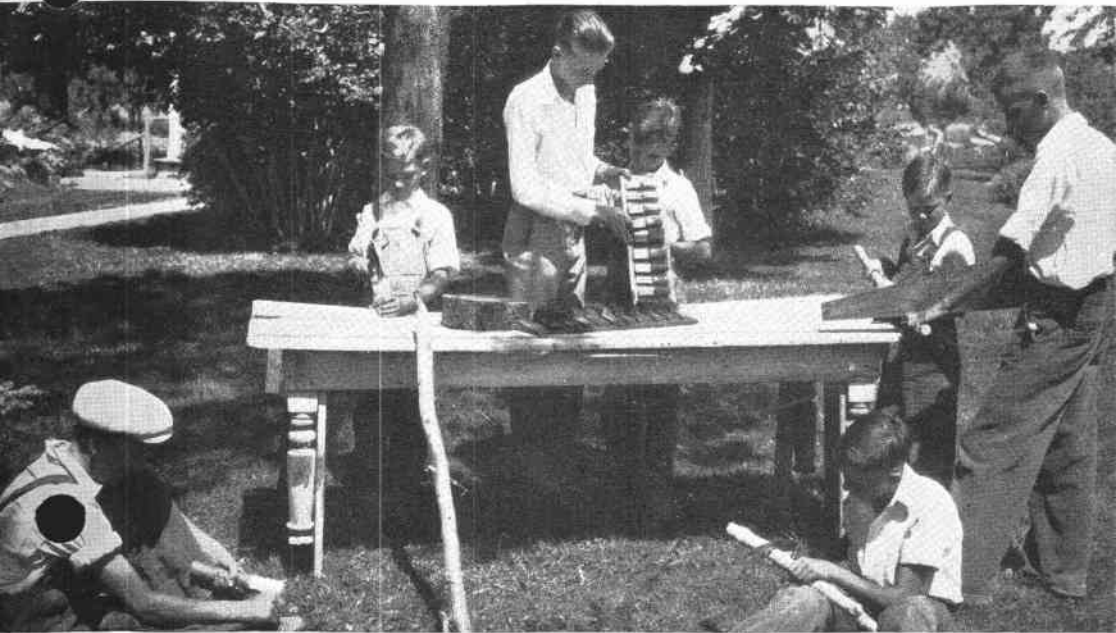




Forestry for 4-H Clubs



MISCELLANEOUS PUBLICATION
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U. S. DEPARTMENT
of AGRICULTURE

Forestry for 4-H Clubs

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CONTENTS

	Page
Forestry and farming.....	1
Sources of information.....	1
Illustrative material.....	3
Community survey.....	3
The project.....	3
Forest trees and forest types.....	5
Growth of trees and forests.....	9
Forest reproduction.....	11
Forest planting.....	15
Improving woodlands by cutting trees.....	17
Protecting woodlands.....	19
Protective effects of woodland.....	21
Location and extent of farm woodlands.....	24
Products from the home woodlands.....	25
Measuring and estimating timber.....	28
Using farm timber.....	31
Marketing forest products.....	33
Supplement.....	35

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This publication furnishes information that should be useful to 4-H Club leaders and members and other young people. It is intended to supplement subject-matter material published by the various States and other agencies. The text emphasizes getting acquainted with forest trees and forest stands and learning their different values to their owners and their place in the economy of the farm and the community. Practical phases of managing the farm home woodlands properly are also given important consideration. The topic outlines should serve as a guide and an aid in working out club projects, programs, and demonstrations that will have real educational value and also prove financially profitable to many young people on farms.

This publication supersedes U. S. Department of Agriculture Bulletin No. 863, Forestry Lessons on Home Woodlands.

ON TITLE PAGE

S-12869C.

Top.—4-H Club boy thinning and pruning young trees to develop clear and more valuable lumber (New Hampshire).

S-17834C.

Center.—4-H Club members preparing wood specimens for exhibit.

S-14757C.

Bottom.—4-H Club boys in Connecticut planting young pines on worn-out and idle land.

Forestry and Farming

Much attention is being given to forest trees and woodlands in planning for the best use of all farm lands. On many farms timber and other forest products are an important income crop.

The uses and commercial value of different kinds of trees, the management of a tract of woods, and the action of trees in checking soil erosion and modifying climate should be common knowledge. If the subject of forestry is properly understood, the interest of rural young people and their parents can be aroused in the farm woodlands which in the aggregate constitute a considerable part of our forests. Much can be accomplished in getting the general public to recognize the importance and value of farm woodlands through 4-H Club work.

Forestry has a definite and valuable relation to farming (fig. 1).

Timber is required on the farm for building and repairing, as well as wood for fuel. Trees are needed on farms to protect the soil against erosion, to shelter livestock and crops against dry winds of summer and cold winds of winter, to beautify the farmstead, to furnish homes for game animals and birds, and in general to contribute to man's comfort.

A knowledge of farm forestry, applied along simple lines, should make farming more profitable. The outlines (pp. 5 to 34) are designed to furnish 4-H Club members and other rural young people with a guide for study of some of the fundamental facts concerning farm-forest lands. They present the subject of farm forestry with respect to the important local forest trees and their uses, the proper location of woodlands on the farm and their economic value to the farm, protecting and improving woodlands, planting young trees, the different farm-timber products, measuring and marketing timber, and utilizing timber rightly on the farm.

Sources of Information

The best use can be made of a publication of this kind only when accurate references are available. Almost every State agricultural college has one or more bulletins on some phase of forestry, and, when available, they may be obtained by writing to the county extension agent or the dean of the agricultural college.

Farmers' bulletins and other publications of the United States Department of Agriculture to which reference is made in this publication cover many of the topics to be studied. As long as the supply lasts Farmers' Bulletins will be sent free to any resident of the United States. Application should be made to the Chief of Publications, Department of Agriculture, Washington, D. C., or to your Senator, Representative, or Delegate in Congress. Because of the limited supply, applicants should select only those publications which are of special interest and order but one copy of each. When the free supply is exhausted, these bulletins may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., usually at the price of 5 cents. Other publications of this department are also for sale by the Superintendent of Documents, but they are more often technical bulletins which may be of interest only to those who wish to specialize in the subject.

Publications on various phases of forestry may be obtained directly from the Forest Service, United States Department of Agriculture. Textbooks on forestry may be procured from book companies, or consulted in some libraries.



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FIGURE 1.—A 4-H Club boy in pines on his project acre. Young stands should be properly thinned.

Illustrative Material

The proper use of illustrative material will arouse interest in the subject being discussed and greatly aid in presenting the information. A good collection of illustrative material should be provided and kept available for use. Illustrations can sometimes be obtained from bulletins, books, and other publications. Pictures that show the relation in size of crown and trunk of a typical tree growing in the open and a tree growing in a close stand illustrate important facts.

Drawings of the cross section of a tree trunk showing how the tree increases in size by a new ring of growth each year stimulate interest. Four-H Club members may collect leaf specimens of trees of the district and mount them on cardboard after pressing and drying the leaves. Samples of different kinds of wood obtained locally from trees of uniform size may be mounted on boards or in frames or racks. The various specimens of woods may be classified and mounted by groups, such as hardwoods, softwoods, or oaks, maples, and pines. Charts showing the relative importance and uses of the most abundant woods should be made.

Lantern slides showing important facts about forestry should be used in connection with certain topics. The Extension Service, United States Department of Agriculture, Washington, D. C., has available slide sets and film strips pertaining to forestry.

Community Survey

The best way to judge the interest of the local people in forestry is through a community survey in which 4-H Club members may assist in assembling important information about woodlands and forests in the locality. This first-hand knowledge of the community's interest should be valuable in the local study of farm woodlands. The survey should be educational and planned to determine the kind of woodland, whether hardwood, conifer, or mixed type, and the important species of trees in the forest or woodlands. It is important to make records of their abundance, their use and commercial value, the leading rough timber products that have been sold, and the prices received.

On a map of the township, perhaps one drawn by the 4-H Club members, the homes and farms of the different families should be indicated. The acreage of each farm, the number and location of the buildings, and a sketch of the woodlands should be included.

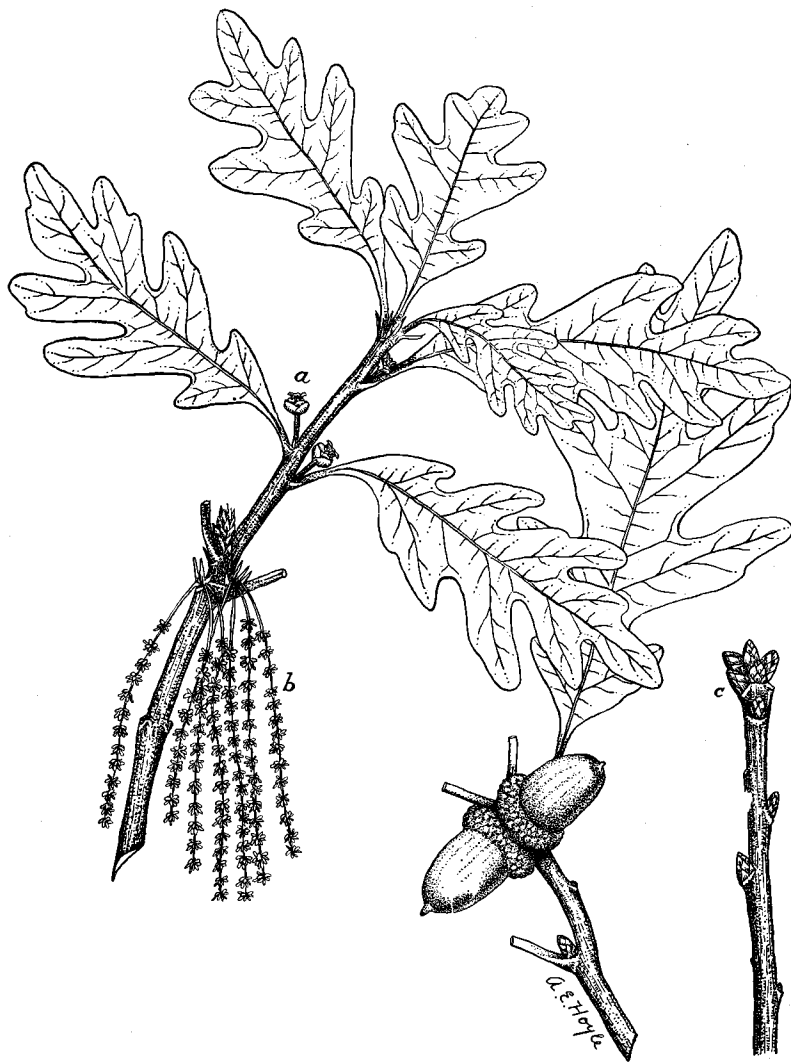
The Project

The project method of study has gained wide recognition in recent years. There can be no doubt that the intelligent use of the project aids in motivation. An advantage claimed for the project method is that it gives a better understanding of subject matter and develops a better plan of reasoning.

It is generally agreed that instruction in agriculture should follow certain definite lines: (1) It should be seasonal. (2) It should be local in its interests and development. (3) It should meet the interest of the young people. (4) It should be practical. The project plan affords the best means of meeting these conditions, especially the practical. Through the 4-H Forestry or some other project the club member works out for himself the principles and theories he has been taught.

The term "project" has been generally applied to instruction in agriculture below the college level. It includes each of the following requisites: (1) A plan for work at home covering a season more or less extended. (2) A problem more or less

new to the individual. (3) Agreement by the parents and club member to the plan. (4) A competent leader to supervise the work. (5) Detailed records of time, method, cost, and income honestly kept. (6) A written report based on the record to be submitted to the leader when the project is completed. The final



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FIGURE 2.—White oak leaf, flower, fruit, and winter bud: *a*, Pistillate or female flower; *b*, staminate or male flower; *c*, winter bud.

report may be in the form of a booklet. The term project or demonstration is also used extensively in 4-H Club work.

Type of forestry project.—A project in forestry must, of necessity, be different from one in farm crops or animal production. The slow growth of forest trees,

covering more than one season, and other factors involved make it so. However, forest projects for a short period can be conducted and made of much value to the 4-H Club members and the community. Among the forestry projects that can be carried out, the following are suggested: (1) The renovation of a farm woodland, (2) replanting of a woodland and subsequent care of the young trees, (3) planting of forest trees on eroding lands or other waste ground on the farm, (4) mapping and finding the area of a forest tract, (5) cutting and marketing farm forest products, (6) giving especial attention to proper cutting of trees and to removal of the parts of the trees not marketed, and (7) a study and survey of forest fires, insect enemies, and the diseases of the common forest trees.

The suggestions which follow will be helpful in developing such projects or others which the local situation may offer.

Forest Trees and Forest Types

Aim.—To learn how to recognize at sight the chief forest trees of the locality.

Sources of information.—Bulletins of the State departments of forestry and State colleges of agriculture on forest trees; United States Department of Agriculture Miscellaneous Publication 217, which contains much about forest trees, and the forest-tree key and description of 100 important forest trees on pages 39 to 50. Your State forester and the Forest Service, United States Department of Agriculture, Washington, D. C., are ready to identify leaves, fruit, buds, and woods that are puzzling.

Illustrative material.—The best illustrative material on forest trees and types is to be found in the woods, where the different species may be seen and their characteristics studied. If it is impossible to go to the woods for material, pictures of typical trees may be used. Sketches showing the forms of different trees are easily made and should be used.

Guides to study.—Get acquainted with the important kinds of forest trees in your locality. Learn their various common names and other names. A few trees are known widely by the same common name, but many are called by different names in various sections of the country. Consider the importance of botanical names for certain identification. Distinguish the different kinds or species of trees by some well-marked characteristics of leaf, bark, fruit, seed, buds, or twig arrangement.

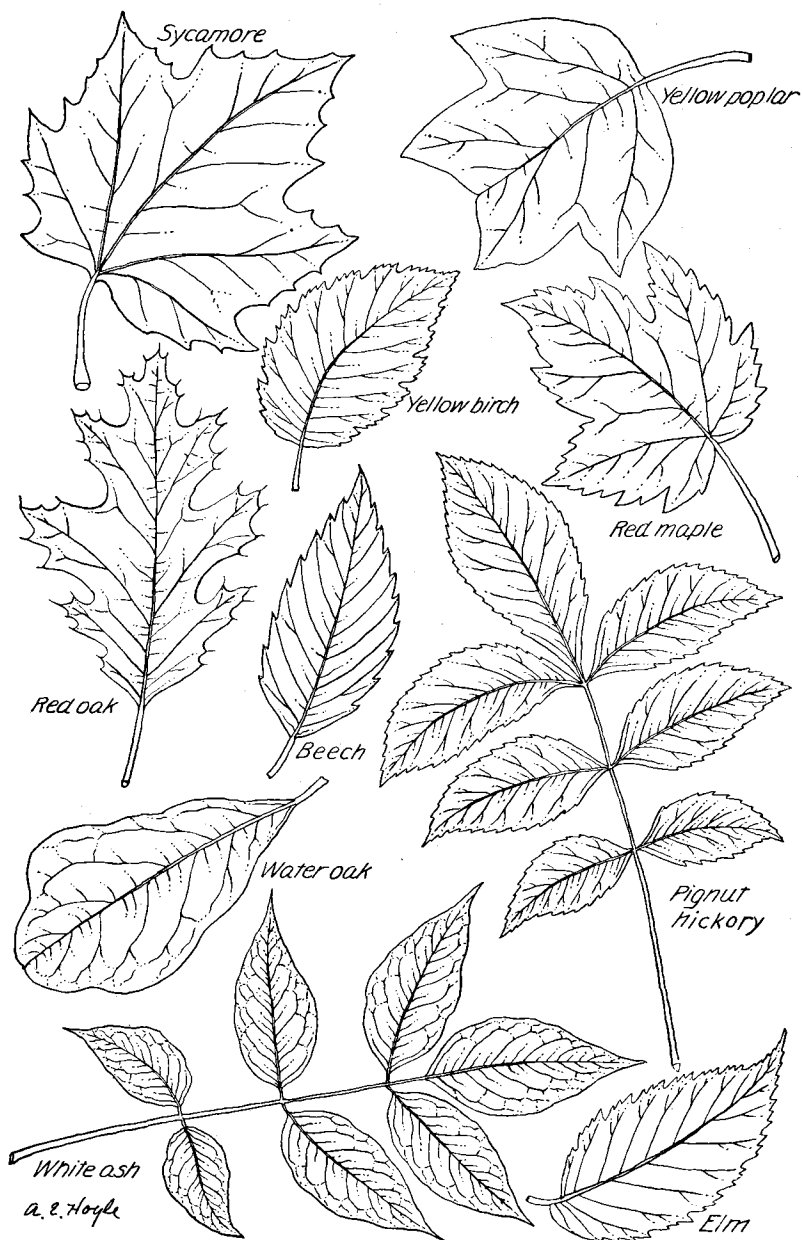
Conifers: These include trees bearing cones, such as the pines, spruces, firs, hemlocks, cedars, junipers, larches, and cypress. How do baldcypress and the larches differ from the others? Become familiar with distinguishing characteristics of each group or genus, and learn something about its different members or species, particularly those that occur locally.

Hardwoods: These include trees most of which have wood harder than the wood of the conifers and broad leaves that are usually deciduous, or are shed in the fall. Learn the kinds of hardwood trees which are evergreen. Classify the hardwood trees by general groups, such as the oaks, maples, elms, and others, and identify as many different species of each as possible.

Study kinds of trees which are associated in different forest types, such as the ridge type, slope or cove type, bottomland type, and swamp type. Observe locally the trees that are associated to make (1) coniferous forest type, (2) pure hardwood type, and (3) mixed hardwood and conifer type.

Practical things to do.—Gather leaves and fruit of the important local forest trees, press in wrapping paper, fold and label with place and date (fig. 2).

Study the shape and size of leaves; trace a leaf of each of the important kinds of trees, and label with name, place where found, and date.



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FIGURE 3.—Leaf outlines of a few important species or kinds of hardwood trees. (Reduced and not to uniform scale.)

Group trees by kinds of fruit borne—nuts, keys, berries, cones, etc.

Collect samples of winter buds from important local species, labeling with name of tree, place of collection, and date.

Make a study of winter buds, with drawings of buds and the twig arrangements.

Collect blossoms from red and silver maples, willows, catalpa, American elm, oak, flowering dogwood, yellowpoplar or tuliptree, American basswood or linden, buckeye, and magnolia.

*Field study.*¹—Now to the woods, that you may come into personal touch with the forest trees of your own neighborhood.

Leaves: The leaf is the trade-mark of the trees. Gather the leaves, study and compare them to gain a first-hand knowledge of the trees as individuals, then as groups. The yellowpoplar writes its name plainly upon its square-cut leaf, but the boxelder has a leaf somewhat resembling that of the ash, though its seed is similar to the maple key (fig. 3). Wherein does the ash leaf differ from that of the locust or the hickory? The oaks are divided into the red and the white oaks. What is a typical leaf of each class?

You will probably begin this study in the autumn, so before the leaves fall and your memory of them fails, press sample leaves and either mount them or place them in paper folders, and label with name, place where found, and date (fig. 4).

If the foliage of the black tupelo is reddening, that of the sweetgum will soon begin to change, and presently all the woods will be brilliantly colored. The autumn colors will help to identify your trees and beautify your herbarium. A few of the broadleaf trees and all the conifers except the larches and baldcypress are evergreen. Separate the conifers into the pines, spruces, cedars, or other cone bearers of your woods, and divide into as many species as you find. Make a table, and under the two heads—broadleaf trees and conifers—group the trees that you identify, with a short description of each.

Fruit: While gathering leaves, bring in any fruit or seed found—the pulpy fruit, nuts, berries, pods, winged seed, and tufted seed of the broadleaf trees and the cones of the conifers, and add to your herbarium.

Buds: As the leaves fall, gather the bare branches and study the winter buds that hold next year's leaves and flowers, from the big bud that tips the horsechestnut to the long, sharp bud of the beech. Label them as you did the leaves.

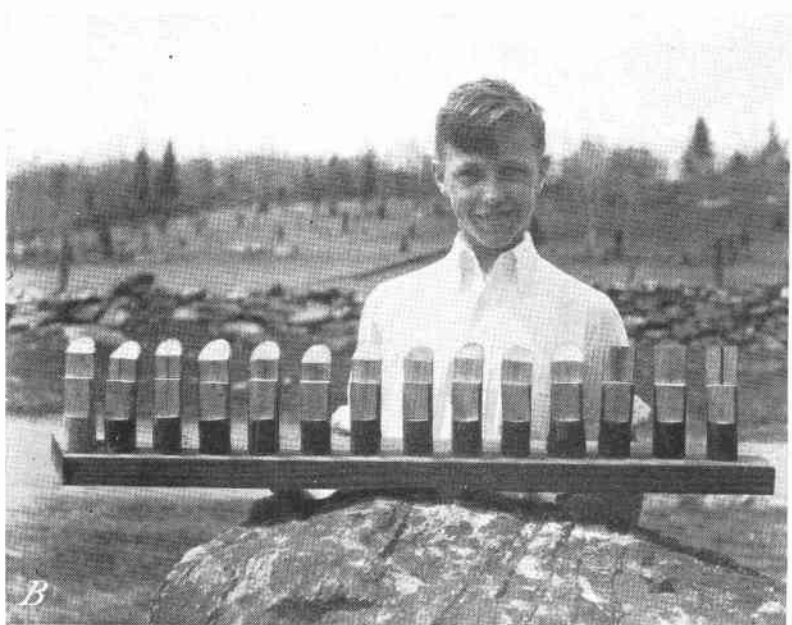
Bark: The American sycamore or plane tree bark tells its own story, but do you know the bark of the elm from that of the ash? Contrast the glove-fitting bark of the American beech with the rough-and-ready coat of the shagbark hickory, and note the difference in barks of other kinds of trees.

Branches: Each tree has its own way of branching, though its form is not always so definite as the red cedar spire. What is typical of the white oak bough? The leaves of the scarlet and pin oak are considerably alike, but what is the character of each tree? Draw a leafless elm.

Flowers: When spring comes and the buds are bursting, do not forget the flowers of the forest trees. They provide a "clock dial" for the advancing year. As they bloom in succession, bring in the blossoms of the willow, the maple, the American elm, and the eastern cottonwood, until you have gathered the last flower of June and seed are on the wing.

While you are getting acquainted with your trees, you will learn that they prefer certain localities; you will find the willow by the stream, the yellowpoplar or tuliptree in the valley, the red oak on the higher ground, for one needs much moisture in its soil while another will grow in a drier situation. You will discover that certain trees "hobnob" together because of similar requirements of soil, moisture, and light. In this way you will learn to group your trees into forest types when you begin your practical work as the forester of your home woodland.

¹ The sections on field study in the sections on Forest Trees and Forest Types and Protective Effects of Woods were contributed by Miss Lucy Kellerhouse, formerly of the U. S. Forest Service.



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FIGURE 4.—*A*, Forestry club members mounting specimens of leaves of forest trees. *B*, Collection of wood specimens made by a New England 4-H Club boy.

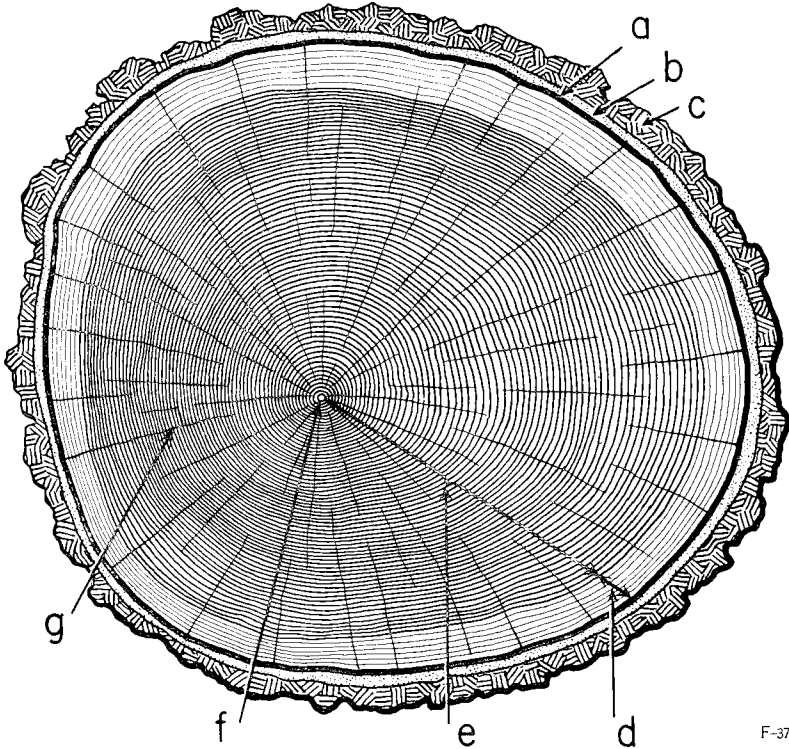
Sketch the different types of trees in the district; make drawings or tracings of the different shaped leaves. Mount these drawings and file with other illustrative material.

Growth of Trees and Forests

Aim.—To find out how trees and forests grow.

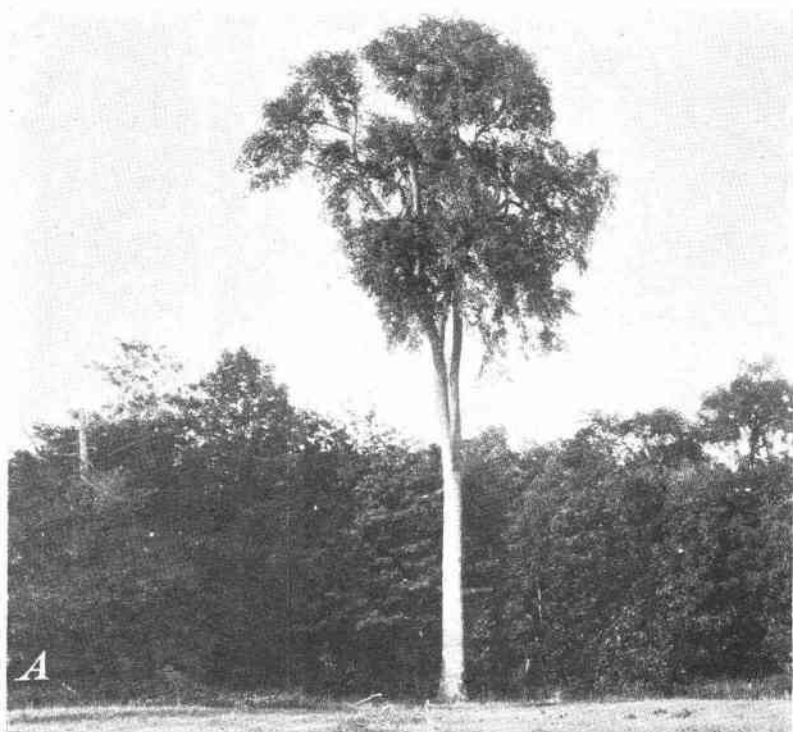
Sources of information.—Farmers' Bulletins 173, 1256, 1392, 1486, 1517, 1628, and 1671; Miscellaneous Publication 162.

Illustrative material.—Potted seedlings, pots or boxes, and seeds of trees. A chart showing roots, stems, and leaves of a tree. A chart, or better an actual cross section of a tree stem, showing different parts such as annual rings, heartwood, sapwood, bark, and cambium (fig. 5). Leaves mounted so that their structure can be studied. Branches showing bud and twig arrangement. Drawings showing shapes of crowns or tops of trees grown in the open and of those grown in close stands.



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FIGURE 5.—How the tree trunk grows. All growth takes place in the cambium (*a*), lying between the inner bark and sapwood. This is a very thin layer of living cells, which divide and subdivide, forming on the outside bark and on the inside wood. The inner bark (*b*), or last tissue, is soft and moist. Its function is to carry the food prepared in the leaves to all growing parts of the tree. By a gradual change the inner bark passes into outer bark (*c*), a corky layer composed of dry, dead cells. This serves to protect the living stem against evaporation and mechanical injury. The woody growth during one season is called an annual ring. In the spring the newly formed cells are thin-walled and spongy, while in midsummer and fall the walls of the cells become thicker and denser. This difference can be distinguished in many kinds of trees as light-colored spring wood and darker colored summer wood. Sapwood (*d*) is the lighter colored band of wood beneath the bark, often from 1 to 2 inches thick. It carries the sap from the roots to the leaves. Heartwood (*e*) is the result of a gradual change in the sapwood by which it becomes darker, heavier, and often more lasting. Most of the trees, but not all, form heartwood. Pith (*f*) is the soft tissue on the innermost part of the stem, about which the first woody growth takes place in the newly formed twig. From it extend the pith rays (*g*). These are flat vertical bands of tissue which connect the pith with the various layers of wood and the inner bark. They transfer and store up food.



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FIGURE 6.—*A*, Trees which grow in close stands form clear trunks that make the best grades of products. This tree was left in clearing the land. *B*, By counting the annual rings of growth the age of a tree can be determined. The number of years it took the seedling to reach the point of the count should be added.

Guides to study.—The life of a tree and why it is necessary to know something about how trees live.

The leaves, trunk, and roots, and function of each in the tree's existence. How the tree breathes and gets its food from the soil and air; what travels upward and what downward in the branches and stems. Structure of the leaf and different parts of the trunk.

How the branches lengthen and the tree trunk increases in diameter; the location, color, and structure of the living tissue or cambium layer. What are annual rings, heartwood, and sapwood?

Requirements for growth: Air, light, moisture, heat, and food. How to find the age of trees by counting the annual rings (fig. 6).

Trees in association—a stand. Influence of trees upon each other. Difference, if any, between shape of crowns of open-grown trees and those grown in closed stands. Influence of different light and soil-moisture supply.

Effect of tree density (number of trees in a given area) upon growth of the individual tree. Natural death of trees in closed stands with advancing age. Understocked, well-stocked, and overstocked stands and the production of (a) saw timber and (b) cordwood per acre under each condition.

Practical things to do.—Make the following tests to show requirements for growth: Place a potted forest-tree seedling in the dark for a few days; withdraw moisture from one and supply moderate amounts of moisture and excess moisture to other seedlings; subject plants, if possible, to different degrees of heat. Note results. Erect a pole or 1- by 2-inch timber strip close beside a young, thrifty sapling pine or hardwood. At regular intervals of a week or month, mark on it the total height of the growing tree. Keep a record also of the dates and measured heights.

Forest Reproduction

Aim.—To find out how trees reproduce themselves.

Sources of information.—Farmers' Bulletins 173, 1177; Miscellaneous Publication 162.

Illustrative material.—Make a collection of seed specimens of the kinds indicated under Guides to Study. Mount these seeds on cardboard or put them in wide-mouthed bottles. Clip pictures of young forest growth.

Guides to study.—Seeds: Learn the various devices of nature for dispersing the seed widely. Tree fruits (a) with wings, plumes, etc.; (b) pulpy fruits with hard seeds sought by birds; (c) rich nut kernels liked by rodents and birds, and often buried or otherwise stored away; (d) light seeds which float on the surface or heavy seeds which roll along the bottom of streams. Species of trees whose seeds are carried by (a) wind (fig. 7), (b) water, or (c) birds and animals (fig. 8).

Sprouts: Different species of trees which reproduce themselves by means of sprouts from stumps. From what part or parts of the stump do sprouts arise? Species which sprout from surface or lateral roots. Influence of the season of the year when cutting is done upon the vigor and growth of sprouts. Influence of age of parent tree upon success of sprouting.

Natural forest reproduction: Young growth (figs. 9 and 10). Conditions under which young growth starts in woodlands. A forest without young growth is like a community without children—it will die out. Need for large numbers of young trees for perpetuation of the forest. Competition and shading out of the weaker seedlings and saplings.

Age groups of young growth: (a) Seedling, (b) small sapling, (c) large sapling, (d) small pole.

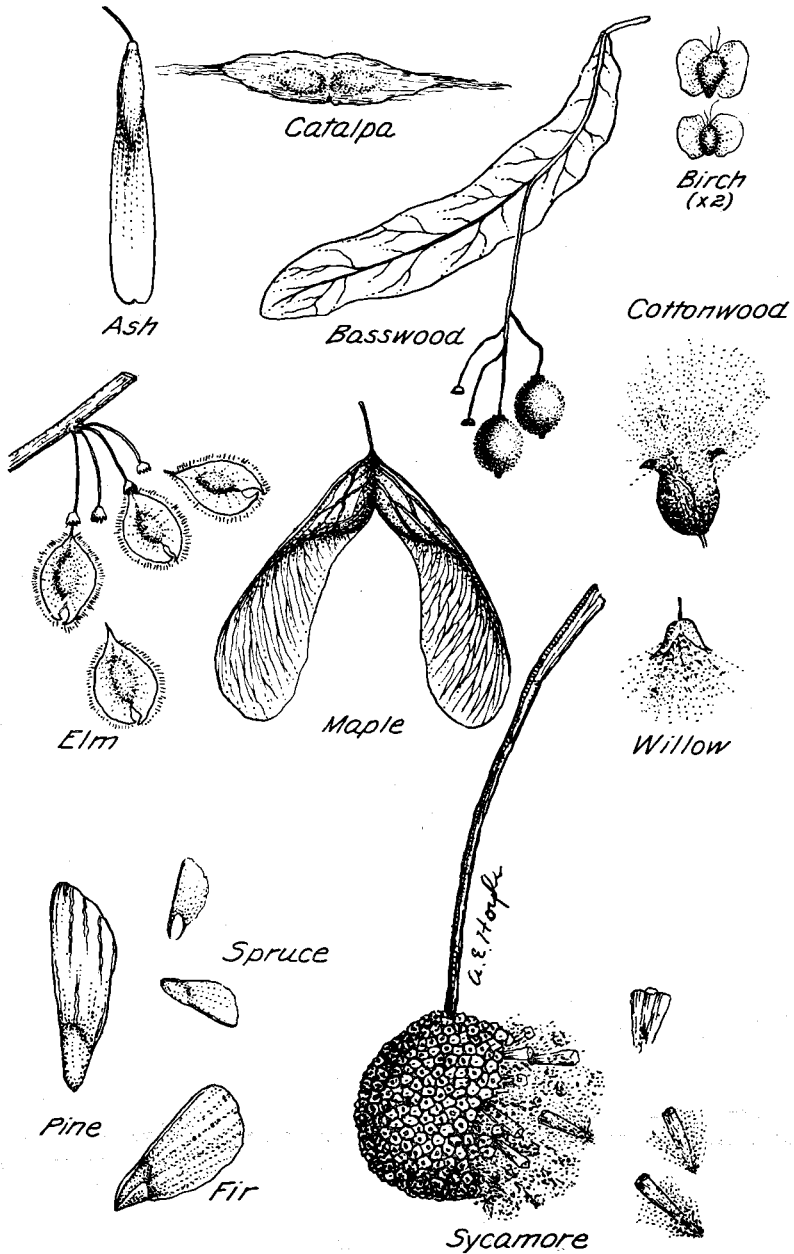


FIGURE 7.—How the forest travels: By wind.

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BY ANIMALS

Hickory
Walnut
Butternut
Oak
Honeylocust
Persimmon
Beech



BY BIRDS

Redcedar
Cherry



BY WATER

Cypress
Tupelo gum
Cottonwood
Willows
Maples
etc



F-370130

FIGURE 8.—How the forest travels: By animals; by birds; by water.



F-273290

FIGURE 9.—Woods with plenty of young growth to take the place of the larger trees when cut.



F-247300

FIGURE 10.—When protected from fire and cut rightly, as here, southern pines reproduce themselves freely in openings with plenty of overhead light.

Forest Planting

Aim.—To learn how to reforest land by direct seeding or planting seedlings.

Sources of information.—Farmers' Bulletins 1123, 1256, 1392, 1405, 1453, 1486, 1492, 1517, 1628, 1664, 1671, 1693, 1813; Leaflets 155, 156, and 159; Miscellaneous Publication 357; Technical Bulletin 492.

Illustrative material.—Obtain pictures showing different methods of planting seedlings in a farm forest or woodland; also pictures of important local trees and specimens of leaves; also fruit and bark, and keep available for study.

Guides to study.—How to start a young forest by direct seeding or by transplanting nursery-grown seedlings. Best results to be expected from seed collected locally. Sowing the seed in the place where the trees are wanted. Kinds of trees started this way; usually the species difficult to transplant on account of large, deep taproots, such as hickories, walnuts, some of the oaks, and some pines. Collecting the seed. Storing the seed over winter. Sections of the country (North) where seed sowing is best done in the spring and (South) where it may be done in the fall or early winter. Preparation of the soil and method of planting seed of different kinds. Care of growing seedlings.



FIGURE 11.—4-H Club boys in Mississippi planting black locust seedlings on farm to grow a supply of durable fence posts.

Planting seedlings grown in nursery beds. Preparation of nursery beds and sowing of seeds. Kinds of trees commonly raised in nursery beds. Age of seedlings fit for planting. Need for transplanting seedlings in nursery prior to planting out in the woods or fields. Season of year for successful planting and method of planting. Injury or loss and how to avoid them.

Regions where forest plantations are needed and commonly started. Purposes for which plantations are set out. Kinds of trees profitable in plantations. Pure and mixed plantations, and advantages of each.

Planting steep slopes and eroding soils with forest trees to check soil wastage and land destruction. Kinds of trees suitable for taking hold quickly and multiplying on dry banks.



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FIGURE 12.—*A*, 4-H Club boy in southern Georgia and his trip-winning forest planting acre. *B*, An 8-year-old planted stand of pines in southern Georgia; trees 18 to 25 feet in height and growing now at the rate of nearly 2 cords per acre yearly.

Filling up large openings in the woods and improving existing woodlands by planting desirable species of trees.

Utilizing poor soils and so-called waste places about the farm by planting quick-growing, useful kinds of trees—black locust for fence posts, pine and other species for use as treated fence posts (fig. 11).

Trees about the farm and farmstead for shade, nut production, and ornamental purposes.

Practical things to do.—Visit if possible a nearby section where forest trees are being planted. Talk with local farmers or foresters about the best methods to use in caring for young forests. Study the habits of growth of young trees of the community (fig. 12 *A* and *B*). Make a list of the kinds of forest trees observed on the field trip, and classify the trees in order of their commercial importance. Learn to identify different local trees.

Improving Woodlands by Cutting Trees

Aim.—To find out how to improve woodlands by cutting.

Sources of information.—Farmers' Bulletins 1177, 1256, 1486, 1517, and 1671; Leaflets 29, 30, 55, and 153; State foresters' publications.

Illustrative material.—Charts or illustrations showing results of overcrowding and of proper thinning of forest trees. Pictures showing results of careless felling of trees. If possible, visit a forest where these results can be actually shown by

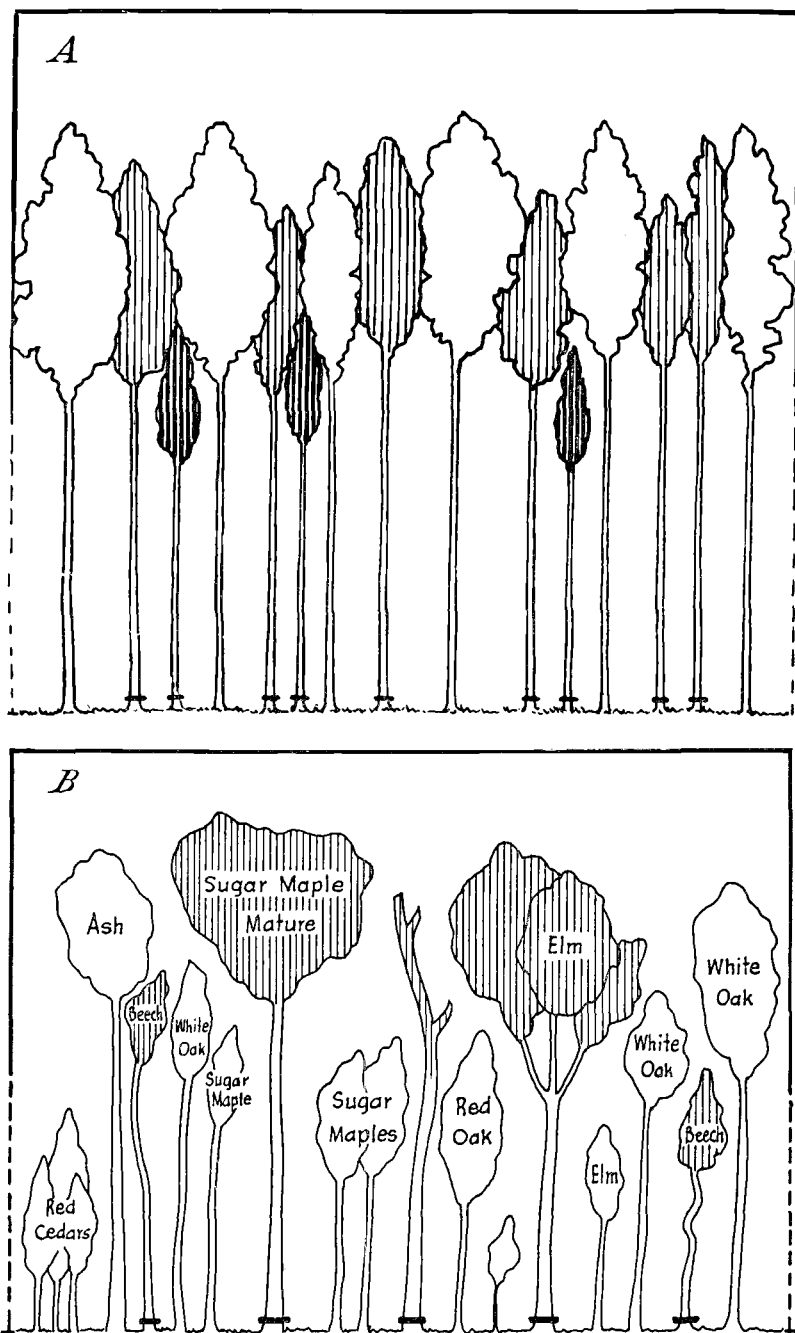


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FIGURE 13.—Improving growth and value of young forests: 4-H Club boys thinning out the defective or crooked trees in an improvement cutting. (Florida.)

observing rings on stumps or cutting into trees that have been thinned several years previously. In an even-aged group, note different sizes of trees of the same age as a result of differences in growing space.

Guides to study.—How to cut the individual tree properly; why as little as possible of the tree's stump should be left in the woods; careful felling of trees. What is likely to happen to trees injured by falling of others.



F-370127

FIGURE 14.—The growth and value of timber stands are increased by repeated thinning. The trees removed can generally be used or sold profitably for firewood, treated fence posts, or small timber: *A*, Before thinning pines. Fifteen overcrowded trees. *B*, Trees to be cut in thinning a stand of northern hardwoods (shaded trees to be cut).

Advantages of thinning overcrowded stands of forest trees. How fewer and fewer trees can grow on an acre as the trees increase in size. Available light supply for growth. Purpose of thinning to utilize timber that would otherwise die and go to waste. Also to stimulate the remaining trees to increased growth, which means increased value. How and why prune trees; advantages in doing so.

Improvement of the woods by proper cutting, taking out (1) the mature trees, (2) broken, crooked, diseased trees, and (3) the slow growing and less valuable species (figs. 13 and 14). Most woodlands have many such trees crowding out the young, promising trees of the better kinds. Making woodlands yield a profit on the investment and increasing farm income and the selling value of the farm.

Practical things to do.—The facts brought out in this study should be verified by actual observation in trips to forests. Study first-hand the results of cutting practices. Locate a good project that shows the improvement of a forest plot by proper thinning, including the removal of diseased, defective, overcrowded, and dead trees, and undesirable species.

The group may construct the charts mentioned under Illustrative material.

Make drawings of trees showing development under adverse conditions and of others under proper conditions.

Make a survey and write a report on the general practice of home forest improvement in the district.

Make a district or county map locating the farm forest areas and designating those under improvement. Draw an outline map of the State locating the farm-forest areas.

Protecting Woodlands

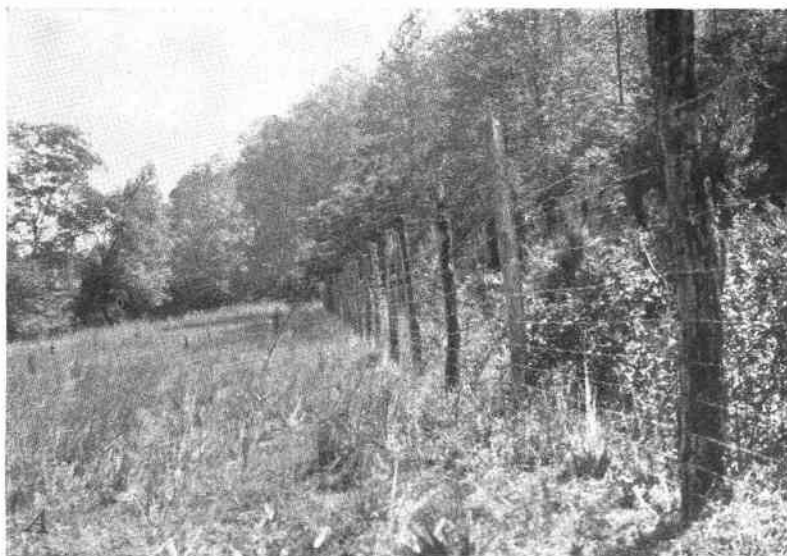
Aim.—To learn how to determine causes and extent of injury to trees and methods of prevention.

Sources of information.—Farmers' Bulletins 117, 1169, 1177, 1586, 1643, 1726, and 1759; Leaflets 40, 68; Department Circular 243; State publications. The United States Department of Agriculture and the State agricultural colleges will be glad to give assistance by identifying and furnishing information concerning various forest insects.

Illustrative material.—Pictures of forest fires, burnt-over woodlands, forest rangers and their camps and equipment will make excellent illustrative material. Pictures of trees damaged by grazing, insects or fungi, samples of damaged wood, and samples of insecticides and materials used to prevent insects from damaging trees should also be used.

Guides to study.—Fire, the arch enemy of the forest: It kills large numbers of the smaller trees and kills or weakens the vitality of the older trees; the humus layers over the ground are destroyed. The homes of animals and other wildlife are often ruined and their food destroyed. The loss of the protective covering exerts a marked effect in causing the soil to dry out and become hard, as a result of which the rain is shed rapidly following dry weather, much as when it falls on a house roof. Trees in farm woodlands and city parks are often seen dying at the tops from this cause.

Forest rangers employed by the State and Federal Governments for the administration and protection of the State and national forests. Private timberland owners protecting their lands in cooperative effort with the State and Federal Governments. What type of men are required for forest rangers, whose duties require them to live out of doors and ride or work in all kinds of weather? Each national forest divided into districts in charge of rangers. Fire-protection plans



F-242996 S-13544-C

FIGURE 15.—It is good forest practice to keep livestock out of the woods (except in parts of the South) and everywhere to prevent fires. Trees, like other crops, require protection *A*, Heavy grazing in a pasture contrasted with an untrampled and unbrowsed thrifty farm woods. *B*, 4-H Club boys establishing a firebreak on a club project.

worked out in great detail for preventing, detecting, and fighting fires as soon as possible after they start. Fire-fighting equipment, such as lookout towers, telephone lines, and fire-fighting tool boxes at convenient points over the forest. Cleared and burned lines as firebreaks (fig. 15). Use of airplanes and radio.

Protection for State forest lands by similarly organized methods. Federal cooperation with the various States, authorized by the Weeks Law, for the protection of headwaters of navigable streams against fire.

The grazing of livestock: This practice has much the same effect in removing the protective covering and packing the ground hard as fire has. Cattle and horses browse off the tender young seedlings and tramp down the upper soil layers (fig. 15). Sheep and goats, particularly when closely herded, are very destructive to young seedlings. Hogs feed upon most kind of acorns and nuts, although by rooting up the leaf litter they sometimes favorably expose the mineral soil for the quick germination of tree seeds. Hogs are very destructive to the seed or mast of the longleaf pine, and the young seedlings are killed in large numbers by animals stripping off the thick, sweet, spongy bark from the roots.

Damage by insects: Leaf and inner bark-eating, twig cutting, bark- and wood-boring insects. Methods of checking spread of insect infestation by right methods of cutting.

Fungi in forest trees as a source of the injury and death of many trees: Some trees less subject to attack than others. Importance of keeping woods in a healthy growing condition and rightly cut in order to combat the spread of fungous diseases.

Practical things to do.—Make a trip through the district to see what damages occur in farm woodlands and what forest protection is practiced. Look for any disease or insect which is attacking any special group of trees. Find out by observation if farm woodlands are being grazed and make a note of any damage that is being done by livestock.

Protective Effects of Woodland

Aim.—To find out how the forest or woods conserve soil moisture, check soil erosion, and modify temperature.

Source of information.—Farmers' Bulletins 173, 1405, 1767, 1809, 1813; Circulars 19, 347, and 380; Miscellaneous Publications 162, 196, 247; Technical Bulletin 567.

Illustrative material.—The best illustrative material will be found in a trip to the woods and fields. Actual examples of the effect of the trees or woods can be pointed out. If a field trip is not practicable, illustrations may be clipped from papers and magazines showing erosion on unprotected hillsides and the use of trees as shelters in pastures and about farm buildings.

Guides to study.—With an acquaintance formed with the different species of trees, it will be worth while to learn their value both individually and when associated in woodlands.

Timber or wood products: Trees grouped according to their value for wood or timber. (This is expanded in *Products from the Home Woodlands*, p. 25).

How a forest cover conserves the water from rainfall or melting snow (fig. 16).

Flow of streams from open and from forested land; seepage and springs. Protecting watersheds of city reservoirs and headwaters of large streams from erosion and floods. State and municipal forests. The 176,000,000 acres of Government national forests held for protection of watersheds and streams and for a permanent timber supply. Private owners hold four-fifths of the total standing timber in the United States.

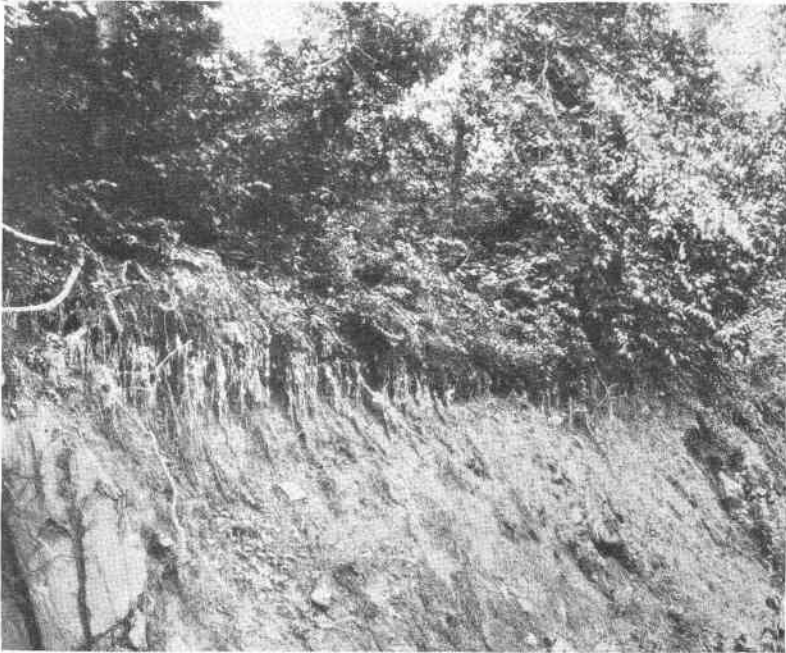
How trees protect the soil against erosion and the formation of gullies on steep slopes (fig. 17). Examples of local hillsides and regions of the United States

Woods as shelter against hot and dry or cold winds, for grain and fruit crops, livestock, and for protecting the farm home. The difference in temperature of the air in midsummer out in the open road or field and in the shade of a single tree or of woods. The difference in the same situations on a cold windy day in winter.

Field study.—In an excursion to the hills and the fields boys and girls can learn, by actual observation, the bond between the forest and the river.

Upon leaving the open and entering the cool shade of the woods they will note the forest floor—the undergrowth of young trees and shrubs, the ferns and moss, and the litter of fallen leaves. With a jackknife, or a trowel, they can dig beneath this cover into the mold of many years' fallen leaves. The soil will be spongy and moist. What happens when rain falls or snow melts? Under the forest canopy it sinks into the spongy earth (fig. 16).

What becomes of the rain and snow that the forest has soaked up like a sponge? Find a spring. This is where the stored water is seeping out to feed the streams. The rainfall that has been held back in the hidden reservoir of the forest is here transformed into a steady supply of water for the pasture, the farm, the mill, and the city.

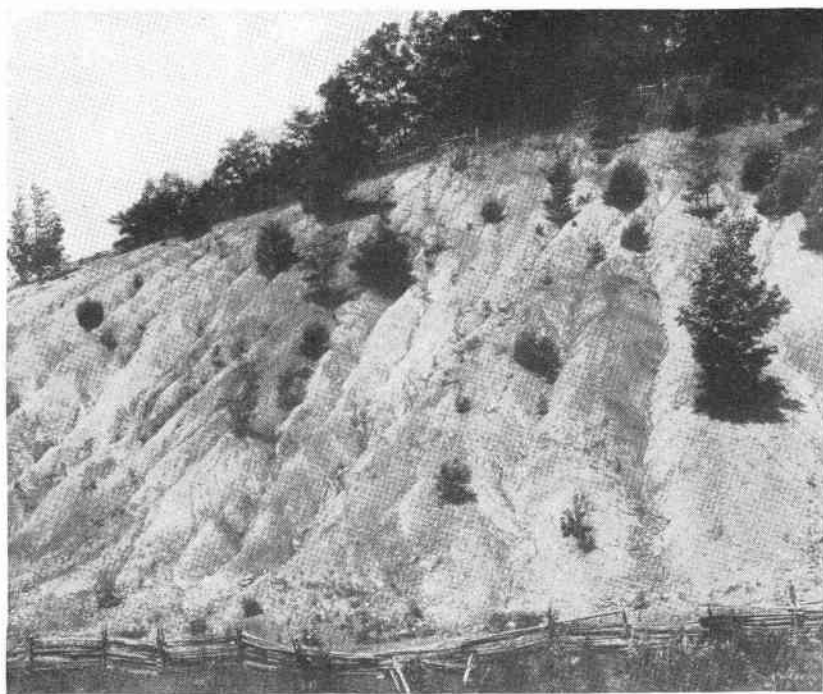


F-34411

FIGURE 16.—The forest floor: Dense growth of seedling and sapling trees covering and protecting the soil; leaves and twig litter on the ground beneath the trees; spongy layer of decomposed vegetable matter or humus, and the lower layer of soil interlaced with tree roots and rootlets; and the clay subsoil.

Return to the open and dig into the soil on the unwooded slope. It will be found dry and hard. What happens when the rain falls or the snow melts on the open hillside? It is not held back and absorbed but rushes down the slope. In a heavy rain the streams rise rapidly. Perhaps the group will find a place where a bridge has been carried away in a freshet. Someone may tell of the destruction of a log bridge on the farm. What happens when the winter snow melts upon the unprotected mountain slopes and the spring rains swell the rivers? (Figs. 17 and 18.)

On the open hillside, places will be found where the soil, which has no roots to bind it, has been washed away by the rain, and on some steep slope there will be deep gullies dug into the ground. Where does the soil go that is washed down the slope? Into the stream. Perhaps the stream carries the silt into the water supply of a city. If there is a river near, a sand bar may be found that has resulted from



F-12234

FIGURE 17.—Effect of deforestation: Washing of soil and devastation of valuable farm lands at the heads of streams.



F-42100

FIGURE 18.—Effect of deforestation: Sand bars in the stream channels. Millions of dollars are spent yearly in dredging our rivers to keep them navigable.

sediment washed down from the hill country. What do muddy rivers mean to harbors near the coast? Who has seen the dredge at work scooping up the silt to keep the channel free? This means a vast expense to the country (fig. 16).

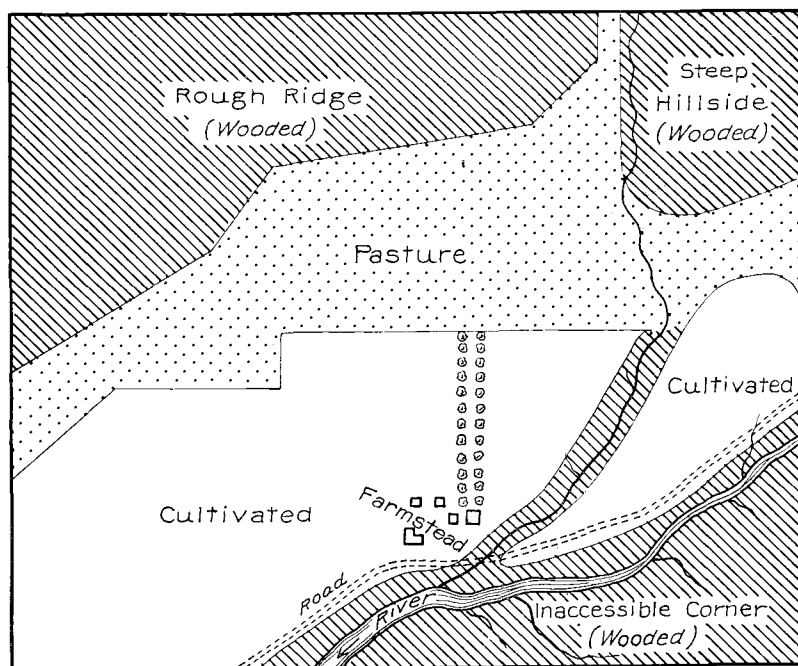
The boy or girl who has noted these facts about woodland, soil, and stream will begin to see the relation which the forests of the country bear to the land. The examples of soil protection and clear streams, of erosion and flood damage that he or she finds in his own neighborhood, are intimations of the larger meaning of the Nation's forests to farm land and industry and commerce. The home woodland is a part of Nature's plan to aid man and his enterprise.

Location and Extent of Farm Woodlands

Aim.—To learn how to determine the location and area of land on the farm on which trees should be grown as a crop.

Sources of information.—Leaflet 29, Farmers' Bulletin 1117.

Guides to study.—Timber is a poor-land crop. Observe places about the farm which should be kept in forest trees and woods. Places where forest trees are profitable: (1) Poor soils. (2) Steep slopes. (3) Eroding soils. (4) Rocky land. (5) Wet land. (8) Unused corners or waste places.



F-370128

FIGURE 19.—Rough, steep, and poor lands, and inaccessible parts of the farm may be used to increase farm income by growing trees in permanent woodlands.

Extent of woodlands in the locality: Proportion of cropland and woodland. The total acres of woods on 10 to 20 representative farms in a locality.

Practical things to do.—From the data gathered in the survey construct a chart showing the proportion of cropland and woodland, the total crop acreage, and the

total woodland acreage. Study the places where trees are growing and list such locations. List the kinds of trees commonly growing in each of these localities. Note farms that could profitably plant forest trees, and the kinds of trees that should be planted.

Draw a map of a farm or of the school district, locating the poor soils, steep slopes, eroding soils, rocky land, wet land, unused corners or wasteland, and mark on this map the names of the trees that grow on these places or that could be profitably grown thereon (fig. 19).

Write a report showing the advantages of using the poor soils and wastelands for tree planting, giving examples from the farms of the district if possible.

Products From the Home Woodlands

Aim.—To learn what products from the home forest to use for home and for the market.

Sources of information.—Farmers' Bulletins 1210, 1256, 1366, 1392, 1486, 1664, 1756, and 1759; Leaflets 29 and 153; Miscellaneous Publications 106, 162, and 247.

Illustrative material.—Prepare a wall chart showing in tabulated form the various wood products. In each product column write the name of the tree or, better still, place a sample of the wood that furnished that product. Prepare another chart showing in like manner other forest products such as nuts, roots, bark, gum, and edible fruits, listing the trees from which the products are obtained. Any of the products from root, bark, gum, etc., will also make interesting and useful illustrative material.

Guides to study.—Wood, in a rough state, is the principal farm-timber product. What kinds of wood are used for the following rough products: (1) Sawlogs; (2) poles and piling; (3) fence posts; (4) bolts, blocks, or billets for (a) cooperage, (b) implement handles, (c) wagon and automobile spokes, (d) pulpwood; (5) cross ties; and (6) fuel wood? The sizes and other requirements for each of these various wood products, including the species which are best suited for them and bring highest prices on the market (fig. 20).

Forest trees which produce nuts of commercial value, roots, bark, sugar, edible fruit, and crude turpentine.

Lumber is manufactured from the woodland sawlogs. (How to measure sawed lumber is treated in the section on Measuring and Estimating Timber.) That work is ordinarily done by the sawmill man rather than by the farmer.

Practical things to do.—Make a study to determine the chief use of wood in the district. What other forest products are made or used here? What trees

Help Prevent Woods Fires

BE SURE your match is out before throwing it away.

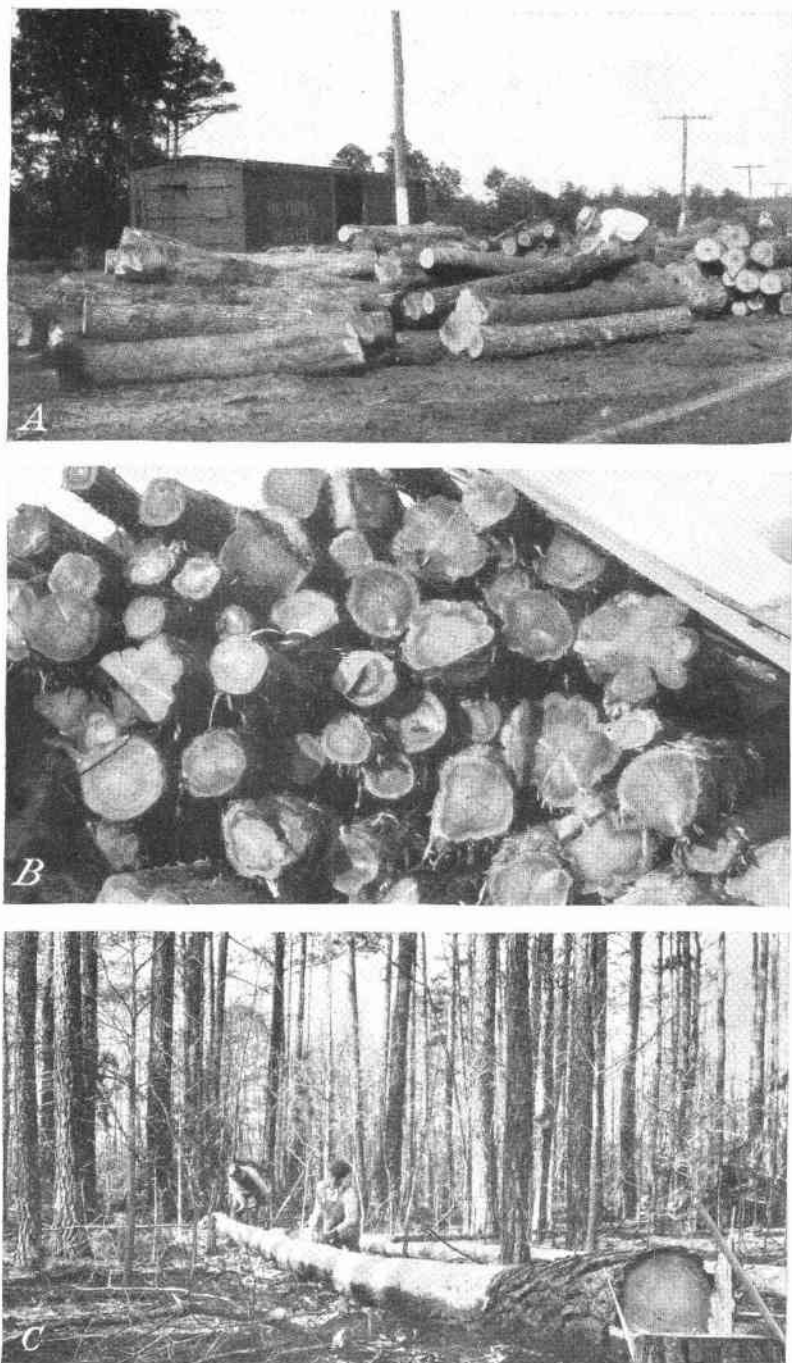
DON'T throw away burning tobacco.

CHOOSE a safe place and make your campfire small.

PUT OUT your fire with water and then cover it with mineral earth.

DON'T make large brush heaps. Choose a still day for burning and plow furrows to protect nearby woods.

Be Careful With Fire



F-219590 F-174462 N. C. 781

FIGURE 20.—Some products from farm woodlands are: *A*, log; *B*, posts; *C*, piling.



F-240805 N. C. 879

FIGURE 21.—More products from farm woodlands: *A*, cross ties; and *B*, wood for pulpwood or fuel.

furnish the greatest amount of wood? What kind of lumber is sawed in the district? What becomes of this lumber?

If there are any wood-product factories in the district, arrange for a trip to study the various processes from the rough wood to the finished products.

Make a list of the forest products under various headings and indicate what they are used for commercially.

On the basis of local study determine what timber in the district is most valuable.

An interesting study to make is the part forest products play in the construction of machinery, transportation lines, airplanes, etc.

Make a list of animals, birds, and other wildlife inhabiting the local farm woodlands.

Measuring and Estimating Timber

Aim.—To find out how to measure and estimate timber.

Sources of information.—Farmers' Bulletin 1210; publications of colleges of agriculture or State foresters; loose-leaf volume tables for most species of conifers, eastern hardwoods and western species, Forest Service; handy sets of log and



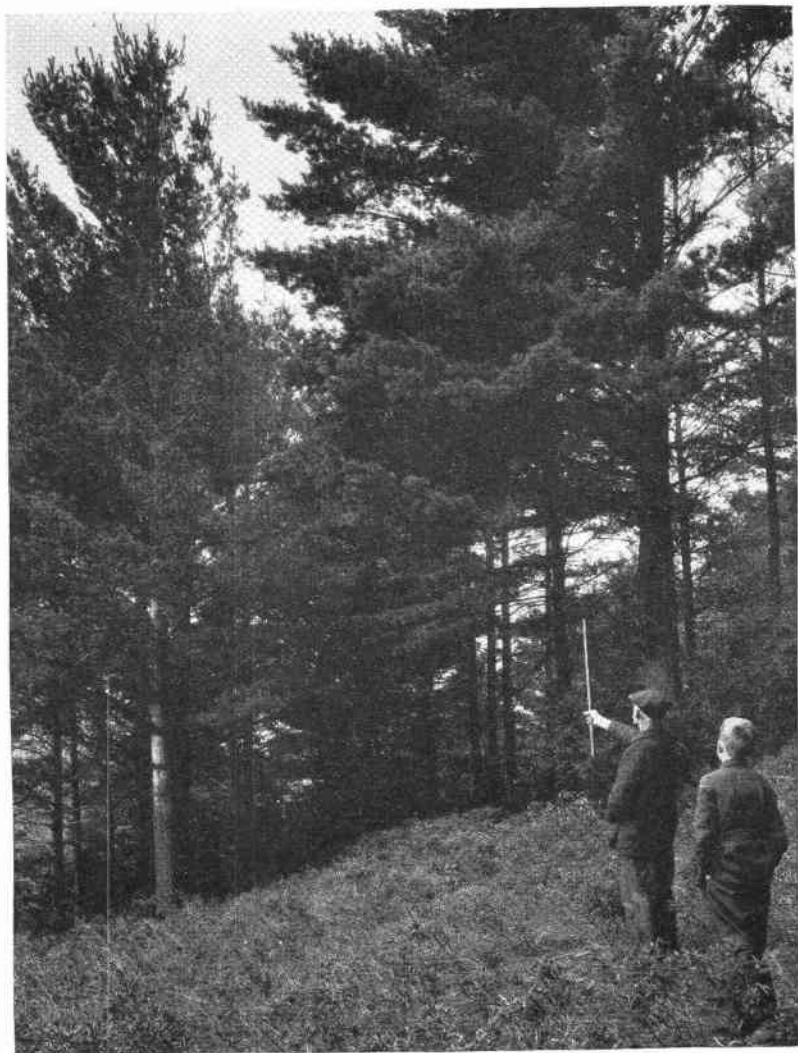
S-14747-C

FIGURE 22.—4-H Club member measuring the diameter of a white oak tree (outside the bark and at breast height) with a tape covered to read diameters in inches.

tree scale sticks (for northern trees apply to Federal Land Bank, Springfield, Mass.; for southern pines, to American Forestry Association, Washington, D. C.); rules for scaling logs on page 38.

Illustrative material.—Procure any good pictures showing how saw timber is measured and estimated. Tables for scaling logs.

Guides to study.—Measuring sawlogs; show how the diameter at the small end is found by measuring inside the bark along an average line or averaging two measurements at right angles. The diameter and length found, the approximate lumber contents is found by referring to a copy of some log rule. Probably

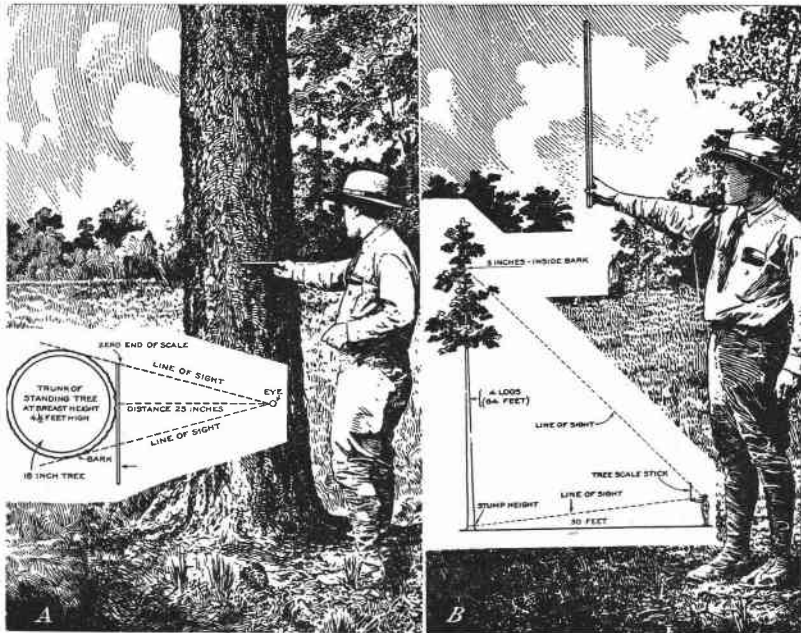


S-7516-C

FIGURE 23.—Showing a 4-H Club boy how to measure the height of a tree or the number of 16-foot cuts with a cruiser's, Biltmore, or tree scale stick.

the most common rule in use is the Doyle, although for small logs under 16 to 20 inches it is very inaccurate, because from one-third to one-half more lumber is usually sawed out than is indicated by the rule. The International log rule (for $\frac{1}{4}$ -inch saw kerf) gives more nearly what small mills cut from logs. (See p. 38.)

Practical things to do.—Write an account of a method of scaling logs. Determine scale and estimate the number of feet in a given sawlog. Determine how bolts and billets are measured. What constitutes a standard cord of wood? Look up information about allowances made for defects in sawlogs, bolts, or blocks, and in other material.



F-370132

FIGURE 24.—Estimating the saw timber in a tree by the use of a tree scale or cruiser's stick: *A*, If the stick is held horizontally against the trunk of the tree at a specified distance from the eye, the observer is able to read directly the diameter of the tree outside the bark. The standard is called the breast-high diameter, and is taken at a height of $4\frac{1}{2}$ feet above the average level of the ground. *B*, The stick is graduated so that, when held a specified distance from the eye of the observer who stands a specified distance from the tree, the observer can read the number of 16-foot-log lengths of the tree. The principle is that of two similar triangles.

Estimate the timber in standing trees: Find approximately the contents in cords or board feet of lumber by measuring the diameter at breast height ($4\frac{1}{2}$ feet above the ground), estimating or measuring the number of 16-foot log cuts in the tree, and by using the information given in Farmers' Bulletin 1210 (figs. 22, 23, and 24). Estimate the timber in a whole tract. Apply the same method to all the trees on a measured one-tenth or one-quarter acre, thereby estimating the contents per acre. Record the measurements by different species on a simple blank form ruled in squares in two directions.

Using Farm Timber

Aim.—To learn how to make the best use of farm timber.

Sources of information.—Farmers' Bulletins 744, 1177, 1210, 1660, and 1756; Leaflet 29; Department Circular 64; Circular 489; publications of State foresters and colleges of agriculture.

Illustrative material.—Again a field trip will furnish the best illustrative material. Note the height of the stumps where timber has been cut, the careless felling of trees causing injury to young trees, the tops and large limbs left in the forest. If field trips are not possible, pictures may be used to illustrate the points mentioned.



F-353330

FIGURE 25.—Wasteful cutting of pine trees for pulpwood: The clearest and best timber has been left to decay. It would have paid for the cutting of the trees. Two or three of the trees should have been left to grow and reseed the land.

Guides to study.—The right use of timber on the farm should begin at the time the tree is cut. Waste of good timber in the woods is entirely too common nowadays when wood is high priced and getting scarcer.

High stumps mean usually that the best timber in the tree is wasted (fig. 25). Often the timber left in high stumps would cover the costs of logging. Sawlogs can now be taken profitably from the tops which had to be left only a few years ago. Wherever possible the tops should be worked up into crossties, mine props, or firewood. By careless felling of trees much promising young timber is broken and destroyed.

High grade and valuable timber should not be used in places about the farm where less valuable woods will answer the purpose. Sometimes choice white oak, worth \$40 a thousand feet in the log for veneers, is split into fence posts, or black walnut is used for farm gates. Parents or neighbors should be able to suggest satisfactory substitutes for these purposes.

Small and young timber cut in making improvement thinnings in overcrowded stands can often be sold or used on the farm for posts, poles, or firewood, instead of being allowed to decay in the woods (fig. 26).

Treating fence posts: Short-lived woods when soaked in hot and then cold creosote last from 10 to 20 years as fence posts. As the supply of long-lived woods, such as black locust, osage-orange, eastern red cedar, American chestnut, mulberry, and catalpa becomes less, treated fence posts are being increasingly used. Almost all farms grow some common woods which take coal-tar creosote readily.

Practical things to do.—In a field trip to the farm forests note what care is taken in felling trees, the disposition of limbs and tops, and the height of the stumps. Note examples of use of expensive wood where a cheaper wood might do. Note the high-priced timber in the district. Determine the common method of treating



F-39260-A

FIGURE 26.—Small pine logs from thinnings made to improve the growth and quality of the stand.

fence posts in the neighborhood. Examine telephone and telegraph poles to see how they are treated. Make a list of good and bad examples of the use of farm timber.

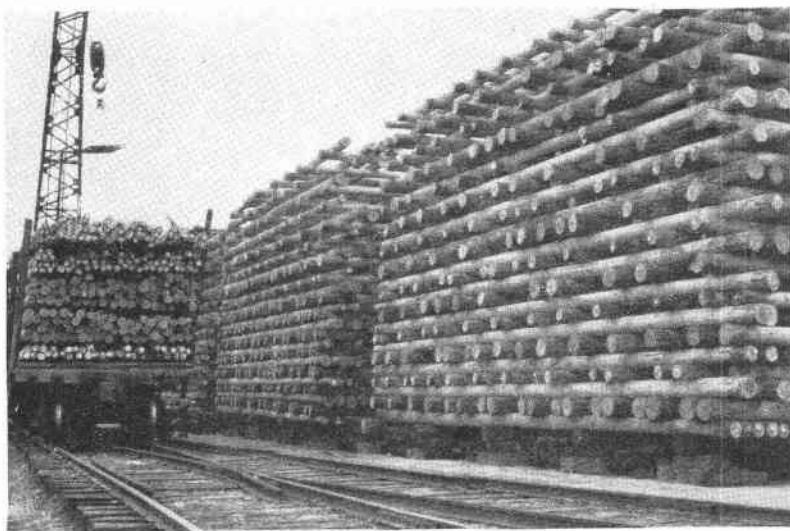
Make a report on the methods of cutting and handling timber on the farm, with especial reference to disposing of waste timber. Write a short account of the best methods for preserving timber used in posts, railroad ties, and other lumber.

Measure the height of stumps in a tract of cut-over timber and calculate the amount of lumber wasted. If one hundred 7-foot walnut fence posts, averaging 5 inches square, can be replaced by 100 locust or red cedar posts of the same size, calculate, on the basis of local prices, the amount saved by the substitution. If treating a softwood post with creosote costs 15 cents, but will make it last three times as long as one not treated, assuming average present local prices for labor in replacements and cost of untreated posts, what will be saved in 20 years in fencing a quarter section of land with posts spaced 12 feet apart?

Marketing Forest Products

Aim.—To learn where and how to market farm-forest products.

Sources of information.—Farmers' Bulletins 1210, 1366, 1392, 1459, and 1664; Leaflet 29; bulletins of the State colleges of agriculture and State foresters.



F 262435

FIGURE 27.—Poles and piling are bringing woodland owners more money per tree than most other products. Poles are in good demand. Those on the car are 4 to 5 inches top diameters and 16 feet in length.



F-16187-A

FIGURE 28.—The best timber brings high prices and can usually be shipped for veneer or choice lumber. Several owners can join in marketing a carload or truckload.

Illustrative material.—Timber price lists. Addresses of firms dealing in timber. Local prices for cordwood, posts, cross ties, and piling.

Guides to study.—Finding the best markets: Before timber is cut its approximate size and amount by species and its disposal should be determined as definitely as possible. How to find buyers of cut-timber products. How are logs, bolts or billets, piling, posts, cross ties, and firewood generally sold? Advertising in the newspapers, consulting neighbors who have recently sold timber, consulting State foresters and reliable experienced men.



N. C. EXTENSION

FIGURE 29.—Illustrates what is happening nowadays in the woods. 4-H Club boys in increasing numbers are learning about growing timber as a crop and completing forestry projects.

The owner should protect himself by a simple form of written contract; much loss comes to sellers of timber products by failure to observe this precaution and to have the agreement in proper written form.

Selling standing timber: Selling for a stated sum by the acre, or a lump sum for the whole tract or "boundary."

What to cut and what timber to keep growing in the woods; what timber to sell and what to use at home. Poles are in strong demand for telephone and transmission lines (fig. 27). Choice logs of certain woods bring high prices and can be profitably shipped long distances by rail or water (fig. 26).

Cooperative marketing of farm timber: Carload lots of logs, etc., the least amount that can profitably be shipped. Many wood manufacturing concerns buy direct from producers in carload lots. A farmer may not have sufficient white oak sawlogs or hickory spoke blocks to make shipment profitable.

Practical things to do.—Time might well be spent trying to find out what timber is being sold from the local farm woodlands; who is buying it; what standing timber is sold; what cooperative shipping of timber is being done (fig. 29).

SUPPLEMENT

Publications of the United States Department of Agriculture Relating to Forestry on Farm Woodlands

Directions for Requesting These Publications

Of the following list of publications, some are available free upon application; others can be had only by purchase. Changes in these lists occur almost daily. Therefore the best way is to write to the United States Department of Agriculture, Washington, D. C., for those you wish to get. The free publications will be sent to you, and you will be informed of those that are available only by purchase. Upon receipt of this information application should be made to the Superintendent of Documents, Government Printing Office, Washington, D. C., inclosing the money, preferably in the form of postal or express money order, although cash will be accepted. It is risky to send cash. Stamps will not be accepted.

Farmers' Bulletins

- 173. A Primer of Forestry, Part I. 5 cents.
- 744. The Preservative Treatment of Farm Timbers. 5 cents.
- 1087. Beautifying the Farmstead. 5 cents.
- 1123. Growing and Planting Hardwood Seedlings on the Farm. 5 cents.
- 1169. Insects Injurious to Deciduous Shade Trees and Their Control. 10 cents.
- 1177. Care and Improvement of the Farm Woods. 5 cents.
- 1208. Trees for Town and City Streets. 5 cents.
- 1210. Measuring and Marketing Farm Timber. 5 cents.
- 1256. Slash Pine. 10 cents.
- 1366. Production of Maple Sirup and Sugar. 5 cents.
- 1392. Black Walnut for Timber and Nuts. 5 cents.
- 1405. The Windbreak as a Farm Asset. 5 cents.
- 1453. Growing and Planting Coniferous Trees on the Farm. 5 cents.
- 1459. Selling Black Walnut Timber. 5 cents.
- 1477. Preventing Damage from Lyctus Powder-Post Beetles. 5 cents.
- 1481. Planting the Roadside. 5 cents.
- 1482. Trees for Roadside Planting. 5 cents.
- 1486. Longleaf Pine Primer. 5 cents.
- 1492. Arbor Day, Its Purpose and Observance. 5 cents.
- 1501. Nut-Tree Propagation. 5 cents.
- 1517. Loblolly Pine Primer. 5 cents.
- 1526. Clearing Land of Brush and Stumps. 5 cents.
- 1567. Propagation of Trees and Shrubs. 5 cents.
- 1582. Protection of Log Cabins, etc., from Injurious Insects. 5 cents.
- 1586. The Southern Pine Beetle. 5 cents.
- 1591. Transplanting Trees and Shrubs. 5 cents.
- 1628. Growing Black Locust Trees. 5 cents.
- 1643. Fire Safeguards for the Farm.
- 1660. The Use of Logs and Poles in Farm Construction. 5 cents.
- 1664. Christmas Trees as a Cash Crop for the Farm. 5 cents.
- 1671. Shortleaf Pine. 5 cents.
- 1680. Farmers in Northern States Grow Timber as Money Crop. 5 cents.
- 1693. Growing Christmas Holly on the Farm. 5 cents.
- 1726. Treatment and Care of Tree Wounds. 5 cents.
- 1756. Selection of Lumber for Farm and Home Building. 5 cents.
- 1759. Game Management on the Farm. 5 cents.
- 1767. Soil Defense in the Piedmont. 15 cents.
- 1794. Forest Farming. 5 cents.
- 1809. Soil Defense in the South. 10 cents.
- 1813. Prevention and Control of Gullies. 10 cents.
- 1826. Care of Ornamental Trees and Shrubs. 5 cents.

Leaflets

- 29. The Farm Woods—A Savings Bank. 5 cents.
- 30. Cutting the Farm Woods "Profitwise." 5 cents.
- 40. Woods Burning in the South. 5 cents.
- 41. Good Naval Stores Practice. 5 cents.
- 44. Fires on Farms. 5 cents.
- 55. Small Trees Wasteful To Cut for Saw Timber. 5 cents.
- 57. Pulpwood Crops in the Northeast. 5 cents.
- 83. More Turpentine-Less Scar-Better Pine. 5 cents.
- 84. Planting Black Walnut. 5 cents.
- 86. Protect Hardwood Stands from Grazing. 5 cents.
- 153. How To Cut Southern Farm Timber for Steady Profit. 5 cents.
- 155. Growing Nursery Stock of Southern Pines. 5 cents.
- 156. Harvesting and Selling Seed of Southern Pines. 5 cents.
- 159. Planting Southern Pines. 5 cents.

Miscellaneous Publications

- 106. Pine Tree Treasures. 5 cents.
- 162. Our Forests, What They Are and What They Mean to Us. 5 cents.
- 196. Floods and Accelerated Erosion in Northern Utah. 5 cents.
- 217. Forest Trees and Forest Regions of the United States. 15 cents.
- 247. Forests and Permanent Prosperity. 5 cents.
- 249. Careers in Forestry. 5 cents.
- 290. Work of the U. S. Forest Service. 10 cents.
- 357. Southern Pines Pay. 5 cents.

Department Circulars

- 64. How Lumber is Graded. 10 cents.
- 243. Forest Fires in California: An Analytical Study. 15 cents.

Circulars

- 19. Forests and Floods. 5 cents.
- 134. Suggestions for the Management of Spruce Stands in the Northeast. 10 cents.
- 347. Effect of cover on Surface Run-Off and Erosion in Loessial Uplands of Mississippi. 5 cents.
- 358. The Forest-Tax Problem and Its Solution Summarized. 5 cents.
- 380. Erosion Control on Mountain Roads. 10 cents.
- 431. Increasing Growth and Yield of Young Spruce Pulpwood Stands by Girdling Hardwoods. 5 cents.
- 489. Selection, Installation, Finish, and Maintenance of Wood Floors for Dwellings. 5 cents.

Technical Bulletin

- 567. Soil Erosion and Stream Flow on Range and Forest Lands of the Upper Rio Grande Watershed in Relation to Land Resources and Human Welfare. 15 cents.

American Wood Series

- Nomenclature, Distribution and Growth, Supply, Production, Properties, Principal Uses. Maps of Botanical Range of Different Species (Forest Service).

Volume Tables

- Loose Leaf Volume Tables for Most Species of Eastern Conifers and Eastern Hardwoods (Forest Service).

State Forestry Departments

Forty-four States have departments of forestry or equivalent State organizations, all of which publish more or less material on varied phases of forestry. Applications should be addressed to the State foresters at the following places:

- Alabama, State Commission of Forestry, Montgomery.
- Arkansas, Arkansas State Forestry Commission, Little Rock.
- California, State Board of Forestry, Sacramento.
- Colorado, Department of Forestry, Fort Collins.

Connecticut, State Park and Forest Commission, Hartford.
Delaware, Forest Conservation Commission, Dover.
Florida, Florida Forest and Park Service, Tallahassee.
Georgia, Department of Natural Resources, Atlanta.
Idaho, State Board of Land Commissioners, Boise.
Illinois, Department of Conservation, Springfield.
Indiana, Department of Conservation, Indianapolis.
Iowa, State Forestry Commission, Des Moines.
Kansas, State Agricultural College, Manhattan.
Kentucky, Conservation Department, Frankfort.
Louisiana, Department of Conservation, New Orleans.
Maine, State Forest Service, Augusta.
Maryland, State Department of Forestry, Baltimore.
Massachusetts, Department of Conservation, Boston.
Michigan, Department of Conservation, Lansing.
Minnesota, Department of Conservation, St. Paul.
Mississippi, Mississippi Forest and Park Service, Jackson.
Missouri, Missouri Conservation Commission, Jefferson City.
Montana, State Forest Department, Missoula.
Nebraska, University of Nebraska, Lincoln.
Nevada, State of Nevada, Carson City.
New Hampshire, Forestry and Recreation Department, Concord.
New Jersey, Department of Conservation and Development, Trenton.
New York, Conservation Department, Albany.
North Carolina, Department of Conservation and Development, Raleigh.
North Dakota, State School of Forestry, Bottineau.
Ohio, Department of Forestry, Wooster.
Oklahoma, Oklahoma Planning and Resources Board, Oklahoma City.
Oregon, State Board of Forestry, Salem.
Pennsylvania, Department of Forests and Waters, Harrisburg.
Rhode Island, State Department of Agriculture and Conservation, Goddard Memorial Park,
East Greenwich, P. O.
South Carolina, State Forestry Commission, Columbia.
South Dakota, Department of Schools and Public Lands, Pierre.
Tennessee, Department of Conservation, Nashville.
Texas, Texas Forest Service, College Station.
Vermont, Department of Conservation and Development, Montpelier.
Virginia, Virginia Conservation Commission, University.
Washington, Department of Conservation and Development, Olympia.
West Virginia, Game and Fish Commission, Charleston.
Wisconsin, State Conservation Commission, Madison.

Rules for Scaling Logs

TABLE 1.—*The contents of logs, in board feet, scaled by the International log rule (using saw cutting one-fourth-inch kerf).*

Diameter at top end of log inside bark (inches)	Length of log in feet						
	8	10	12	14	16	18	20
	Contents of log in board feet						
6	10	10	15	15	20	25	25
7	10	15	20	25	30	35	40
8	15	20	25	35	40	45	50
9	20	30	35	45	50	60	70
10	30	35	45	55	65	75	85
11	35	45	55	70	80	95	105
12	45	55	70	85	95	110	125
13	55	70	85	100	115	135	150
14	65	80	100	115	135	155	175
15	75	95	115	135	160	180	205
16	85	110	130	155	180	205	235
17	95	125	150	180	205	235	265
18	110	140	170	200	230	265	300
19	125	155	190	225	260	300	335
20	135	175	210	250	290	330	370
21	155	195	235	280	320	365	410
22	170	215	260	305	355	405	455
23	185	235	285	335	390	445	495
24	205	255	310	370	425	485	545
25	220	280	340	400	460	525	590

TABLE 2.—*The contents of logs, in board feet, scaled by the Doyle log rule.*

Diameter at top end of log inside bark (inches)	Length of log in feet						
	8	10	12	14	16	18	20
	Contents of log in board feet						
6	2	2	3	3	4	4	5
7	4	5	7	8	9	10	11
8	8	10	12	14	16	18	20
9	12	16	19	22	25	28	31
10	18	22	27	31	36	40	45
11	24	31	37	43	49	55	61
12	32	40	48	56	64	72	80
13	40	51	61	71	81	91	101
14	50	62	75	87	100	112	125
15	60	76	91	106	121	136	151
16	72	90	108	126	144	162	180
17	84	106	127	148	169	190	211
18	98	122	147	171	196	220	245
19	112	141	169	197	225	253	281
20	128	160	192	224	256	288	320
21	144	181	217	253	289	325	361
22	162	202	243	283	324	364	405
23	180	226	271	316	361	406	451
24	200	250	300	350	400	450	500

Key to Common Kind of Trees ²

The following key is intended only as a guide in the identification of the more common kinds of trees. It is based on prominent, distinctive characteristics which can be readily observed by those who have no special training in botany. Most of the terms used require no explanation.

To use the key, decide first, by an examination of the leaf, in which of the following seven sections your tree belongs; then turn to that section, and from the descriptions there given determine what kind of tree it is.

Section

Trees with needles or scalelike leaves, mostly evergreens, bearing cones. . . . I

Trees with broad leaves:

Leaves simple—

Alternately attached to twigs—

With toothed edges. II

Edges neither toothed nor notched. III

Opposite on twigs—

With toothed edges. IV

Edges neither toothed nor notched. V

Leaves compound—

Alternately attached to twigs. VI

Opposite on twigs. VII

THE CONIFEROUS ³ TREES

I. *Trees with needle or scalelike leaves, mostly evergreen, bearing cones.*

A. Leaves needle-shaped:

(1) Leaves clustered—

(a) Leaves long, from 1 to 18 inches, 2 to 5 in a cluster. Cones large, with many thick, woody scales. . . . (Pinus) Pine.

(b) Leaves short (less than 2 inches long) in brushlike clusters of 12 to 40, falling off in late autumn or early winter. Cones very small, with thin scales, remaining on tree for one or more seasons. (Larix) Larch.⁴

(2) Leaves single—

(a) Leaves scattered around twigs; falling off when dry or dead. Cones elongated with thin scales. Twigs roughened by leaf-scars.

(x) Leaves stiff, often sharp pointed and more or less foursided. (Picea) Spruce.

(y) Leaves soft, flat, rounded or notched at ends, the bases abruptly contracted into threadlike stems. (Tsuga) Hemlock.

² This key and the following tree descriptions are by William H. Lamb, formerly Scientific assistant in dendrology, Forest Service.

³ Cone-bearing.

⁴ The larches are peculiar in having single, scattered leaves on the new or terminal twigs produced each season. These should not be mistaken for the "single" leaves borne throughout by other kinds of evergreens.

A. Leaves needle-shaped—Continued.

(2) Leaves single—Continued.

- (b) Leaves in two distinct rows, one on each side of the twig; falling off in late autumn or early winter. Cones small, ball-like.....(Taxodium) Bald cypress.
 - (c) Leaves often in two rows on the sides of the twigs of lower branches and mostly flat, those on upper branches stouter and arranged on the sides and tops of the twigs. Cones long, erect, produced only on upper side of topmost branches; the scales falling off in autumn, leaving spike-like central axes of the cones attached.....(Abies) Fir.
- B. Leaves scalelike, pointed, overlapping, closely forming flat or four-sided twigs.
- (1) Twigs four-sided. Cones spherical or ball-like, with small, thick scales armed with a spurlike point; seed with very narrow, hard wings.....(Cupressus) Cypress.
 - (2) Twigs flattened.
 - (a) Cones elongated, with only a few thin scales; bent back on branches.....(Thuja) Arborvitæ.
 - (b) Cones spherical, very small, berrylike, with thin scales armed with a tiny point; seeds with a broad, thin wing on two sides.....(Chamaecyparis) Cedar.
 - (c) Cones berrylike (showing indistinct outlines of, but no separation into, scaly parts). Leaves either short, scale-like, and sharp jointed, or much longer, needlelike, standing out loosely, and attached in pairs or in threes on the twigs.....(Juniperus) Juniper.

THE BROADLEAF TREES

II. *Leaves simple, alternate, lobed, and with toothed edges, or only with smooth or coarsely toothed edges*

A. Leaves deeply lobed, or with large notches.

- (1) Leaves as wide as they are long. Fruit, a swinging ball, 1 to 1½ inches in diameter.
 - (a) Leaves with finely toothed margins; star-shaped, the divisions pointed. Fruit, burlike balls, from which, when ripe, small, winged seeds may be shaken. Bark rough.
(Liquidambar) Sweetgum.
 - (b) Leaves with smooth margins, 3 to 5 inches long, pointed lobes, the space between the lobes rounded. Fruit, a rough ball, easily broken when ripe; composed of closely packed long, narrow seeds which have hairlike bristles at their lower ends and are attached to a bulletlike central part. Old bark of trunks and large limbs peeling off in thin, curled pieces, leaving pale inner bark showing in irregular patches.....(Platanus) American Sycamore or plane.
- (2) Leaves longer than wide.
 - (a) Leaves large, with deep, roundtopped, or with pointed bristle tipped lobes, or only with coarse marginal teeth. Fruit, an acorn, resting in a separate cup.
(Quercus) Oak.
 - (b) Leaves small, with little sharp teeth on margin. Twigs bearing sharp thorns. Fruit small (like a little apple), spherical, with bony seeds.....(Crataegus) Hawthorn.

B. Leaves one-sided (one side of leaf shorter at base than the other side).

- (1) Leaves large, oval, 5 to 10 inches long, heart-shaped. Fruit, a cluster of small, woody balls $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter, hanging from a narrow, leaflike blade. (Tilia) American Basswood or linden.
- (2) Leaves 3-veined at base, with long tapering points, which generally turn to one side; edges smooth, or with small teeth of uniform size. Fruit, a small berry about $\frac{1}{4}$ inch in diameter.

(Celtis) Hackberry.

- (3) Leaves with straight lateral veins, oval; edges double toothed (little teeth on the larger ones). Fruit in clusters, dry, flat, with papery wings all around the seeds. (Ulmus) American elm.

C. Leaves even sided (both sides of leaf the same length).

- (1) Leaves oval, evergreen, thick, with short needlelike teeth. Fruit, a bright red berry. (Ilex) American holly.
- (2) Leaves more or less elongated, deciduous, with one tooth at the end of each side vein.

(a) Trees with smooth, bluish-gray bark, and long, pointed, chestnut-brown buds. Fruit, a small, three-cornered nut, in a spiny husk which splits open at the top into three parts. (Fagus) American beech.

(b) Trees with ridged, grayish-brown bark. Fruit, large, spherical, covered with dense, needlelike spines; splits open from the top into 3 or 4 divisions, and containing several thin-shelled, chestnut-brown nuts.

(Castanea) American chestnut.

- (3) Leaves very narrow, long, pointed, finely toothed. Small branches slender, usually tough. Fruit, a long cluster of little pods filled with "cotton" (seeds). (Salix) Willow.
- (4) Leaves somewhat triangular in outline, broad at base, pointed, toothed. Buds of some species coated with aromatic gum. Branches coarse. Fruit, a long cluster of little pods filled with "cotton" (seeds). (Populus) Poplar.

- (5) Leaves oval, pointed, with sawlike teeth.

(a) Fruit a tiny scaly cone.

(x) Bark of trunk and branches peeling off in thin papery sheets. Leaves double-toothed (little teeth on the large ones.) Fruit ("cones") borne singly, pendulous, scaly, falling apart when ripe, seeds with gauzelike wings on two sides. (Betula) Birch.

(y) Bark smooth or broken, but not peeling. Leaves with small teeth. "Cones" several in a cluster on stiff, upright stems, hard, woody, not falling apart; seed with narrow wings on two sides.

(Alnus) Alder.

(b) Fruit, a berry; fleshy, edible.

(x) Leaves large, 3-veined at base, often irregularly, deeply lobed; containing milky juice. Fruit similar in appearance to a blackberry.

(Morus) Mulberry.

C. Leaves even sided—Continued.

(5) Leaves oval—Continued.

(b) Fruit, a berry—Continued.

(y) Leaves small- or medium-sized, feather-veined; containing green juice; fruit (cherry or plum) with one hard-shelled, flattened or spherical seed.

(i) Seed ("stone") flattened. Fruit large and short-stemmed....(Prunus) Plum.

(ii) Seed spherical. Fruit small and long-stemmed.....(Prunus) Cherry.

III. Leaves simple, alternate, regularly or irregularly lobed, edge neither toothed nor notched

A. Leaves with deep lobes.

(1) Leaves with blunt ends (appearing as if cut off), and with two pointed, side lobes. Flowers tuliplike. Fruit conelike, pointed, upright, composed of long, thin, overlapping, winged seeds. Bruised twigs have a peppery odor.

(Liriodendron) Yellow poplar (tuliptree).

(2) Leaves with rounded ends; oval, often with a lobe on one side, making the leaf mitten-shaped, or sometimes with a lobe on each side. Bruised twigs and inner bark of trunk sweet-smelling.

(Sassafras) Sassafras.

B. Leaves without lobes.

(1) Bruised twigs with peppery odor.

(a) Leaves oval (evergreen in one species) or elongated, pointed, large. Flowers large, at ends of branches. Fruit cone-like, with a bright red seed in each division.

(Magnolia) Magnolia.

(2) Bruised twigs without peppery odor.

(a) Leaves broader at top than at the base, 8 to 12 inches long, with very short leafstalk. Fruit fleshy, edible, elongated, 3 to 4 inches long, with thick, yellowish, smooth skin when ripe, and large, bony, flat seeds. Buds brown and hairy.....(Asimina) Papaw.

(b) Leaves broadest at middle, oval, 3 to 10 inches long.

(x) Fruit short-stalked, spherical, 1 to 1½ inches in diameter; when ripe pale orange color, sur-rounded at base with old flower-cup; very bitter, but edible after frost....(Diospyros) Persimmon.

(y) Fruit long-stalked, elongated or spherical, solitary or in pairs, with thin flesh and a ridged stone or seed....(Nyssa) Tupelo (known also as gum).

(c) Leaves rounded or heart-shaped, 3 to 5 inches across. Flowers pealike, pink, appearing before the leaves. Fruit, a dry flat pod, 2½ to 3½ inches long; in dense clusters on sides of branches; seeds, hard, small, oblong, ¼ inch long.....(Cercis) Redbud.

(3) Bruised or cut twigs and leaves with milky juice.

(a) Leaves with narrow points. Twigs bearing thorns. Fruit large, orangelike, with smooth, uneven surface, 4 to 6 inches in diameter.....(Toxylon) Osageorange.

IV. Leaves simple, opposite, with lobe-toothed edges

- A. Leaves with large (often lobelike) teeth. Fruit in pairs, each part with a conspicuous, flat, very thin wing. Fruit matures in spring or in autumn, when it becomes dry and yellowish-brown. (Acer) Maple.

V. Leaves simple, opposite, edges neither toothed nor notched

- A. Leaves very large, heart-shaped long-pointed. Flowers showy, trumpet-like, in large upright clusters. Fruit, a long, cylindrical pod, 8 to 14 inches long, containing closely packed, flat, dry seeds, with fringed wings at each end. (Catalpa) Catalpa.
- B. Leaves rather small, oval, tapering at base and point. Flowers conspicuous, white (occasionally rosy), appearing with the expanding leaves. Fruit, a small cluster of two-seeded berries, turning red in autumn. (Cornus) Flowering dogwood.

VI. Leaves compound, alternately attached to twigs

- A. Leaflets small, many, attached along two sides of a main stem. Fruit, a flat, bean, dry or fleshy pod.
- (1) Leaflets with small wavy teeth. Pods flat, broad, long, often twisted, thin-skinned, with thick, cheesy, sweetish pulp about seeds. Trees with long, keen, branched thorns on the trunk. (Gleditsia) Honeylocust.
 - (2) Leaflets not toothed.
 - (a) Twigs with pairs of short, keen thorns. Leaflets oblong, rounded at ends. Flowers showy white, in large clusters. Pods small, flat, thin, dry, with small seeds. (Robinia) Black locust.
 - (b) Twigs stout, thornless. Leaflets oval, pointed. Flowers greenish, with violet odor. Pods large, flat, thick, with greenish jellylike pulp (poisonous) around the large, black-brown seeds (Gymnocladus) Coffeetree
- B. Leaflets large. Fruit, spherical, with a separable or inseparable husk, containing a hard-shelled nut.
- (1) Leaflets narrow at base becoming larger at outer end. Nut light-colored, smooth, in a husk which separates more or less completely into four parts when ripe. (Hicoria) Hickory.
 - (2) Leaflets broader at base, becoming narrower at outer end. Nut dark, rough, in a fleshy husk which is inseparable by natural divisions and turns black when old. Pith of twigs forms numerous cross-partitions. (Juglans) Walnut.

VIII. Leaves compound, opposite on twigs

- A. Leaflets arranged along two sides of a main leafstalk, with a leaflet at the end.
- (1) Leaflets generally 3 (sometimes 5), toothed only near the ends. Fruit, a cluster of dry, winged seeds, arranged in pairs like those of maple. (Acer) Boxelder.⁵
 - (2) Leaflets generally more than 3 (3 to 11), and either not toothed or with small teeth. Fruit, a cluster of single-winged, dry, oar-shaped "seeds" (Fraxinus) Ash.
- B. Leaflets (5 to 9) clustered at end of a main leaf-stem. Fruit, with a thick, warty or prickly husk, which separates into several parts containing a shiny brown nut. (Æsculus) Buckeye.

⁵ Boxelder, a true maple, differs from the others in having compound leaves.

One Hundred Eastern Forest Trees ⁶

Name	Distribution	Characteristics
1. Eastern white pine (<i>Pinus strobus</i>).	Northeastern and Lake States and Appalachian Mountains.	Fine timber tree; leaves in clusters of 5, 3 to 5 inches long.
2. Jack pine (<i>Pinus banksiana</i>).	Northern tree, best growth north of Lake Superior.	Common on sandy soil; leaves in clusters of 2, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long.
3. Red pine (<i>Pinus resinosa</i>)..	Northern tree, associated with white pine.	Leaves in clusters of 2, 5 to 6 inches long.
4. Pitch pine (<i>Pinus rigida</i>)..	Northeastern and middle Atlantic States.	Leaves in clusters of 3, 3 to 5 inches long.
5. Loblolly pine (<i>Pinus taeda</i>).	Southeastern United States—Coastal plain, New Jersey to Texas.	Leaves in clusters of 3, 6 to 9 inches long. Cone, 2 to 3 inches in diameter.
6. Shortleaf pine (<i>Pinus echinata</i>).	Middle Atlantic and Southern States, with hardwood trees. Piedmont uplands, New Jersey to Texas.	Leaves in clusters of 2 and sometimes 3, 3 to 5 inches long. Cone small, 1 to 2 inches in diameter.
7. Spruce pine (<i>Pinus glabra</i>)..	Southeastern States.....	Leaves in clusters of 2, $1\frac{1}{2}$ to 3 inches long. Do.
8. Virginia pine (Scrub pine) (<i>Pinus Virginiana</i>).	Middle Atlantic States to Indiana.	
9. Pond pine (<i>Pinus rigida serotina</i>).	Southeastern States in Coastal Plain. Scattered.	Leaves 6 to 8 inches long, tree similar to pitch pine but cones remain closed for several years. Cone egg-shaped.
10. Slash pine (<i>Pinus caribaea</i>)..	Southeastern and Gulf States, in poorly drained soils; uplands in Georgia, associated with longleaf pine.	Leaves in clusters of 2, sometimes 3, 8 to 12 inches long. Important turpentine tree.
11. Longleaf pine (<i>Pinus palustris</i>).	South Atlantic and Gulf States.	Leaves in clusters of 3, 8 to 18 inches long. Important turpentine tree.
12. Tamarack or Eastern Larch (<i>Larix laricina</i>).	Northeastern and Lake States and in Canada to Alaska; best growth in Canada.	Leaves needle-shape, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long, in dense, brush-like clusters; falling off in winter.
13. White spruce (<i>Picea glauca</i>)..	Northeastern and Lake States and Canada.	Leaves $\frac{1}{8}$ to $\frac{3}{4}$ inch long, arranged singly around the smooth twigs; whitish.
14. Black spruce (<i>Picea mariana</i>).	Northeastern and Lake States and in Canada to Alaska.	Similar to white spruce, but twigs are minutely hairy; cones strongly attached.
15. Red spruce (<i>Picea rubra</i>)..	Northeastern States, Canada, and Appalachian Mountains.	Similar to black spruce, but cones begin to fall when ripe.
16. Eastern hemlock (<i>Tsuga canadensis</i>).	Northern and Eastern States and in mountains to Georgia.	Leaves $\frac{1}{8}$ to $\frac{3}{8}$ inch long, attached by tiny leafstalks; cones $\frac{1}{2}$ to $\frac{3}{4}$ inch long.
17. Baldcypress (<i>Taxodium distichum</i>).	South Atlantic and Gulf States; in swamps.	Leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch long, falling off in winter; cones ball-like.
18. Balsam fir (<i>Abies balsamea</i>).	Northeastern and Lake States to southwest Virginia.	Leaves $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; cones upright, falling to pieces when ripe.

⁶ Eastern half of United States. Most of these are important as commercial timber trees; a few however, are small sized and included because of their botanical importance and wide occurrence in mixture with timber trees, particularly in second-growth forests.

All of the trees in the United States are similarly described and additional information about our forests is given in U. S. Department of Agriculture Miscellaneous Publication 217, Forest Trees and Forest Regions of the United States.

One Hundred Eastern Forest Trees—Continued

Name	Distribution	Characteristics
19. Fraser fir (<i>Abies frazeri</i>)...	High southern Appalachian Mountains.	Similar to balsam fir, except that the cones are covered with protruding scaly bracts.
20. Northern whitecedar (<i>Thuja occidentalis</i>).	Northeastern and Lake States and eastern Canada,	Leaves scale-like; cones $\frac{1}{4}$ to $\frac{1}{2}$ inch long, bent backward on twigs, which are flat.
21. Atlantic white-cedar (<i>Chamaecyparis thyoides</i>).	Swamps of eastern and Gulf Coast States.	Cones ball-like; leaves somewhat resembling arborvitæ.
22. Eastern redcedar (<i>Juniperus Virginiana</i>).	Eastern United States.....	Leaves scale-like, those on young shoots and seedlings awl-shaped and spreading; young cones changed into a firm berry.
23. Sweetgum (<i>Liquidambar styraciflua</i>).	Central and Southeastern United States.	Leaves star-shape; fruit a bur-like ball suspended by a long stalk.
24. American Sycamore; plane (<i>Platanus occidentalis</i>).	Eastern United States.....	Leaves broad and coarsely toothed; base of leafstalk inclosing a winter bud in peculiar manner; fruit a hard-surfaced, long-stalked ball.
25. White oak (<i>Quercus alba</i>).....do.....	.....do.....	Leaves deeply lobed, not bristle-tipped; acorns ripening in one season.
26. Bur oak (<i>Quercus macrocarpa</i>).	Central and Northeastern United States to the Dakotas, Nebraska, and Texas.	A white oak with fringe-edged acorn and larger leaves more deeply lobed.
27. Overcup oak (<i>Quercus lyrata</i>).	Southeastern United States.	A white oak with acorns completely or almost covered by the thin cup.
28. Post oak (<i>Quercus stellata</i>).....	Eastern United States.....	A white oak with leaves cut deeply above and below the middle lobes, suggesting a Maltese cross.
29. Chestnut oak (<i>Quercus montana</i>).	Northeastern United States and Appalachian Mountains Common on ridges.	A white oak with leaves resembling those of the chestnut, and with long, large, shallow-cupped acorns.
30. Northern red oak (<i>Quercus borealis</i>).	Eastern United States.....	Leaves deeply cut, with bristle-tipped points; acorns ripening in 2 seasons; large, with very shallow cups.
31. Black oak (<i>Quercus velutina</i>).....do.....	.....do.....	An oak with thicker, large, glossy leaves which are more or less minutely woolly beneath; acorns with small cups, as deep or deeper than wide.
32. Pin oak (<i>Quercus palustris</i>).....do.....	.....do.....	A red oak with smaller leaves and smaller and shallower cupped striped acorns.
33. Southern red oak (<i>Quercus rubra</i>).	Central and Southeastern States.	A red oak with leaves very deeply cut, the upper central portion being very narrow and sometimes slightly curved, and with dense, tawny-yellow wool beneath.
34. Water oak (<i>Quercus nigra</i>).....	Southeastern United States.	A red oak; leaves not toothed, small, tapering from broad top-end to the base; sometimes 3-lobed. Small acorns with shallow cup. Much planted as street trees throughout South.
35. Willow oak (<i>Quercus phellos</i>).	Eastern United States.....	A red oak with leaves resembling a smooth-edged willow or peach leaf. Much planted as street shade tree in Middle Atlantic and Southern States.

One Hundred Eastern Forest Trees—Continued

Name	Distribution	Characteristics
36. Live oak (<i>Quercus virginiana</i>).	South Atlantic and Gulf States.	An evergreen oak with narrow, smooth-bordered leaves which are turned under on the edge and pale-woolly beneath and glossy above; small, pointed acorns with long stalks.
37. American basswood; American linden (<i>Tilia glabra</i>).	Northeastern United States.	Leaves smooth, broadly heart-shaped with finely toothed edge; fruit a cluster of little woody balls suspended from the middle of a long narrow leaf-like bract.
38. White basswood; Bee tree linden (<i>Tilia heterophylla</i>).	Middle and South Atlantic States.	Similar to basswood except that the leaves are whitish (or minutely woolly) beneath.
39. Hackberry (<i>Celtis occidentalis</i>).	Middle Atlantic States to the Dakotas, Kansas, and Missouri.	Leaves finely toothed, long pointed; fruit a long-stalked, single-seeded berry with very thin, sweetish flesh.
40. American elm (<i>Ulmus americana</i>).	Eastern United States.	Leaves sharply toothed; fruit flat, papery, about $\frac{1}{2}$ inch long, fringed around with tiny hairs.
41. Slippery elm (<i>Ulmus fulva</i>).	.....do.....	Long leaves, very rough on the upper side; inner bark is slippery when chewed, and the flat fruits have a smooth edge.
42. Rock elm (<i>Ulmus thomasii</i>).	Northeastern United States.	Differing from other elms in having fruit minutely hairy all over, and twigs with conspicuous, corky ridges.
43. American holly (<i>Ilex opaca</i>).	Eastern United States.	Evergreen tree, the leaves having spiny teeth, and fruit a bright red berry, remaining attached through the winter.
44. American beech (<i>Fagus grandifolia</i>).	.....do.....	Leaves with saw-tooth edge; fruit a light brown spine-covered bur containing a 3-cornered brown nut.
45. American chestnut (<i>Castanea dentata</i>).	Northeastern and Middle Atlantic States.	Long narrow leaves with sharp, forward-pointing teeth; fruit a spherical, spiny bur containing several brown nuts. Trees mostly killed by blight disease.
46. Chinquapin (<i>Castanea pumila</i>).	Middle and Southern States.	Leaves smaller than chestnut and finely woolly beneath; but one nut in the spiny husk. Mostly known as a shrub, but reaches tree size.
47. Black willow (<i>Salix nigra</i>).	Eastern United States.	Leaves slender, long-pointed, and finely toothed. The largest of our eastern willows, difficult to distinguish from other willows.
48. Balsam poplar (<i>Populus balsamifera</i>).	Northern United States.	Large leaves, very broad at base, toothed, whitish beneath, with round leafstalk.
49. Eastern cottonwood (<i>Populus deltoides</i>).	Northeastern United States.	Leaves triangular, long-pointed, toothed, smooth, with flattened leafstalk.
50. Swamp cottonwood (<i>Populus heterophylla</i>).	South Atlantic and Gulf States.	Heart-shaped leaves with round leafstalk, minutely woolly on underside when young; smooth later.

One Hundred Eastern Forest Trees—Continued

Name	Distribution	Characteristics
51. Quaking aspen (<i>Populus tremuloides</i> .)	Northern and Western United States.	Leaves broad, finely toothed, leaf stalks flat, longer than blades.
52. Bigtooth aspen (<i>Populus grandidentata</i> .)	Northeastern United States.	Leaves broad, coarsely toothed, with flattened leafstalks.
53. Paper birch (<i>Betula papyrifera</i> .)	Northern United States.....	Leaves broad at base, finely toothed, fruit a papery cone which falls apart when ripe; white bark peeling off in thin sheets.
54. Sweet birch (<i>Betula lenta</i>)..	Northeastern United States..	Bark dark brown, hard and close, not peeling off in sheets; tiny scales of cones smooth, not minutely hairy along edges as in yellow birch.
55. Yellow birch (<i>Betula lutea</i>)..	Eastern United States.....	Bark yellow-gray; tiny scales of the cones minutely hairy along edges.
56. Red mulberry (<i>Morus rubra</i>.)	.....do.....	Leaves large, heart-shaped, sharply toothed; fruit red or black, blackberrylike.
57. American plum (<i>Prunus americana</i> .)	Eastern United States and Rocky Mountain region to Utah and New Mexico.	Leaves conspicuously veiny, pointed finely toothed; fruit red or yellow with short stalks; branches with spinelike twigs. Small tree.
58. Pin cherry (Wild red cherry) (<i>Prunus pennsylvanica</i> .)	Eastern United States across northern United States, south in Appalachian Mountains.	Smooth red-brown bark; leaves resemble those of the peach; fruit bright red when ripe, long-stalked in clusters of 3 to 5.
59. Common Chokecherry (<i>Prunus virginiana</i>.)	.....do.....	Fruit in a long cluster, ripe berries glossy black, bitterish, producing a puckering sensation in the mouth.
60. Black cherry (<i>Prunus serotina</i> .)	Eastern United States.....	Fruit resembles common chokecherry, but smaller and thin-fleshed.
61. Yellowpoplar; tuliptree (<i>Liriodendron tulipifera</i>.)	.....do.....	Leaves large, blunt or with deep notch at end; flowers large yellow; tuliplike; fruit a woody, upright cone.
62. Sassafras (<i>Sassafras variifolium</i>.)	.....do.....	Leaves oval with one lobe like a "mitten," or with a lobe on each side. Twigs and inner bark fragrant.
63. Black tupelo (<i>Nyssa sylvatica</i> .) (Known also as black gum.)	.....do.....	Large tree; leaves oval with smooth edge. Fruit an elongated black berry with seed but little flattened and scarcely ridged.
64. Swamp tupelo (<i>Nyssa biflora</i> .) (Known also as swamp black gum.)	Southern States.....	Small tree; resembling black tupelo, but fruit, which also grows in pairs, has a flattened and ridged stone.
65. Water tupelo (<i>Nyssa aquatica</i> .) (Known also as tupelo gum.)	Swamps of Southeastern Coastal States.	Large tree; fruits produced singly, with a stalk longer than the fruit; stone of fruit sharp-edged or winged.
66. Ogeche tupelo (<i>Nyssa ogeche</i> .) (Known also as ogeche gum.)	Swamps, South Carolina to Florida.	Small tree; resembling water tupelo but fruits with stalks shorter than the fruit itself.
67. Sweet bay (<i>Magnolia virginiana</i> .) (Known also as sweet magnolia.)	Coastal swamps, Southeastern and Gulf States.	Small flowers, white, fragrant. Leaves silky-white beneath.
68. Cucumbertree (<i>Magnolia acuminata</i> .)	Eastern United States.....	Leaves large, oval, smooth-bordered, pointed; flowers greenish yellow; fruit slender.

One Hundred Eastern Forest Trees—Continued

Name	Distribution	Characteristics
69. Fraser magnolia (<i>Magnolia fraseri</i>).	Southeastern States	Flowers white; leaves deeply lobed at base, forming "ears."
70. Bigleaf magnolia (<i>Magnolia macrophylla</i>).	.....do	Flowers large, white; leaves very large, with "ears" at base, and white beneath. Largest leaved tree in North America (20 to 30 inches long).
71. Common persimmon (<i>Diospyros virginiana</i>).	Eastern United States, except northern portion.	Leaves oval, smooth, with smooth margin; fruit orange colored, 1 to 1½ inches in diameter, edible in late fall after frost.
72. Eastern redbud (<i>Cercis canadensis</i>).	Eastern United States (south and west of New York.)	Leaves heart-shaped, smooth margin; fruit a pealike pod in clusters of 4 to 8; flowers resembling a small rose-colored sweet pea.
73. Osageorange (<i>Toxylon pomiferum</i>).	Native to Arkansas, eastern Oklahoma, and Texas, but widely planted throughout eastern United States.	Glossy leaves with smooth edges; fruit a heavy ball, resembling an orange, 4 to 5 inches in diameter, milky juice.
74. Sugar maple (<i>Acer saccharum</i>).	Eastern United States to Kansas and Oklahoma.	Leaves 3 to 5 lobed with large rounded teeth; fruit a pair of keys ripening in autumn. Yields maple sugar.
75. Silver maple (<i>Acer saccharinum</i>).	Eastern United States.....	Leaves deeply 5-lobed, with sharp irregular teeth; fruit ripening in spring before appearance of leaves. Yields maple sugar.
76. Red maple (<i>Acer rubrum</i>) ..	.....do.....	Leaves 3 to 5 lobed, finely toothed; reddish fruit ripening 'n spring or early summer. Yields maple sugar.
77. Boxelder (<i>Acer negundo</i> , including 6 varietal forms).	Throughout United States...	Leaves compound, the leaflets toothed; fruit ripening in early summer and remaining on trees during winter.
78. Northern catalpa (<i>Catalpa speciosa</i>).	South Central States, widely cultivated elsewhere.	Leaves large, heart-shaped; fruit a long "pod" filled with flat seeds which are tufted at each end. A better shaped tree than common catalpa (<i>Catalpa bignonioides</i>).
79. Flowering dogwood (<i>Cornus florida</i>).	Eastern United States.....	Leaves mostly clustered at ends of branches, with slightly wavy margins; flowers white with four large bracts resembling petals. Leaves opposite.
80. Pagoda dogwood (<i>Cornus alternifolia</i>).	Northeastern States and Appalachian Mountains.	Leaves resembling those of flowering dogwood, but alternate in arrangement; white flowers without the four large petallike bracts.
81. Honeylocust (<i>Gleditsia triacanthos</i>).	Central States and Minnesota to Texas. Widely cultivated elsewhere.	Leaves doubly-compound, the leaflets with slightly wavy margins; fruit a flat pod a foot or more in length, twisted when dry. Trees with large branching thorns.
82. Black locust (<i>Robinia pseudacacia</i>).	Appalachian region, widely cultivated and naturalized all over United States.	Leaves compound, leaflets with smooth margins; fruit a pod 3 to 4 inches long. Trees with pairs of short thorns at the base of leaves and twigs. Wood heavy and durable in the ground.

One Hundred Eastern Forest Trees—Continued

Name	Distribution	Characteristics
83. Kentucky coffeetree (<i>Gymnocladus dioicus</i>).	Mainly in Ohio and Mississippi Valley.	Leaves doubly compound, the pointed leaflets with entire margins; fruit a large, woody, wide pod, 6 to 10 inches long, 1½ to 2 inches wide containing a greenish jelly, which is poisonous. Trees without thorns.
84. Pecan (<i>Hicoria pecan</i>)	Mississippi Valley	Bud scales few, shell of nut thin, husk wing-ridged, with large cavities; nuts elongated with sweet kernel.
85. Bitternut hickory (<i>Hicoria cordiformis</i>).	Eastern United States	Nut broader than long, without angles, very thin shelled; bitter kernel, husk thin.
86. Water hickory (<i>Hicoria aquatica</i>).	Gulf States and Lower Mississippi Valley.	Nut broad, with bitter kernel.
87. Shagbark hickory (<i>Hicoria ovata</i>).	Eastern United States exclusive of southern coastal region.	Buds with many scales (all of the preceding hickories have buds with few scales); bark loosening from trees in shaggy strips.
88. Shellbark hickory (<i>Hicoria laciniosa</i>).	Eastern United States, exclusive of New England.	Leaves large; large, angled, thick-shelled nuts with thick husks splitting to the base; bark shaggy.
89. Mockernut hickory (<i>Hicoria alba</i>). (Known also as bigbud or white hickory.)	Eastern United States	Leaves large, hairy; buds large, bud-scales many; bark closely furrowed, not separating from the trunk. Nut with thick husk, large, angled, thick-shelled.
90. Pignut hickory (<i>Hicoria glabra</i>).	.....do.....	Leaves small, smooth; fruit abruptly tapering at base to thick stem (resembling a small fig); husk barely splitting at top end and usually retaining the nut.
91. Black walnut (<i>Juglans nigra</i>).	.....do.....	Leaves compound with toothed edges; spherical fruit growing singly or in pairs; bark brown, furrowed.
92. Butternut (<i>Juglans cinerea</i>)	.....do.....	Leaves compound, with toothed edges; fruit in hanging clusters of 3 to 5, pointed and elongated, with viscid hairs when young. Velvety cushion just above leaf-scar; bark gray and smooth on young trees.
93. White ash (<i>Fraxinus americana</i>).	.....do.....	Smooth twigs, opposite; leaves compound, leaflets toothed or wavy on the margins and paler beneath; seed with a plump, well-rounded body and a wing extending almost entirely from the end and borne in dense clusters. High-ground tree.
94. Red ash (<i>Fraxinus pennsylvanica</i>).	.....do.....	Differs from white ash in having young twigs and leaflets (beneath) velvety; and wing of seed extending down along sides of seed body, which is narrow. A low-ground tree.
95. Green ash (<i>Fraxinus pennsylvanica lanceolata</i>).	Eastern United States; west in the Rocky Mountain region.	Like the preceding, except twigs are smooth, leaflets sharply toothed; body of seed and pointed wing very narrow. Low-ground tree.

One Hundred Eastern Forest Trees—Continued

Name	Distribution	Characteristics
96. Pumpkin ash (<i>Fraxinus profunda</i>).	Scattered, mostly east of the Mississippi River.	Resembling red ash, but seeds are very much larger, sometimes twice the size. Swamp tree.
97. Black ash (<i>Fraxinus nigra</i>).	Northern and Lake States..	Leaflets stemless, finely toothed, 7 to 11; seeds with a flat, wide wing, which extends conspicuously down the sides of the seed body and is blunt. Swamp tree.
98. Carolina ash (<i>Fraxinus caroliniana</i>).	Southeastern States.....	Leaflets oval-elongated, barely pointed; seeds with a very broad, short-pointed wing. Swamp tree, often on inundated river swamps.
99. Ohio buckeye (<i>Aesculus glabra</i>).	Ohio and Mississippi Valleys.	Leaves palmately compound like horsechestnut; fruit knobby, prickly, spherical. Small tree.
100. Yellow buckeye (<i>Aesculus octandra</i>).	.....do.....	Leaves resembling the preceding, but fruit smooth. Large tree (90 feet high).