called the inner bark. The cells in the inner bark carry food, made in the leaves, down to the branches, stem, and roots.

The very thin layer of cells just inside the bark is invisible to the naked eye and is the cambium (discussed earlier).

Next is a wide band of lighter colored wood toward the outside of the stump or log which is called sapwood and is the part of the pipeline system carrying water and food from the roots upward to the crown.

Notice the darker, dead, completely inactive wood in the center of a stump or log. It is called heartwood and provides support and strength to the tree.

FORESTRY TERMS

To understand something about forestry, know the meaning of words commonly used:

Annual ring—the growth layer of 1 year, as viewed on cross section of a stem, branch, or root (made up of one light-colored ring of spring growth and one dark-colored ring of summer growth).

Board foot—a unit of measurement represented by a board 1 foot long, 1 foot wide, and 1 inch thick.

Browse—any shrub or tree eaten by domestic or wild animals (usually refers to wild animals) for food.

Cambium—the growth layer of cells between the bark and the wood of the tree. The cambium cells divide, causing the tree to grow in width.

Clearcutting—a method of harvesting where all trees of a certain species in an area are cut, such as Norway pine and black spruce.

Climax-plant community—the final stage of plant succession which continues to occupy an area indefinitely—as long as climatic and soil conditions remain the same. Also see definition of plant succession.

Conifer—cone bearing trees with needle-shaped leaves, usually evergreen. Produces wood known commercially as softwood.

Cord—a unit of measurement of stacked wood. A standard cord is a pile of stacked wood containing 128 cubic feet. The standard dimensions of the pile are 4 by 4 by 8 feet. 2½ cords = 1,000 board feet.

Crown—the upper portion of the tree including branches, twigs, leaves, flowers, and fruit. Crowns of adjacent trees form a forest canopy.

Deciduous—a group of plants which lose their leaves during the fall: commonly called broadleaf or hardwood.

Deliquescent—the pattern of trunk development where there is a series of branches radiating from a shortened stem which does not have a definite leader. See page 21.

d.b.h.—diameter breast height is 4.5 feet above the ground. The diameter of the tree is measured at this point.

Duff—dead leaves and other organic debris in various stages of decay, on top of mineral soil. Also called forest litter.

Ecology—the study of plant and animal development within a community or communities of living things, the relationships with each other and with the physical surroundings (environment). An understanding of ecology is basic to conservation.

Excurrent—the pattern of trunk development where the main trunk or bole runs straight up from the ground to a definite leader. Most common in conifers. See page 21.

Forestry—the scientific management of forests for the continuous production of goods (such as lumber and Christmas trees) and services (such as erosion control, water retention, and recreation).

Grazing—the eating of any kind of standing vegetation by domestic livestock or wild animals.

Hardwood—group of trees with broad leaves shed in the fall; also refers to wood, regardless of texture, produced by such trees.

Heartwood—the inner portion of the tree trunk, between the pith and sapwood. It is old, darkened sapwood which functions to support the tree.

Humus—the plant and animal residues of the soil, litter (duff) excluded, which are undergoing decay.

Increment borer—a tool used to measure the age of a tree by removing a small core to count the annual rings.

Intolerance—the inability of a plant to develop and grow in the shade and in competition with other plants, examples are aspen and most pine.

Litter—see duff.

Pith—loose, spongy, center of plants. In trees this may harden to some degree. Represents the center of the tree stump.

Plant succession—the progressive change of one plant community to another until the final or climax community is developed.

Pruning—the removal of live or dead branches from standing trees. This may be done artificially or naturally. Natural pruning is often the result of decay, snow, ice, or lack of light.

Reforestation—the natural or artificial seeding or planting of an area with forest trees.

Sapling—a young tree from 1½ to 3 inches in width: larger than a seedling and smaller than pole-size or mature trees.

Sapwood—the outer, usually lighter-colored, portion of the trunk of the tree functioning as water, mineral, and food conductor between roots and leaves.

Selective cut—harvesting individual trees from a stand of timber or small groups of trees over a period of years thus maintaining a mixed-age stand.

Slash—branches, bark, tops, chunks of wood, cull logs, uprooted stumps, and broken or uprooted trees left on the ground after logging.

Softwood—group of trees having needles or scales as leaves. Usually called evergreens or conifers.

Spring wood—the lighter, more porous, less dense portion of the annual ring formed in the spring.

Summer wood—the darker, usually thinner portion of an annual ring formed in the summer.

Sustained yield—continuous production at a more or less uniform annual rate.

Sylvan—concerned with the forest; pertaining to, living, located, or carried on, in the woods (from the Latin word, sylva, meaning forest).

Terrarium—a living example of a plant community encased in a container and composed of small plants and animals.

Thinning—cutting in an immature stand to increase growth rate, to foster quality growth, to improve composition, to promote sanitation, to aid in better cover, and to use material that would otherwise be lost.

Tolerance—the ability of a plant to develop and grow in the shade and in competition with other plants, examples are sugar maple and balsam fir.

Transpiration—the process by which water vapor leaves the foliage or other parts of a living plant and is released to the air.

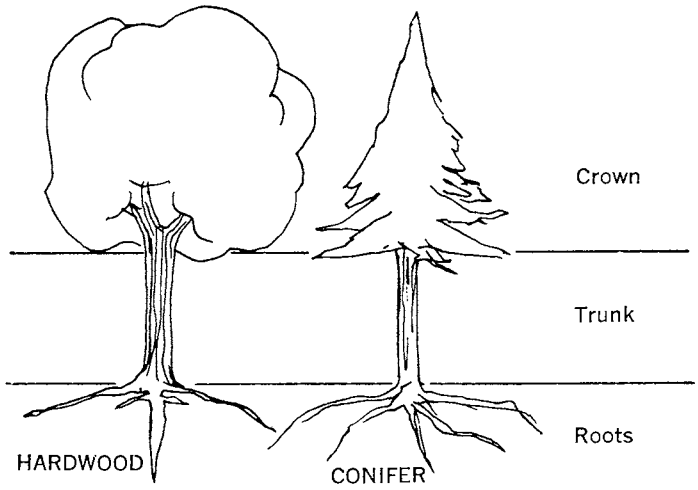
Trunk—the main stem of the tree rising from the ground and supporting the branches: also called the bole.

Whorls—an arrangement of branches (or leaves) in a circle around the stem.

ACTIVITIES

Parts of a Tree

1. Build a model of a hardwood or conifer tree showing the crown, trunk, roots, and other parts you may wish to talk about.



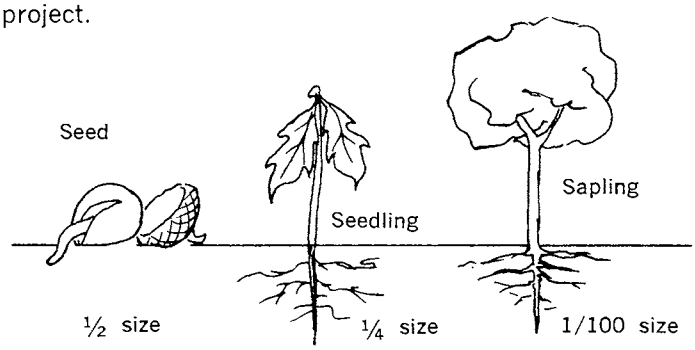
The model might be made of plywood, lumber, styrofoam, cardboard, or craft paper. Glue sandpaper on the back of each piece for a flannelboard talk or demonstration.

Label each part and describe the functions of each part of the tree relating these to the environment: such as soil, water, air, temperature, and wind.

2. Show how a tree grows from seed to maturity. Use models or actual parts of a tree or trees which you have collected.

Show the relationship of various parts of the growing tree to its environment including cooperation and competition with other plants (flora) or animals (fauna).

Observe the differences in growth and form between a hardwood and a conifer or between different hardwoods or conifers. Show how these occur in nature, and with the aid of books on trees, describe these in your project.



3. One of the best ways to observe the growth of various parts of a tree or plant is to plant a seed and observe each day the differences as this seed starts to grow (germinates) and develops into a seedling. You could also observe similar growth with a bean seed which germinates faster than tree seed. Later on in this project, there is a section on growing forest tree seedlings from seed. Also refer to 4-H project *Exploring the World of Plants and Soils, Unit I,* relating to growing plants from seeds. Remember that most plants have roots, a stem, and leaves and these may all be observed in this simple project.

Accomplishment record:

MY TREE STUDY

Adopt a tree in your neighborhood which will be easy to visit throughout the year. Get to know it well and keep notes on things of interest that happen to it throughout the year. Learn as many ways as possible to identify it. Study its twigs, leaves, flowers, fruit, bark, and overall shape. Find books about the tree. Learn its commercial use, if any.

Common name_____

Scientific name_____

Size_____ feet tall

_____ inches in diameter (4½ feet above the ground)

Give dates
Buds opened_____

Flowers opened _____

Fruit formed _____

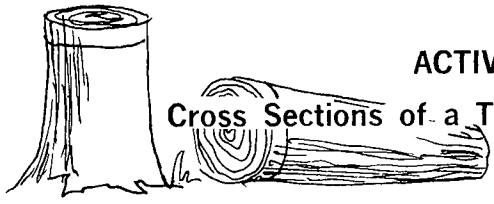
Color of leaves in the fall_____

Birds, insects, and other animals which live around the tree or get food from it

Books I read about the tree (title and author)

Draw a picture of a leaf from the tree

Attach a photo or drawing of the tree

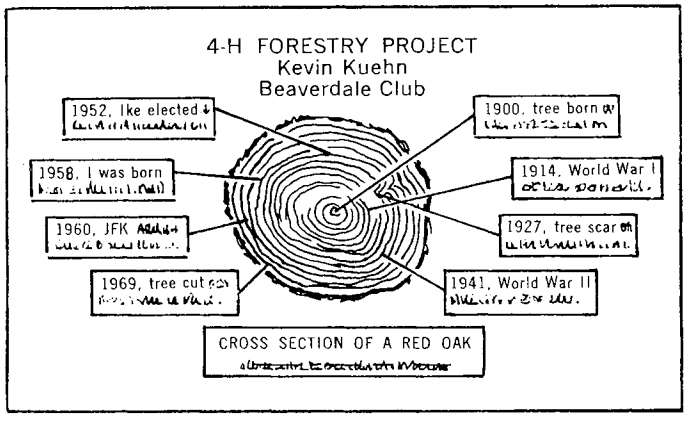


ACTIVITIES

Cross Sections of a Tree Trunk

Locate a stump or a log from which, with assistance, you can obtain a cross section. If working with saws, be safety conscious. If you cannot get a cross section, you might photograph a cross section or use cardboard or craft paper models.

Label the different parts of the trunk, such as inner bark, outer bark, cambium, sapwood, heartwood, pith, annual ring, spring wood, and summer wood.



Compare the cross sections of a hardwood tree and a conifer tree. What are the differences? The similarities? What are the functions of the various parts? How do these relate to the crown, trunk, and roots? What are the relationships to the environment?

How old is the tree?

Count the annual rings (one light and one dark portion next to each other make 1 year's growth) starting at the inner circle (smallest ring) and counting out to the edge. How many years did this part of the tree grow?

When counting rings on a stump, add 1 year to the total number of rings, plus 1 year for each foot of stump height above the ground. Example: If the stump is cut 2 feet above the ground, add 1 + 2 (1 for each foot) = 3, and if you counted 42 rings, the tree would be 42 + 3 = 45 years old.

How old is the tree?_____

Was it growing fast when cut?_____

Hint: Look at the width of the outermost rings just inside the cambium layer.

Label the cross section, or photograph, as to age and year cut, then list something of historical importance for several other rings. (See drawing.)

How old are young pine trees?

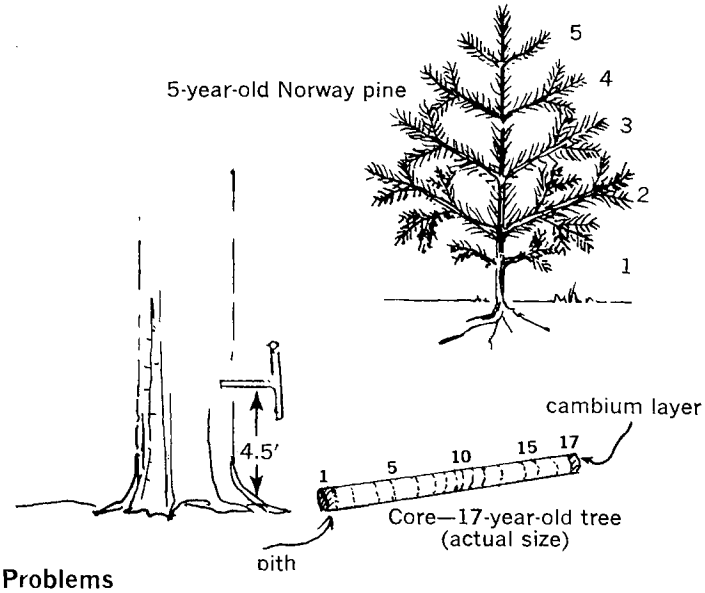
Live trees always have a cluster of buds at the top. As growth begins, the center bud sends up vertical growth and the buds around the center send out horizontal branches.

The age of young conifer trees, like pines and balsam fir, can be determined by counting the number of sets or whorls of these annual horizontal branches. Thus, if 5 whorls of branches are counted, the age of the tree is about 5 years. As the tree gets older, it is difficult to count the whorls.

How old are large standing trees?

The most accurate method of determining the age of older trees is with an increment borer. This instrument is a hollow wood-boring bit that cuts a core (a regular woodboring bit cuts shavings). To determine the age of the tree, the borer is twisted into the center of the tree at 4.5 feet above the ground (d.b.h.); the core is removed from the hollow stem of the borer and the growth rings from the cambium layer to the center of the tree, as shown in the core, are counted. Cores may be carried in a soda straw to avoid breakage. Handle the borer with care to prevent chipping the sharp bit. It must be cleaned and oiled every day it is used so it doesn't rust. Borers are expensive.

Ask your local forester to demonstrate a borer. Maybe he will let you use this instrument.



Problems

Did the tree grow faster when it was younger or older?

Hint: Notice the varying widths of annual rings. Wide ones indicate rapid growth.

How old is the tree? _____

Should it be cut for lumber? _____

What other uses does it have in the forest? _____

Did the borer go in easily? _____

Why do some trees have harder wood than others? _____

_____

What are hardwoods and softwoods? _____

_____

How can you tell when you have bored to the center of the tree? _____

Practice with these tree tools until you can become proficient in their use.

Accomplishment record:

_____

_____

_____

_____

_____

_____

_____

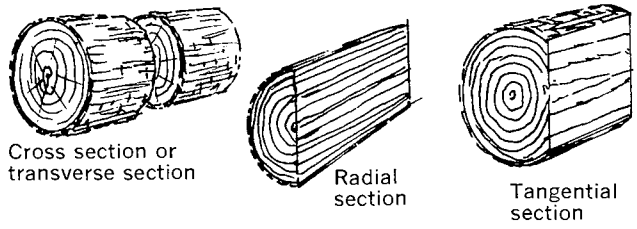
III. The Features of Wood

Knowing the characteristics of wood helps the forester grow trees with high quality wood. It is necessary to understand wood's features so the proper wood can be selected for the job to which it is best suited.

THE PLANES OF WOOD

Before wood can be studied, the planes or faces of a block of wood must be named and learned. These planes determine the direction of sight; that is, top, side, or back.

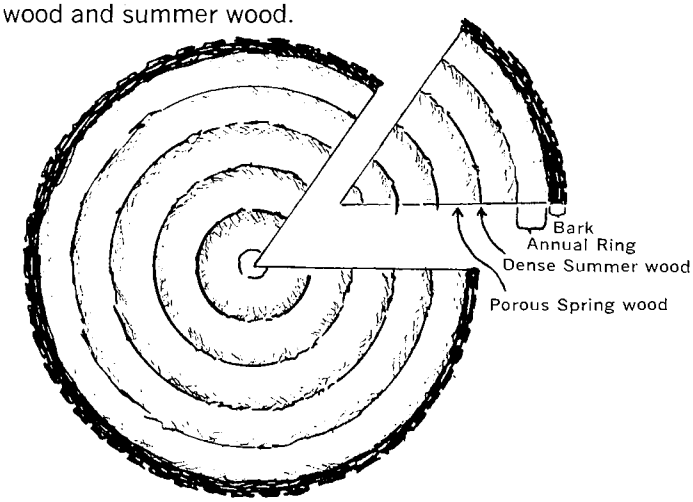
The plane that is exposed when a log is cut across the end is the cross section or transverse section. When a log is cut through the middle, the radial surface appears. The tangential surface is exposed if a slab is cut lengthwise off the log.



ANNUAL RINGS

As a tree grows, a new layer of wood is produced each year. This layer is called an annual ring. This drawing of the end of a log shows the annual rings:

The part of the ring formed in the spring, when growth begins, is mostly cell tissue that carries water and other liquids through the tree. These cells are very porous (have many holes) and are called spring wood. Wood produced later in the season is very dense; made up of many tiny cells packed tightly together. Because of this, the wood appears as a dark ring and is called summer wood. An annual ring is composed of spring wood and summer wood.



SAPWOOD AND HEARTWOOD

Each year, as a young tree grows, more and more wood is produced. A portion of this wood is used to conduct water and minerals from the roots to the leaves, store food during the winter, and provide strength to the trunk. This part of the trunk's wood is called sapwood.

Later, as the tree grows older, the center part becomes inactive: its main function, support. This wood darkens and the cells become filled with certain natural chemicals that are often toxic to fungi and harmful to insects, protecting the tree from decay by these pests. This center is called heartwood.

WOOD RAYS

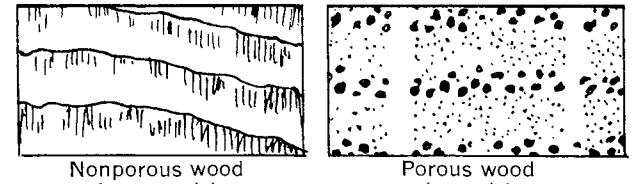
Wood is easily split along the grain and it can be broken but does not split across the grain. The reason for this is the arrangement of cells within the tree.

Most cells are lined up parallel to the sides of the trunk, that is, along the grain. But here and there groups of cells, called wood rays run across the grain. These are sheets or plates of tissue which appear to begin next to the bark and extend into the trunk. They are conducting tissue for water from the trunk's outside to inside.

SOFTWOODS AND HARDWOODS

Trees are divided in two general classes known as softwoods and hardwoods. Softwoods are coniferous or cone-bearing trees, such as pine, spruce, and fir. Sometimes softwoods are called nonporous woods because they have no large vessels or ducts along the grain.

Hardwoods are broadleaved trees such as elm, oak, aspen, and cottonwood. They are often called porous woods because they have large vessels or ducts.



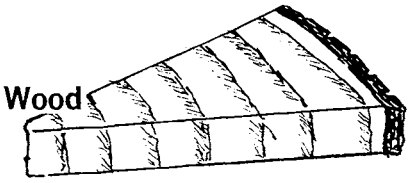
RESIN CANALS

Resin canals are spaces surrounded by cells which manufacture gummy resin. These canals occur in most softwoods, either naturally or as a result of injury. These canals are filled with resin from the surrounding cells. They are usually easily seen with the naked eye.

Resin-making cells are stimulated when the tree receives an injury such as having a chunk of bark chopped away. Resin flows into the canal over the injured area as a protective coating against insects and fungi.

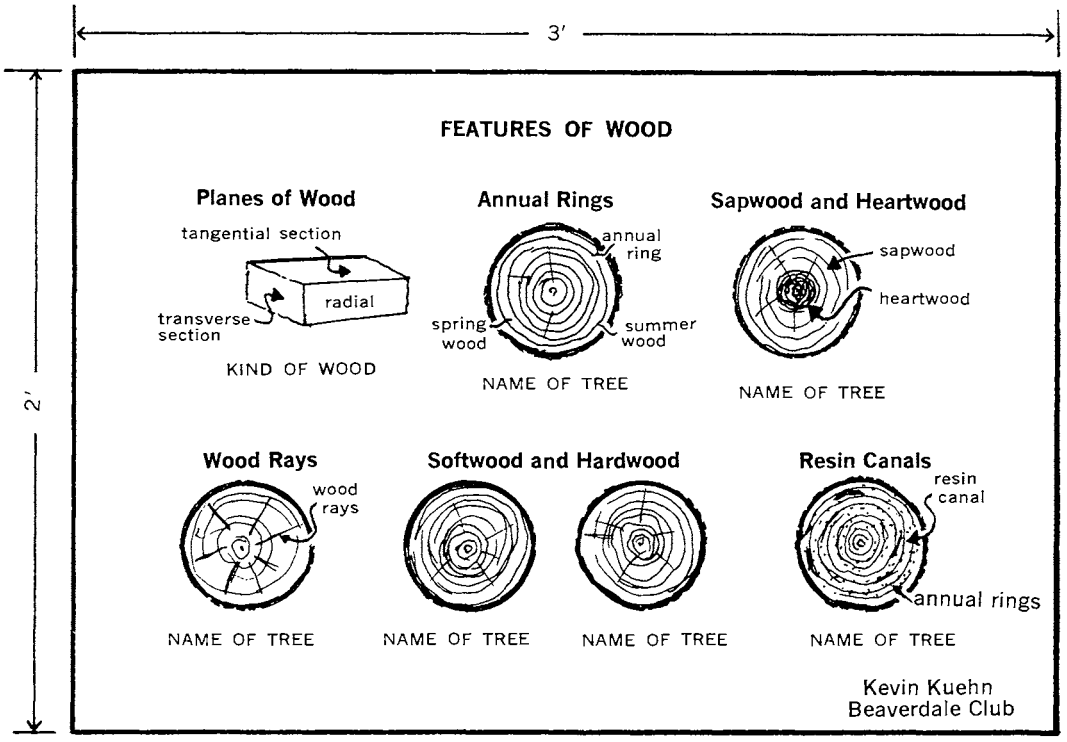
ACTIVITIES

Features of Wood



Develop an exhibit using pieces of wood and cross sections of trees to demonstrate the various features you have learned.

Cross sections of trees should be approximately 2 inches thick and 4 to 6 inches in diameter. Using a plywood or hardboard panel as a background, glue the samples to the panel. Label the features.



Accomplishment record:

IV. What Happens After a Tree Dies?

We are part of a living and dying world. Plants and animals are born, grow to maturity, and die. Their place, in turn, is taken by other plants and animals. As each living thing dies, decays, and returns to the soil, it affects the area around it and changes the environment. These changes may make it possible for new plants to grow where they could not before. This is a part of the dynamic process called ecology.

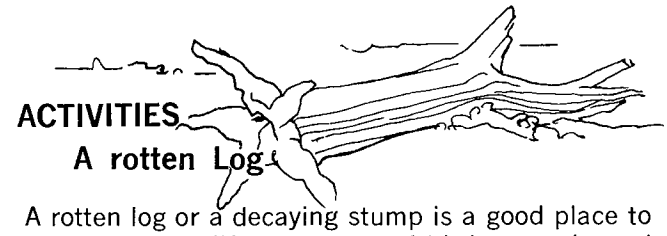
Norway pine tree seeds need mineral soil to germinate and grow. When a Norway pine tree is growing, it covers the forest floor with litter, making it impossible for other pine seeds to reach mineral soil. This means Norway pine seeds cannot reproduce themselves in the dense forest, but when the Norway pine dies and the litter is disturbed, other Norway pine seeds may fall on the mineral soil and start to grow.

Shade-tolerant plants, like the sugar maple, can sprout and grow on rotten logs and humus. We would expect to find shade-loving plants like the balsam-fir, hazel, and dogwoods growing where sun-loving plants cannot.

Shade-tolerant plants growing on rotten logs help the log decay back into the soil. Animals, especially small ones, find homes in the logs; these animals supply food for other animals.

One of the best exercises in studying the ecology of an area is the study of a rotten log or decaying stump. The processes of competition and cooperation among plants, animals, and other factors of local environment (moisture, air, temperature, light) can be studied in this exercise. While all these factors are happening in a very minor (micro) part of our environment, such as the log, the same forces and factors are at work in the larger (macro) environment, such as the forest.

In studying a rotten log or decaying stump, you are studying a community at work. Just as in your community, be it city, town, or village, these same life and death forces are at work. A good example of cooperation and competition is competing as a member of a team against another team. Cooperation and competition exist in the community, too. In any community there are the life processes of birth, growth, and death; these occur in your own community just as they do in a forest community, or on a smaller scale, in the rotten log or decaying stump. By understanding these life processes, it is easier to manage community action. This management is necessary in the proper development and use of our forests.



ACTIVITIES

A rotten Log

A rotten log or a decaying stump is a good place to study some of the life processes of birth, growth, and death and of the cooperative and competitive actions in nature. It is really a study of a small community and the micro-ecological processes.

Locate a rotten log or decaying stump. Record your observations:

What kind of tree is this? _____

What is its location (aspect, slope, upland or lowland, wet or dry)? _____

What is the amount of rainfall each year (a lot or very little)? _____

If it is a log, where is the stump? _____

How did the tree die? _____

How long has it been dead? _____

When did it die? _____

How old was it? _____

Does it still have bark? _____

Is the bark loose? _____

Is the wood rotten or firm? _____

Can you push a nail into it? _____

Is the wood dry or moist? _____

How does this help decay? _____

Is it in the shade or sun? _____

How does this help decay? _____

List the animals you see living in or on the log or stump: (example)

Name	Type of home	Food eaten	Enemies
Carpenter ant	Nest in wood	Fungi in wood	Sapsucker and other birds, reptiles
Earthworm	Tunnels in ground	Soil micro-organisms	Birds, reptiles

List the plants you see living in or on the log or stump: (example)

Name	Location		Roots in		Where did the plant come from?	Is this beneficial or harmful to the community? Why?
	Sunlight	Shade	Mineral soil	Rotten log		
Moss		✓		✓	Spores from moss on trees or ground	Beneficial. Retains moisture, helps decay.
Spruce	✓			✓	Seed from tree 20 feet away	Good. Creates a good environment.

List ways in which the log or stump is useful to:

Soil_____

Water_____

Plants_____

Animals_____

Man_____

Make a terrarium, just as you would an aquarium, using soil, plants, and small animals. Add a piece of decaying wood. Keep moist and warm. See reference list in back—*Indoor Gardening.*

Record your observations. Demonstrate this terrarium and discuss the relationship of the plants, animals, soil, and moisture as you've observed them.

Accomplishment record:

SAFETY IN THE WOODS

When you are working on a forestry project, camping in the woods, or any time you are in the forest, it is essential to practice safety rules somewhat different from those you've learned previously. The forest is a safe place if you observe the rules of the forest.

Don't go into the forest if weather conditions are bad: when the wind is blowing hard or during a hard rainstorm or snowstorm. This is the forest's most important rule.

The second rule is to know where you are in the forest at all times. Later, you will have an opportunity to work on a project in the use of a compass and map reading—tools to assist you in locating yourself in the forest. Remember, no two areas in the forest really look alike, yet when one is lost, every place in the forest looks like someplace you've been before.

If you should lose your way in the forest, the cardinal rule is DON'T PANIC—KEEP COOL. Take a breather, stay where you are, try to reconstruct your route. Then, try to retrace your route backwards for a short distance. If you don't recognize any features (creeks, trees, rocks, hills), stop where you are and make yourself comfortable while you wait for help. Remember—DON'T PANIC —KEEP COOL.

The third major rule is don't be afraid of the forest; that is, go into the forest with respect for it, not fear.

There are some other general rules which apply if you are going to do any work like cutting trees, pruning limbs, or carrying wood products. Wear proper clothing: good boots or shoes, loose fitting clothing, enough clothing to protect your arms and legs against scratches or cuts, and safety equipment such as gloves, hard hats, and safety shoes.

You should always look for and avoid unsafe situations such as dead, hanging branches, or rotten trees. If you have the right equipment and the time, you might wish to get rid of these or knock them down. If there are other people around, you must be careful in felling rotten trees or dead branches.

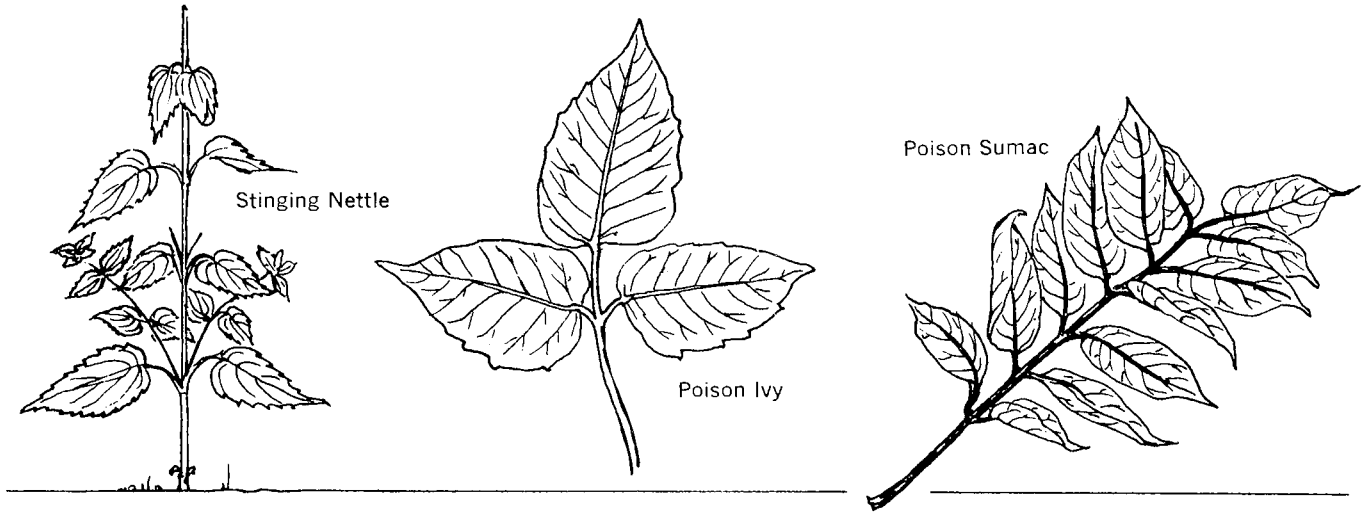
When you are walking in the woods with someone else, it's only good manners not to pull limbs back so that they swish in the face of the person following you. Watch out for steep slopes, extremely wet spots, unsafe ice on ponds or creeks. When walking on logs, be sure that the bark is tight. It may be necessary to carry a stick for balance when you are crossing a stream or a creek on top of a log.

Finally, be alert for the poisonous plants and the harmful insects in Minnesota forests. The poisonous plants, are, of course, poison ivy and poison sumac. Poison ivy has the characteristic 3 leaves you will become familiar with and is generally a small shrub, up to 3-4 feet tall. The rule "leaves three, let it be; berries white, you'll itch at night" is good to memorize and observe. Poison sumac is found in the swamps and is not nearly as common as poison ivy.

The other major irritating plant in Minnesota is nettles. While it may be very uncomfortable for a short time, it is not nearly as dangerous as poison ivy. Nettles is generally found in moist areas especially around streams or river bottoms.

There are several types of wasps, hornets, and bees which should be avoided. Do not poke at wasps' nests in trees. Be careful of the nests which are underground and which wasps enter through very small, generally unnoticed ground holes. Some people are highly allergic to the sting of wasps, hornets, or bees. If someone in your group is stung and the stung portion starts to swell abnormally, get them to a doctor or a hospital as soon as you can, but keep them and yourself calm.

Finally, common sense is good sense; horseplay is foolishness. DON'T PANIC — KEEP COOL.



V. Tree Identification

LEARNING TO KNOW TREES

Many kinds of trees grow in Minnesota forests. You will find forests more interesting if you learn to identify trees in your area and are able to call them by their right name, just as you call your friends by their names.

Trees may be identified by their leaves, fruit, buds, bark, twigs, flowers, method of branching, and general shape. Some trees can be identified by type of thorns and peculiar odor or taste. Leaves are the most common identifying characteristic of trees.

The leaves of pine, spruce, and fir are needlelike; leaves of red and white cedar are scalelike.

The leaves of jack and Norway pine grow in clusters of two; the needles of white pine grow in clusters of five. Needles of balsam-fir and the spruces grow singly on the twig.

Minnesota has a large number of hardwood trees growing throughout the state. These are trees which lose their leaves in the fall, but during the time you will be working on your project, most of these trees will have leaves. The first thing to notice in identifying hardwood trees is whether the branches of the trees are opposite as shown in figure 3 and as in the maples, ashes, and dogwoods. All other hardwood trees have alternate branching shown in figure 4. A bud in the axil indicates a true leaf. Most trees have simple leaves shown in figure 5. Trees with compound leaves are the hickories, ashes, locusts, and walnuts. An example of these is shown in figure 6. Don't be confused by the term compound leaf, meaning a leaf with a number of leaflets. When such a tree sheds leaves in the fall, the leaflets and petiole (stem) usually fall to the ground separately, so it is difficult to find a complete compound leaf.

There are several projects which will assist you in identifying trees. First, list a number of trees that you can see or observe immediately around your house or farm; identify different trees by viewing the sections of wood. These projects in tree identification are aimed at acquainting you with your plant neighbors. Remember, the forest is a community of many trees, plants, and animals—most of which are your friends.

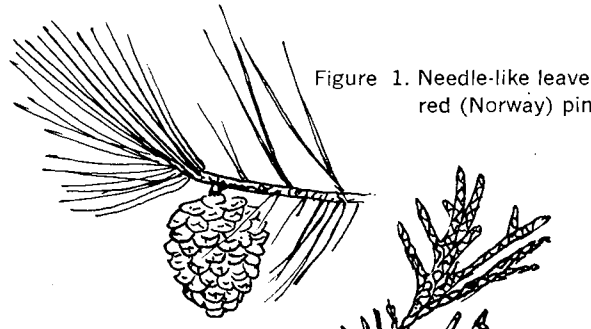


Figure 1. Needle-like leaves of red (Norway) pine

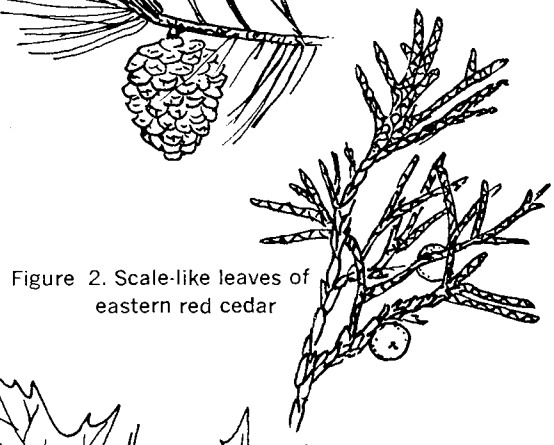


Figure 2. Scale-like leaves of eastern red cedar

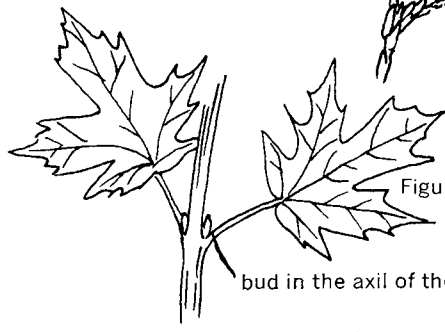


Figure 3. Opposite branching (sugar maple)

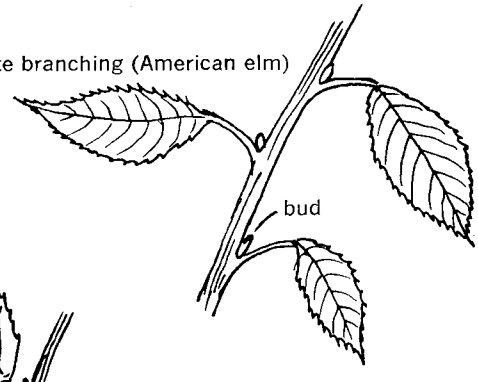


Figure 4. Alternate branching (American elm)

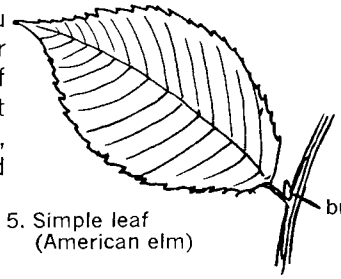


Figure 5. Simple leaf (American elm)

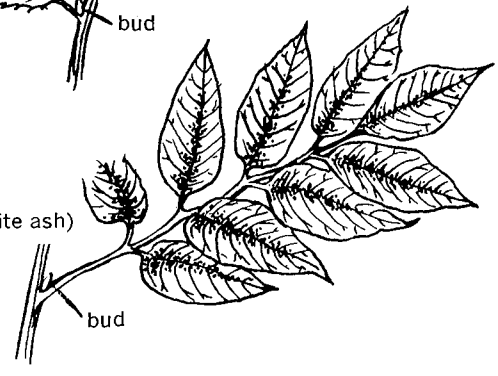
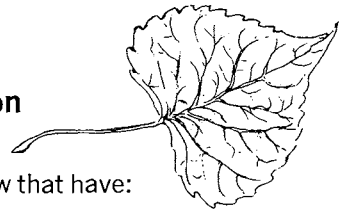


Figure 6. Compound leaf (White ash)

ACTIVITIES
Tree Identification



1. List the trees you know that have:

a. Evergreen leaves

b. Deciduous leaves

c. Opposite branching

d. Alternate branching

e. Simple leaves

f. Compound leaves

2. Collecting and Mounting Leaves, Twigs, Seeds, or Fruit.

Building a Plant Press

Before you attempt to collect any leaves and twigs for mounting, build a plant press.

A plant press is used to dry plant specimens under pressure. Collecting and mounting leaves and twigs will be more enjoyable and you will get better results if you have a plant press for proper drying. Making a plant press is an easy job. Just follow the directions carefully and complete each step to the best of your ability.

Take a scrap of lumber or a discarded apple crate or similar box and measure and saw out the following:

Four pieces of wood 18 inches long, 1½ inches wide, and about ⅜ inch thick.

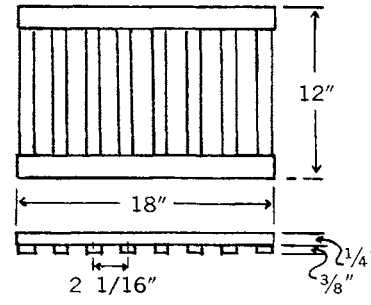
16 pieces of wood 12 inches long, 1 inch wide, and ¼ inch thick, or plaster laths 12 inches long.

Also have the following materials and tools on hand:

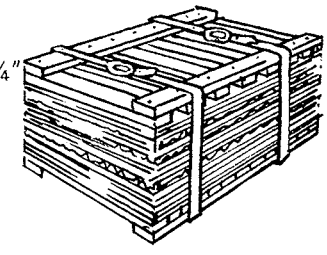
32 small nails or small ½ inch screws.

Hammer, screwdriver, and square.

Make two frames out of the slats. Use half of the material for each frame. They should appear as in the drawing.



sheets of newspaper and cardboard



To make the press ready for use, get the following:

2 buckle straps or pieces of rope, each about 4 feet long.

At least 20 sheets of newspaper for holding plant specimens.

Several pieces of corrugated cardboard 12 by 18 inches (from grocery boxes).

Collecting and Pressing Leaves and Twigs

The only equipment needed is a small knife, a small pad of notepaper, and a magazine with large pages. In the field, carry the specimens between the magazine pages. As the sample is collected, write on a sheet of notepaper or on the magazine page where you insert the leaf, the information you want to remember such as the place, date, and surroundings of the collection.

Select only good average (typical for the plant) samples. Small seedlings or new growth are not typical of the particular tree.

Place the samples in the plant press within a few hours after collection. Put the leaf or twig between several sheets of newspaper—being sure to arrange the leaves and twigs exactly the way they are to appear on the display sheet. Place a piece of cardboard between each sample being pressed. Keep this up until the plant press is packed. Wrap the press tightly with straps or pieces of rope. Place in a dry location where the air can circulate freely all around the press.

Usually 10 days in the press is necessary to dry specimens properly. About the fourth day, replace the newspapers with dry ones. If you do not, the samples are apt to become discolored or rotted by mold.

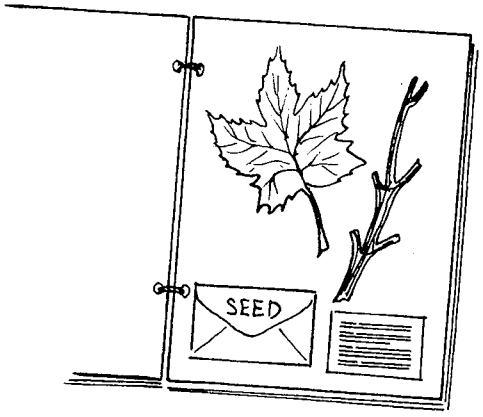
Mounting the Leaves and Twigs in a Display Book

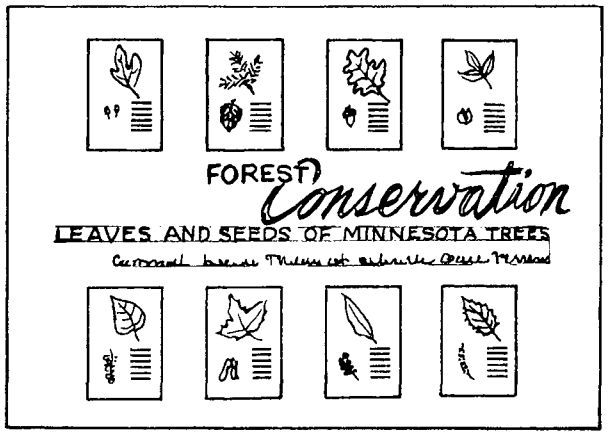
When the sample is thoroughly dried, mount it on the pages of the display book. The paper used for mounting should be stiff enough not to buckle when handled and its size should be at least 12 by 16 inches. (Do not use sheets larger than 16 by 20 inches). Mount the leaves, twigs, seeds, or fruit of each tree on separate sheets, as shown in the picture.

Either paste, rubber cement, glue, transparent or gummed tape may be used to fasten leaves and twigs to the paper. Large cones or pulp fruits can be cut in half and pasted flat side down in transparent envelopes pasted to the mounting paper.

The label is ordinarily placed in the lower right-hand corner of the mounting sheet and should include the common name, scientific name, date and place of collection, and the commercial and farm uses of the tree. The information placed on this label will increase in value over the years, so be thorough.

The last step is to bind the plant mountings into a book. Print your name, club, and year of membership on the cover. Instead of the book, you might want to mount your pages on a large sheet of cardboard or ¼ inch plywood as illustrated or use your own ideas.





Mounting Leaves and Twigs on a Display Board

When the sample is thoroughly dried, mount on a 22 by 28 inch board. The mounting board material should be stiff enough not to buckle when handled. If necessary, use transparent or gummed tape to fasten leaves and twigs. Most specimens can be pasted or glued to the board. Sometimes you may need to use string or wire.

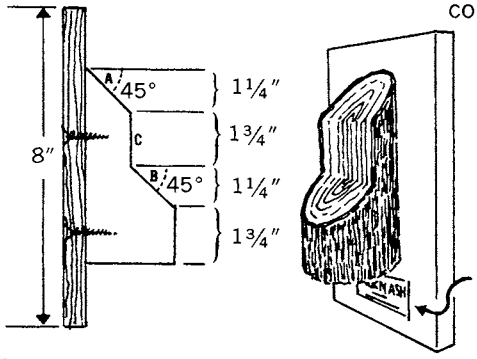
Place the information label containing the common name, scientific name, date and place of collection, and the uses of the tree, below the leaves, twigs, and seeds.

3. Collecting and Mounting Wood Specimens

Wood samples are usually prepared and mounted on a mounting board as pictured. Collect the wood samples from branches with a 2-3 inch diameter. The

samples should be about 6 inches long with the ends sawed square. Air dry the pieces of wood for several weeks before attemping to finish the shaping. After the wood has dried, cut each block as shown in the drawing. Sand and varnish the surface mounting.

Mount the wood samples on a 22 by 28 inch board. All wood samples should be fastened to the board with screws. Below each wood sample place a 2 by 4 inch card containing the following printed or typed information: common name, scientific name, date and place of collection, and uses of the tree.



GREEN ASH
Fraxinus pennsylv.
July 4, 1971 Osseo
Used for handles

Accomplishment record:

VI. Adaptation to Environment

You have now studied the parts of a tree, how a tree grows, and how to identify trees. More specific information about how the individual tree relates to its environment follows.

LIGHT AND PLANTS

Light and seed germination

Certain kinds of seeds need light to germinate. The need for light is not peculiar to a special set of experimental conditions but occurs whenever seeds are planted in ordinary pots of soil. A need for light can be produced in seeds that normally do not need light for germination. The light reaction (photo-reaction) that allows germination to proceed is reversible; red radiant energy drives the reaction in one direction and far-red drives it in the reverse direction. Sensitivity of seeds to a given amount of radiant energy changes with the length of absorption.

Light and plant growth

Light holds back stem growth and promotes leaf expansion. Plants bend toward the light. Chlorophyll formation requires light and the light must be of higher intensity than that which controls stem length. The red, far-red reversible photo-reaction that controls seed germination also controls stem length and leaf size.

Light and plant pigments

Light is required for the formation of the red color (anthocyanin) of certain seedlings and apple fruits. Light is required for the formation of a yellow color in the skin of tomatoes. Coloration occurs only in the areas that receive light—there is no translocation (movement) of the stimulus.

Effect of daylength on plants

Some plants flower in seasons of short days and long nights, while others need long days and short nights. Dormancy (resting) of woody plants in the autumn is brought about by short days. Daylength controls tuber (potato) and bulb (onion) formation as well as flowering and dormancy.

PHOTOSYNTHESIS, ENZYMES, GROWTH FORMS

Leaves are the most important chemical factories in the world. Without their basic product, sugar, there would be no food for man or animal; no wood for shelter; no humus for the soil; and no coal for fuel.

Inside each leaf, millions of green-colored microscopic "synthetic chemists" (chloroplasts) manufacture sugar. They trap radiant energy from sunlight for power. Their raw materials are carbon dioxide from the air and water from the soil. Oxygen, a by-product, is released. This fundamental energy-storing, sugar-making process is called photosynthesis.

What happens to this leaf-made sugar in a tree? With the aid of chemical specialists, called enzymes, every living cell—from root tips to crown tops—goes to work on the sugar. New products result. Each enzyme does a certain job, working with split second timing and in harmony with the others. They break down sugar and recombine it with nitrogen and minerals to form other substances. The oxygen given off by plants is the major source of the oxygen we must have for breathing. About 70 percent of the oxygen on this earth is produced by aquatic plants, primarily ocean plants; the other 30 percent is produced by terrestrial (land) plants.

Enzymes change some sugar to other foods such as starches, fats, oils, and proteins which help form fruits, nuts, and seeds. Enzymes convert some sugar to cell-walled substances such as cellulose, wood, and bark.

Enzymes make some of the sugar into other substances which find special uses in industry. Some of these are rosin and turpentine from the southern pines; syrup from maples; chewing gum from chicle trees and spruces; and tannin from hemlocks, oaks, and chestnuts. Enzymes use some of the sugar directly for energy in the growing parts of the tree—its buds, cambium layer, and root tips.

GROWTH FORMS OF TREES

Trees, like all plants, have growth patterns that give each species a familiar appearance. The characteristic way that certain tree species look is called growth form. Often, the growth form is so striking that a tree can be identified from great distances.

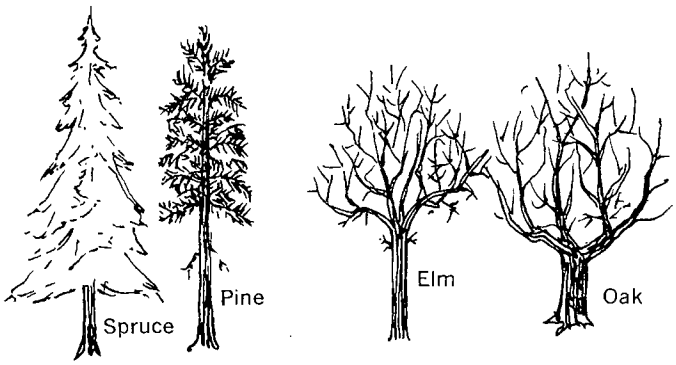
Trees can be divided in two convenient groups based on branching patterns. One type, like the conifers, has a main trunk or bole running straight up from the stump to the top or leader: these trees are called excurrent. The other type breaks up in a series of branches with no definite leader: these are called deliquescent.

Although each species has a characteristic branching pattern, certain environmental conditions may alter it. For example, the excurrent form of growth is encour-

aged by a dense stand of timber. Trees growing close together exert community pressure on one another for water, nutrients, and particularly sunlight. Therefore, the trees tend to grow tall and straight with few lower branches.

Deliquescent growth is fostered by open stands of timber where sunlight can reach lower branches. Wind, sleet, ice, hail, and birds may injure or kill terminal buds of the leader, resulting in a deliquescent form.

Here are examples of the different growth forms.



EXCURRENT DELIQUESCENT

WHY LEAVES CHANGE COLOR

It requires no vivid imagination to picture Mother Nature going about on autumn days with a liberal supply of paint coloring the leaves of forest trees and other plants with brilliant shades of red, purple, orange, and yellow.

Many people suppose that Jack Frost is responsible for the color change, but he is not. Some of the leaves begin to turn before there is any frost. We know that color change is the result of chemical processes which take place in the trees as the season changes from summer to fall.

During the spring and summer months, leaves have served as factories where most of the foods necessary for the tree growth are made. This food-making process takes place in the leaf in numerous cells containing the pigment (coloring matter) chlorophyll which gives the leaf its green color. Besides the green pigment, leaves also contain yellow or orange carotenoids (pigments)—which, for example, give the carrot its color. Most of the year these yellowish colors are hidden by the greater amount of green coloring. But in the fall, partly because of changes in the length of daylight and temperature, the leaves stop their food-making process. The chlorophyll breaks down, green color disappears, and yellowish colors become visible, giving leaves part of their fall splendor.

At the same time other chemical changes may occur, causing formation of additional pigments that vary from yellow to red to blue. Some of them give rise to the reddish and purplish fall colors of dogwoods and sumacs. Others give the sugar maple its brilliant orange or fiery red and yellow. The autumn foliage of some trees, such as quaking aspen, birch, and hickory, shows only yellow colors. Many oaks and other species turn brown or red, while beech turns a golden bronze. These colors are due to the mixing of varying amounts of the chlorophyll and other pigments in the leaf during the fall season.

Color intensity may vary from tree to tree. For example, leaves directly exposed to the sun may turn red, while those on the shady side may be yellow. The foliage of some tree species just turns dull brown from death and decay and never shows bright colors.

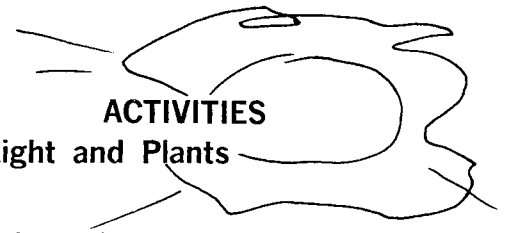
Tree colors may vary from year to year, depending on weather conditions. When there is much warm, cloudy, rainy weather in the fall, the leaves may have less red coloration. The smaller amount of sugar made in the reduced sunlight moves out of the leaves during the warm nights. Thus, no excess sugar remains in the leaves to form the pigments.

Only a few regions of the world are fortunate in having these showy displays. The eastern United States and southeastern Canada possess large areas of deciduous forests (broad-leaved trees) because weather conditions are favorable for bright fall colors. Some western areas of the United States, especially mountain regions, and eastern Asia and southwestern Europe also have bright coloration.

As fall colors appear, other changes take place. Where the base of the leafstalk is attached to the twig, a special layer of cells develops and gradually severs the tissues supporting the leaf. At the same time nature heals the break, so that after the leaf is finally blown off by the wind or has fallen from its own weight, a leaf scar marks the place where it grew on the twig.

Most conifers—pines, spruces, firs, hemlocks, cedars—are evergreen. The needlelike or scalelike leaves remain somewhat green the year round, though often becoming brownish green where winters are cold. Individual leaves may stay on the tree 2 or more years.

Through fallen leaves, nature has provided a fertile forest floor. Fallen leaves contain large amounts of valuable nutrients, particularly calcium and potassium, which were originally a part of the soil. Leaf decomposition enriches the top soil layers by returning part of the elements borrowed by the tree, and at the same time provides for more water-absorbing humus.



ACTIVITIES
Light and Plants

A series of experiments demonstrates light effects on seed germination, plant growth, plant development, and duration of light. For explanations of these experiments and material on how you might develop these projects and exhibits, send to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for *Light and Plants*, Miscellaneous Publication No. 879.

Photosynthesis, Enzymes, Growth Forms

1. Make a collection of forest products which have been formed by the plant sugars or by action of enzymes to other foods or products. These might include fruits, nuts, seeds, rosin, turpentine, Canada balsam, cedar leaf oil, citronella, sassafras oil, cough syrup, maple syrup, chewing gum (chicle), tanning, witch hazel, and others. Mount these for an exhibit.

2. Look at the trees around your house, neighborhood, or farm. Make a list of these trees and their growth form. If possible, determine if the growth form is normal or if the environment (such as soil, climate, space) has caused an abnormal growth form. Explain why two trees of the same species, one growing out in the open and one growing in the forest, have such different forms.

Why Leaves Change Color

Refer back to your ACTIVITIES on page 3, and make colored leaf prints of several of the hardwood trees in your yard, shelterbelt, or park. Compare these colors with those of the conifers.

Do conifer needles change color at different times of the year?

Why?

Accomplishment record:

VII. What is a Forest?

A forest is a living community of plants, with trees the dominant species. From a distance, the forest appears to consist only of big trees. As we come nearer we see other plants—medium-sized trees and shrubs. Then, as we enter the forest, we see many small plants: some of them young trees. A few will eventually become giants. Shrubs, vines, herbs, wild flowers, and mosses also sprawl over the forest floor. This storied effect is called the forest structure.

The forest floor is an important part of the forest community—the base of the forest structure. If the forest floor is swept to remove the dead leaves, humus is exposed. A humus layer takes a long time to develop. It comes from the decay of forest litter—leaves, seeds, twigs, branches, and dead plants and animals. This combination of decayed plant and animal matter gives the soil under a forest canopy a granular, porous structure that makes it easy to "work."

Experts estimate that 2 tons of such debris are converted to soil on each acre of forest floor every year. Bacteria and fungi help to break down the debris. Worms, insects, mice, moles, and shrews also help produce a fertile soil. These forest dwellers find their food and shelter on the forest floor.

The root systems of plants are also important. They take up water and minerals, transport food materials, store food, and anchor the plants. Growing roots also help loosen the soil.

There is other life in the forest community—birds sing from the tree tops, frogs croak on the ground, grouse drum on a fallen log. Some can be seen but not heard—a snake slithers for cover, caterpillars devour a leaf, spiders wait on webs that glisten in the sunshine. Plants and animals compete for living room, both above and below the surface of the ground. It is the joint activity of all the living things of the forest, as they live, grow, reproduce, and die, that makes for soil improvement.

A plant is a combination of elements such as carbon, oxygen, hydrogen, and nitrogen, coming from air and water. Nitrogen, potassium, calcium, silicon, magnesium, phosphorus, chlorine, sodium, iron, sulphur, and trace elements come from the soil.

The plant cycle—from plants to litter, to humus and back to plants—depends on moisture, heat, nutrients, and most of all, the sun. The right combination of these ingredients produces a continuous forest community.

A forest is a great organization made up of countless separate and necessary parts. Whether the forest community can be maintained depends on the living things that use it for their existence and convenience. All living things in a forest are interdependent.

LEARNING THE CONCEPTS OF SUCCESSION

Forestlands are extremely old. Rock was formed in various ways; mountains were uplifted and eroded. Former inland seas either dried up or drained away; some areas were leveled by glaciers, others were covered with deep layers of windblown dust or sand. When bare areas are exposed under the proper climatic conditions, the first plants of a forest complex become established and succession begins.

Succession is the process of one plant community replacing another until the highest form of plant life that will grow under the particular existing climatic conditions is obtained. This final plant community is called climax. Climax plants are those growing in complete balance with their surroundings. Our forests are climax formations.

THE FOREST COMMUNITY

Most of us think of the forest as a place to hunt, fish, camp, or picnic; yet recreation is only one of the many values of our forest heritage. Forests also protect the soil, promote clean and regular streamflow, provide food and living space for wildlife, and supply timber to meet our nation's needs for lumber, paper, poles, posts, Christmas trees, and many other wood products.

In the early days, little thought was given to these permanent values. The virgin forest was treated as a "mine" from which timber was removed to build our cities and farms. Fortunately, forests are renewable, and today much of our timberland is being managed like a farm for continuous yields of wood products as well as recreation, wildlife, and protection of soils and watersheds.

If we are to care for our forests intelligently, we must attempt to understand nature.

A forest is made up of many species of trees, shrubs, grasses, small plants, and mosses. In addition, a host of mammals, birds, frogs, toads, snakes, insects, earthworms, fungi, bacteria, and other forms of life find their home in the forest.

Each species of tree differs in such characteristics as length of life, growth rate, method and cycle of seeding or resprouting, and tendency to be affected by diseases. Each also has its own special needs for soil, moisture, heat, and light. These traits determine where the

tree will grow and its ability to compete with other plants. The same is true with the animals and smaller plants.

Parts of the Forest

Before discussing forest classifications, let's look at this drawing and learn some definitions:

Stand—an individual group of trees of similar age, composition, and general appearance.

Canopy—the upper layer of green vegetative crowns in a more or less closed stand.

Understory—a layer of small trees growing beneath the forest canopy.

Ground cover—grass, shrubs, or scattered herbs growing in openings in the forest canopy where sunlight reaches the ground.

Forest floor—the ground beneath the trees.

Litter—leaves, twigs, and other forest debris on the forest floor.

Classifying Forest by Origin

Forests may be classified by origin, that is, whether it has grown from seed or sprouts. Forests grown entirely from seed are often called high forests. Forests produced vegetatively from root sprouts are called coppice forests.

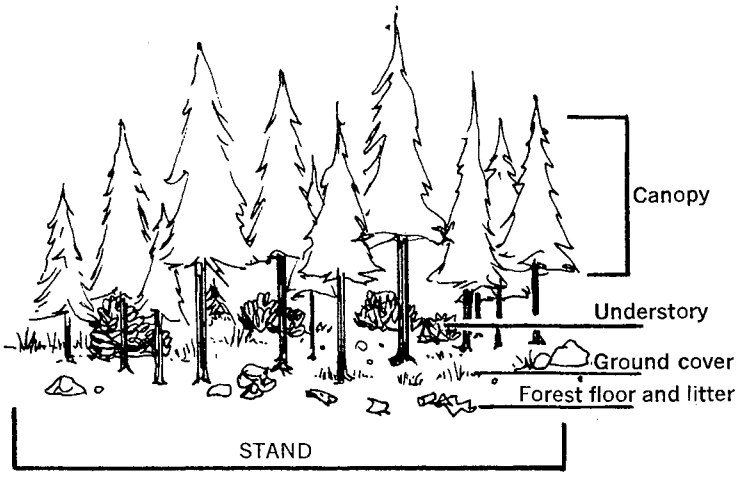
Another set of terms describing the forest's origin is virgin and second-growth. The virgin forest is the natural forest in which no logging has ever taken place. Second-growth implies younger stands of smaller trees which have come in after logging.

Species Composition

Species composition is a very important feature of the forest. The composition describes how a forest is "put together." A pure forest is composed of a single species, such as a Norway pine plantation. A cone-bearing tree forest is called a coniferous forest. One characterized by trees which lose their leaves is called a deciduous forest. When the forest is composed of both conifers and deciduous tree species, it is called a mixed forest. An example might be the aspen-fir-spruce forest. A forest composed of small, pure stands of timber of different species is called mosaic.

MINNESOTA'S FOREST REGIONS

Before the white man arrived, the area which is now Minnesota had three distinct natural vegetation regions: the prairies in the west and southwest, the hardwood forest in the southeast and central portion, and the evergreen forest in the northeast.



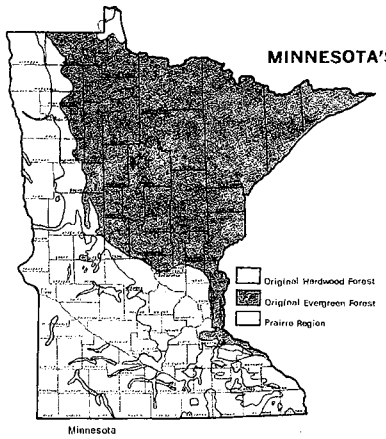
None of these forest regions actually has boundaries as distinct as the map might suggest. For example, some hardwoods have always been mixed with the conifers as far north as Itasca and St. Louis counties in the Evergreen Forest Region. Likewise, white pine was once common along the Mississippi River in the Hardwood Region of southeastern Minnesota, and tamarack swamps are common as far south as St. Paul and Minneapolis.

The Northeastern Evergreen Forest was the largest region of continuous forest with the white, red, and jack pines; the spruces, balsam fir, tamarack, northern white cedar, and certain broadleaf trees: notably the aspens and paper birch which grow with the conifers. As we have seen earlier, these trees did not grow in one grand mixture. Instead, they tended to occur in definite communities determined by soil and moisture conditions, and by the natural fire history of the area.

After the early logging of the pines and other conifers, many forest fires swept the cut-over region. These fires destroyed seed trees and young conifers and encouraged species such as aspen, birch, and oak, which can reproduce by sprouting from the stump or suckering from the roots. Today most of the original evergreen forest is a mixture of aspen, birch, and in places, oaks and other hardwoods mixed with young stands of pine, spruce, and fir, wherever fires and logging did not completely eliminate these trees.

With better fire protection, some conifers such as balsam fir, are now gradually seeding in beneath aspen and birch forests. Balsam can withstand the shade and competition of these trees, and if fire is kept out, part of the second growth aspen-birch forest will in time be replaced by fir and spruce. Unfortunately, pines are not very successful invaders of the less valuable aspen and birch stands.

Within the original hardwood forest region, land has been cleared for agriculture, but forests still exist along the rivers and in many farm woodlots. Typical trees of this region are maple, oak, basswood, elm, cottonwood,



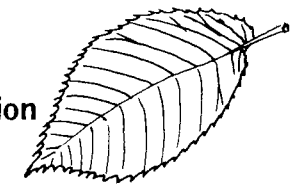
MINNESOTA'S VEGETATION REGIONS, 1820

ash, hickories, and walnut in the southeastern corner of the state. Eastern red cedar is common on dry, gravelly hills.

In the prairie region, natural forests occurred only along the valleys and flood plains of rivers and streams. This is the region where many windbreaks and shelterbelts are planted. Trees such as cottonwood, willow, pine, spruce, elm, green ash, and box elder protect the farmstead and fields from winds and drifting snow; provide shelter for pheasants, rabbits, and quail; and add a touch of beauty to the prairie farm. Natural forests along the streams are made up of willow, cottonwood, green ash, box elder, elm, and occasionally oak, maple, basswood, or other hardwoods.

ACTIVITIES

Forest Appreciation



Take a trip to a forest area. See if you can read the forest "story." Try to determine if it is a high forest or coppice, virgin or second-growth, or pure or mixed. If possible, arrange your group's trip with a forester who can tell you the history and origin of the forest.

While you are in the forest, make a list of the main species making up the canopy and the understory. Note the condition of the forest floor—whether there is little vegetation or whether there are mostly fallen needles and/or broadleaves, or much herbaceous growth. The forester will help you with your list.

Take a field trip to a forested area. Choose a tract which has received proper care for a number of years. This means no fires or grazing by domestic livestock. If it has a small open area that at one time was a field, so much the better. A creek bottom makes an excellent place for study as well as a wonderful place for a picnic lunch. Why not an all day meeting? You will need a spade, sack, old gallon bucket, increment borer, axe, field clothes, and an avid out-of-doors interest.

Procedure:

Pick a spot on the forest floor and lift the fresh leaves, decaying leaves, and forest litter from the soil. Study the soil color and texture. Observe the soil for living organisms. Dig deeper with the spade. Does the soil color change? _____ Why? _____

_____

_____

What does the darker soil on top indicate? _____

_____

_____

Observe the different forms of wildlife you see. What are some of the different places they make their homes?

_____

_____

See how many wildlife foods you can find, either from this season or the past season. Collect them in your sack.

Chop into a dead tree found on the forest floor. (Try to pick one in the latter stages of decay.) Observe what is taking place. Are there any forms of life present? _____

_____

_____

What part do these small plants and animal life play in the forest community? _____

_____

_____

What will eventually happen to this decaying tree? _____

_____

_____

_____

How will it help the soil? _____

_____

_____

_____

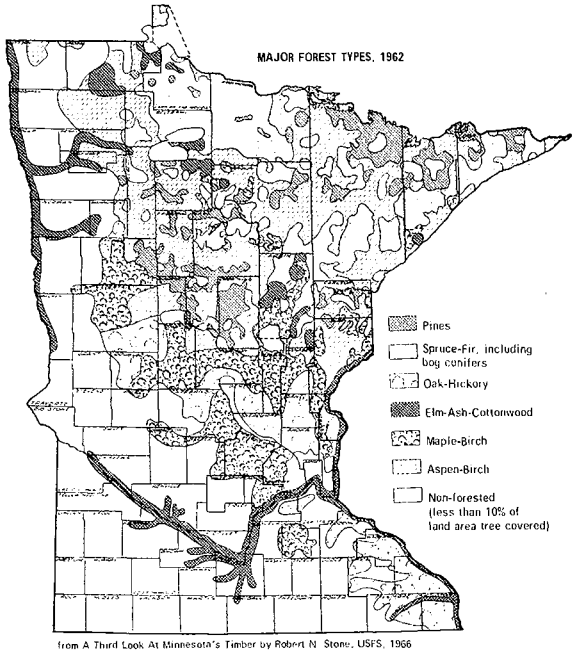
Place some soil from a plowed field in a gallon can (fill about half full). Place some forest soil along with the leaf litter and humus in another gallon can placing the leaf litter on the soil similar to the way it was in the forest. Pour enough water to wet the contents of both cans. Allow the contents of both cans to dry out at normal temperatures. Observe which soil drys out first. Compare the contents of each can. Are the contents packed hard? _____

_____

_____

_____

Tell the story of Minnesota's forests. Prepare maps showing one or more of the glacial periods in Minnesota, the original vegetation types before the white man, the history of logging, and the present day forested areas.



from A Third Look At Minnesota's Timber by Robert N. Stone, USFS, 1966

Accomplishment record:

_____

_____

_____

_____

_____

_____

_____

ACTIVITIES
4-H Forestry Projects

There are many activities to make the project both interesting and educational. Some of the things you might do follow:

Demonstrate. 4-H members can demonstrate to the public what has been learned. Some suggested demonstrations are, "How to Make and Use a Plant Press," "How to Identify Trees," "How to Prepare Wood Specimens," and "Effect of Light on Plants."

Tour. 4-H members might visit members' projects, local tree plantings, tree nursery projects, and public places such as parks, Minnesota's national and state forests, school forests, or nature centers.

Judge and Identify. 4-H members can be given an opportunity to try their skill in identifying trees and shrubs and determining use. Conduct tree identification contests in your club.

Exhibit. There can be individual member and club exhibits: in the community, at shopping centers, at county fairs, and at the state fair. Check with the Extension Agent about requirements for the latter two. Exhibits might consist of booths, floats, or display books and mounts, and science exhibits.

Establish a Lending Library. The club might establish a lending library of pamphlets, books, and similar material pertaining to tree identification, forestry, and conservation. The library might become a part of the school's library or the public library. In this way a club will share knowledge with many people.

STARTING A COMMUNITY FOREST

Clubs wishing to sponsor a movement to establish a community forest often experience difficulty and uncertainty in starting the project. Some suggestions of how to begin, based on the methods that have proved successful, may help groups in other places begin a program of action. The following plan is not a blueprint of procedure for every occasion. Situations and needs differ in each community.

The Plan—The first essential, of course, is to have a clear idea of the objective. The reasons for having the forest should be listed in a concise preamble or introduction to a written plan which will guide the committees working out the various parts of the program. Some of the purposes usually include the following:

To provide facilities for more extensive outdoor recreation.

To grow timber which, in time, will yield a steady income.

To preserve certain woodland areas which are threatened by commercial use.

To beautify the area around the town.

To eliminate unsightly or problem areas.

To create a memorial.

To provide an outdoor laboratory for teaching conservation in schools.

To provide an arboretum.

To provide food and cover for game.

To develop a wildlife sanctuary.

To protect the watershed of the community water supply.

To provide a site for youth groups to carry on projects incidental to citizenship training.

To provide shade at a bathing beach.

To screen and protect local fishing streams from silt and erosion.

To provide a summer camp site for youth groups.

To establish a shelterbelt or windbreak and stop a dust nuisance.

To enclose and screen a municipal sylvan (woodland) theatre.

To provide tourist attractions.

To provide fuelwood for relief families.

To provide a source of supply of Christmas trees and evergreens for municipal decorations.

To demonstrate tree growing for the benefit of private landowners.

To put idle tax land into productive condition.

To stop wind erosion and traveling sand dunes.

Following the statement of objectives, the plan should define as specifically as possible the kind and size of forest proposed to carry out the objectives, and the major improvements needed. For example, will it be a county, municipal, or school forest? Will it have 40, 100, or 1,000 acres or more? Is land already available, or is the site to be acquired? Is erection of a community building or a memorial or other structure planned? Is a shoreline to be developed or an artificial lake proposed? This plan is necessary for selling the project to the people of the community and serves as a guide for the campaign committees.

Action Program—Once the project is clearly defined, you are ready to start the action program. Since the community forest is a public institution, a campaign for its establishment will be successful only if people are interested and want it enough to support it. An educational campaign should, therefore, be started to develop this popular interest. An education committee should be set up for this. It will proceed about as follows:

Get the local newspaper editor to promote the program.

Contact other public service organizations in town (including the Chamber of Commerce, various luncheon clubs, literary, educational, church, welfare, and other social organizations) and ask them to vote their support.

Call a public meeting with prominent speakers to endorse the project.

Appoint the action committee (representing all interested groups) to put on the campaign.

The newspaper editor must be constantly supplied with material for stories about the proposed forest and its benefits to the community. A single story is not enough. In the second step, the plan should be presented to other organizations through personal contacts with their leaders and talks and addresses at their meetings.

The public meeting should be carefully organized and well advertised through newspapers, window cards, handbills, and local persons who enjoy the confidence of the people. The program should be kept free of any political affiliations. The chairman of the meeting should be thoroughly sold on the project and enthusiastically in support of it. Before the meeting, the leaders of all the prospective cooperating organizations should be

contacted and promise to have representatives at the meeting. From the membership of these organizations, representatives should be appointed to work on the community forest campaign committees. These persons should accept their appointment before announcement of their names is made public, to insure their active participation. At the public meeting, the proposal to establish the forest may be brought to a vote and if approved the chairman will appoint the campaign committees to begin work.

SUGGESTED REFERENCES

Conservation Activities for Young People, U.S. Forest Service, 633 West Wisconsin Ave., Greyhound Building, Milwaukee, Wis. 53203*, chapters 1 through 7.+

Constructing Nature Trails, Forestry F.S. No. 7, Bulletin Room, Institute of Agr., Univ. of Minn., St. Paul, Minn. 55101*, 7.+

Light and Plants, A Series of Experiments . . ., USDA Misc. Pub. 879, Supt. of Documents, U.S. Gov't. Ptg. Office, Washington, D.C. 20402. 20 cents. 6.+

Minnesota's State Flower, Bureau of Information, Conservation Dept., 350 Centennial Building, St. Paul, Minn. 55101,* 7.+

Norway Pine—Minnesota's State Tree, Bureau of Information, Conserv. Dept., 350 Centennial Building, St. Paul, Minn. 55101,* 5, 7.+

Products of the Tree Farm, chart, American Forest Institute, 1835 K St. NW, Washington, D.C. 20006,* 7.+

Silvics of Forest Trees of the U.S., Ag. Handbook 271, Supt. of Documents, U.S. Gov't. Ptg. Office, Washington, D.C. 20250, $4.25 (paper cover), 1, 2, 5, 6, 7.+

Textbook of Wood Dendrology, Harlow and Harrar, 5th Edition, McGraw-Hill Book Co., 330 West 42nd St., New York, N.Y. 10036, $12.50, 5.+

Textbook of Wood Technology, Panshin and DeZeeuw, 2nd Edition, McGraw-Hill Book Co., 330 West 42nd St., New York, N.Y. 10036, $14.50, 1, 2, 3.+

Trees and The Forest, sets of 6 charts each, compiled from national ads of St. Regis Paper Co., St. Paul Book and Stationery, 6th and Cedar, St. Paul, Minn. 55101. $5.

Developing the Self-Guiding Trail in the National Forests, U.S.D.A. USDA Misc. Pub. 968, Supt. of Documents, U.S. Gov't. Ptg. Office, Washington, D.C. 20402, 20 cents, 7.+

Evergreens, Ext. Bull. 258. Bulletin Room, Inst. of Agr., Univ. of Minn., St. Paul, Minn. 55101,* 5.+

Forest Adventures of Mark Edwards, American Forest Institute, 1835 K St. NW, Washington, D.C. 20006,* 1, 7.+

Forestry Activities—A Guide for Youth Group Leaders, PA 457, Supt. of Documents, U.S. Gov't. Ptg. Office, Washington, D.C. 20250, 15 cents, 1 through 7.+

Forestry for Minnesota Schools, Minn. Educ. Assn., 41 Sherburne Ave., St. Paul, Minn. 55103. $1.25. 1, 2, 5, 6, 7.+

Forests and Trees of the United States, chart, American Forest Institute, 1835 K St. NW, Washington, D.C. 20006,* 2.+

Growth of a Tree, chart, American Forest Institute, 1835 K St. NW, Washington, D.C. 20006,* 2.+

A Guide to Natural Beauty, USDA Misc. Pub. 1056, Supt. of Documents, U.S. Gov't. Ptg. Office, Washington, D.C. 20402, 55 cents, 7.+

Highlights in the History of Forest Conservation, Ag. Info. Bull. 83, Supt. of Documents, U.S. Gov't. Ptg. Office, Washington, D.C. 20402, 20 cents, 7.+

Indoor Gardening, Ext. 4-H Bull. 61, Bulletin Room, Inst. of Agr., Univ. of Minn., St. Paul, Minn. 55101,* 4.+

It's a Tree Country, American Forest Institute, 1835 K St. NW, Washington, D.C. 20006,* 1, 7.+

Knowing Your Trees, Collingwood and Brush, the American Forestry Assn., 919 17th St. NW, Washington, D.C. 20006, $7.50, 5.+

Trees of the Eastern and Central United States and Canada, Harlow, Dover Publications, Inc., 180 Varick St., New York, N.Y. 10014, $1.50 (paper cover), 5.+

Trees of the Forest—Their Beauty and Use, USDA, PA 613, Supt. of Documents, U.S. Gov't. Ptg. Office, Washington, D.C. 20402, 20 cents, 5, 7.+

Trees of Minnesota, Documents Section, Centennial Building, St. Paul, Minn. 55101, 40 cents, 2, 3, 5.+

Woody Plants for Minnesota, Ext. Bull. 267, Bulletin Room, Inst. of Agr., Univ. of Minn., St. Paul, Minn. 55101,* 5.+

* indicates free material.

+ refers to chapters in this 4-H bulletin No. 74.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Roland H. Abraham, Director of Agricultural Extension Service, University of Minnesota. St. Paul, Minnesota 55101. We offer our programs and facilities to all people without regard to race, creed, color, sex, or national origin.