

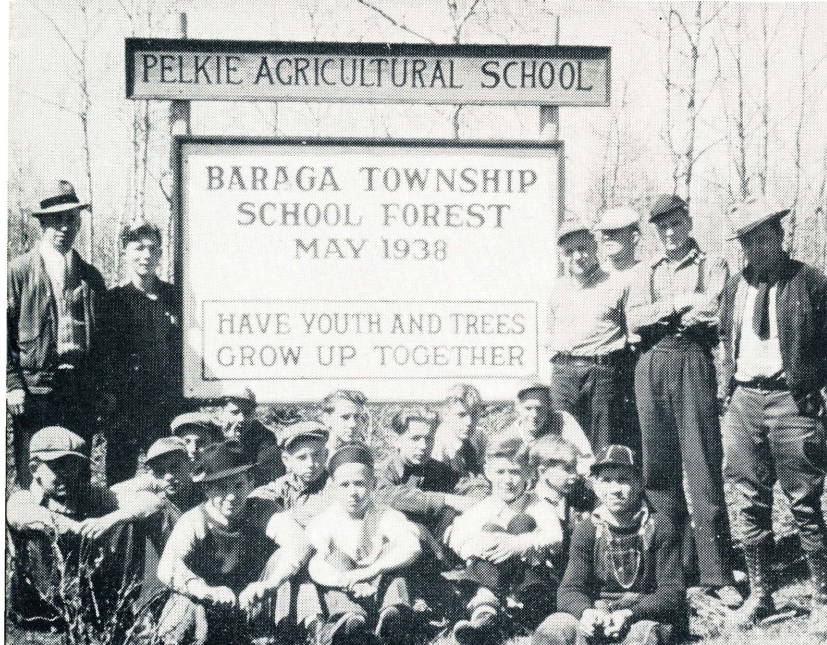
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Forest Planter's Handbook Michigan 4H Forest Rangers
Michigan State University Cooperative Extension Service
4-H Club Bulletin
W. Ira Bull, Extension Forester
Issued May, 1940
32 pages

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Baraga 4-H Forest Ranger Club

CLUB
BULLETIN 19
(First Revision)

MAY 1940

MICHIGAN 4-H FOREST RANGER CLUB

(First Year Project)

MICHIGAN STATE COLLEGE :: EXTENSION DIVISION

EAST LANSING

Cooperative Extension Work in Agriculture and Home Economics,
Extension Service, Michigan State College and the U. S.
Department of Agriculture Cooperating.

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Michigan 4-H Forest Ranger Club

W. IRA BULL
EXTENSION FORESTER

The natural resources of our country and our state can be divided into two broad classifications: renewable and non-renewable resources. The non-renewable resources such as iron, coal, oil and copper are found under the surface of the earth. These minerals cannot be replaced by man but the supply will last longer if they are used wisely.

The renewable resources of soil, forests, water, birds, animals and fish can be conserved by man if proper management is applied. The most important of these resources are soil and forests. All human life, plants, animals and birds depend on the soil. Forests will conserve soil, produce wood products necessary for human life, provide food and cover for animals and birds—also regulate the flow of water in our streams and rivers. Forests and forest tree planting beautify the country, thus making it more attractive to those who seek outdoor recreation.

Forestry is a very important part of the land-use program in Michigan. According to the 1935 census report, only half the land area of the state's 18,459,922 acres is developed for agriculture. Most of the remaining acres is forest land that should be devoted to conservation development of which forestry is the basis. It is the duty of every 4-H club member to help protect this land from fire and to aid in developing it for the health, wealth and happiness of the present and future generations.

This forest conservation program offered to young people of Michigan will include many activities under the three main phases of forest land use: timber growing, wildlife culture and recreation. The project is designed to meet the needs of all groups of young people in the state who want to learn how to conserve and rebuild our natural resources. It may be used for summer clubs, winter clubs or the program can be continued through the entire year.

DUTIES OF LEADER

The leader of a 4-H Forest Ranger club should perform the following duties:

1. Assist the club members to organize and elect officers and see that meetings are conducted in regular parliamentary form.
2. Give a list of the club members to the county agricultural agent or club agent.
3. Assist club members in arranging for field trips and lectures.
4. Attend all club meetings, field trips and lectures.
5. Assist club members to complete the required activities.
6. Assist club members in getting necessary reference material for meetings.
7. Assign topics to club members to report on at club meetings.
8. See that club members complete their required work by achievement day, and send all stories of the year's work to the county agricultural agent or club agent.
9. Assist club members in designing and making exhibits for county or local fairs.
10. Assist in gathering material for and training demonstration teams.
11. Perform all other duties that should be done by a good 4-H club leader.
12. The calendar of activities is provided to assist the club leader in planning subject matter for meetings in order to give the members a well rounded forestry and conservation training. Other activities of local importance not mentioned in the calendar can be incorporated in the program.

REQUIREMENTS FOR BOYS AND GIRLS 4-H FOREST RANGER CLUB

1. Boys and girls between the ages of 12 and 20 can be members of a 4-H Forest Ranger Club.
2. Each member should follow the suggested program and complete the following activities:
 - (a) Complete at least one of the tree planting activities suggested in the calendar of activities under April or May.
 - (b) Learn to identify 20 forest trees. Collect, press and mount leaves of at least 20 trees for a club exhibit, or each club member may collect and prepare leaves for individual exhibits.
 - (c) Collect forest tree seeds to plant in a nursery next spring.
 - (d) Each member should determine the survival of trees that he planted, listing the number of trees living and number dead.
 - (e) Each member should attend and report at least two lectures on conservation or field trips taken.
 - (f) A suggested activity for Forest Rangers who are members of a handicraft club: During the four years of forestry club work the following items may be made by each club member; a forest fire prevention sign, a forest tree seedling planting tray, a bird house and a bird feed shelter or any other item suggested in Club Bulletin 29, "Conservation Program for Michigan 4-H Clubs". (The club leader may require this activity if he deems it desirable.)

- (g) On achievement day the club leaf collection or individual leaf collections should be exhibited.
Design an original educational exhibit pertaining to forest conservation.
Display items that have been made under suggested activity (f).
- (h) Write a story of the year's work including the following points:
Kind of forest tree seedlings planted.
Age of planting stock.
Where trees were planted.
Number of seedlings planted; and spacing.
Method of ground preparation; and setting seedlings.
Number of seedlings living after the first summer.
Name the kinds of tree leaves collected, tell how they were dried, pressed and mounted.
Make a brief outline of the field trips taken or of lectures heard, giving name of speaker and his subject.

SCHOOL AND COMMUNITY FORESTS

A school forest is a tract of land that has been acquired by the directors of a school district for the purpose of practicing forestry and other conservation activities. It is an outdoor laboratory for teaching biology, nature study and conservation to school pupils in order to give them a greater appreciation of their natural surroundings. It offers young people an opportunity to do some constructive work



Fig. 1. Recreation on the Felch School Forest, Dickinson County.

toward rebuilding the natural resources of the state. They can be given actual training in practical forestry by growing, planting, protecting and improving forest trees, also surveying, measuring and marketing timber.

Young people can practice the culture and management of wild animal, bird and fish. They can learn to appreciate wholesome recreation out-of-doors, also to plan and build recreational areas that can be enjoyed by others.

Community forests may be owned by counties, townships or municipalities. They offer an opportunity for all organized groups of both young and older people to practice forestry, wildlife conservation, and recreation development.

Authorization for Community Forests

Authorization for the Michigan Conservation Department to sell land to counties, townships, municipalities and school districts for forestry purposes is given under Act No. 217 of Public Acts of 1931. This law also suggests that a commission of three members may be appointed by the legislative body of the community to manage the forest. Only one member of the community legislative body can be appointed to the forestry commission.

How Land is Acquired

Schools and communities can obtain land by gift, purchase, or long-term lease. In the cut-over areas of the state, lumber companies and mining companies are frequently glad to give, or lease or sell land for a small purchase price to schools and communities.

State land not included in the boundaries of state forests, parks and wildlife refuges can be obtained by schools and communities for a nominal charge from the Conservation Department. The local conservation officer will assist in locating a tract of state land suitable for forestry purposes. A request for the land, giving correct legal description, should be filed with the Land Division of the Michigan Conservation Department. The division will present the land purchase proposal to the Conservation Commission.

At the present time there are about 125 school and community forests, containing approximately 11,500 acres of land.

Who Owns Land?

State land deeded to a school or community becomes the property of the school district or political subdivision, but when it ceases to be used for forestry or conservation purposes it will revert to the state. State land cannot be deeded to organized groups such as Boy Scouts, 4-H clubs, or service clubs.



Fig. 2. The North Lake School Forest, Marquette County.

Where State Land is Available

Practically all state land available for school and community forests is located north of a line between Bay City and Muskegon.

Forest Tree Seedlings for School and Community Forests

In the past, the Forestry Division of the Michigan Conservation Department has given from 1,000 to 5,000 forest tree seedlings a year to schools and communities to plant on their forests. In order to qualify for free trees, the land to be planted must be in public ownership. It is anticipated that this policy of free trees for school forests will continue but the number given may vary from year to year. Free trees cannot be obtained to plant on land owned by organized groups such as Boy Scouts, 4-H clubs, or service clubs.

Forest tree seedlings can be purchased from the Forestry Department of the Michigan State College and from private nurseries.

CALENDAR OF ACTIVITIES

MARCH

Organization of 4-H Forest Ranger Summer Clubs.

Give a brief outline of forestry club program to new members.

ACTIVITY

Make a planting tray to carry seedlings.

Visit a deer yard with the local conservation officer to see how these animals have lived through the winter. If the ground is covered with snow, this trip should be taken in April.

TOPICS FOR DISCUSSION

1. What kind of forest tree seedlings should be planted on the home farm or the school forest? Consider the following factors: soil fertility, soil texture, soil moisture, ground cover (trees, shrubs or grass), and direction of slope, if ground is not level.
2. Is ground preparation such as furrowing or "scalping" necessary and why?
3. Discuss planting a windbreak to protect the farm home, a field or orchard. On which side, or sides of the field, orchard or home should the windbreak be planted? How far should the trees be planted from the buildings? What species and age of planting stock should be used? How many rows are necessary? What spacing should be used?
4. Which of the following trees are most satisfactory for shade trees and why? Sugar maple, red maple, Norway maple, silver maple, American elm, Chinese elm, red oak, pin oak, white oak, Carolina poplar, yellow poplar.

APRIL OR MAY

ACTIVITY

A tree planting demonstration should be given by the extension forester, forest officer, conservation officer, county agricultural agent or club agent.

Select one of the following planting activities:

- (1) Plant 500 seedlings on the home farm.
- (2) Plant a windbreak of 100 transplants.
- (3) Help to plant not fewer than 1,000 seedlings on the school forest when scalping is necessary.
- (4) Help to plant not fewer than 2,000 seedlings on the school forest in furrows.
- (5) Transplant two native broad-leaved trees, not less than 6 feet high, from openings in the woods to the lawn, along the lane or on the roadside near home.
- (6) Transplant one broad-leaved tree not less than 10 feet high for each club member from openings in the woods to the school yard, church yard or township hall.

When trees are planted on the school forest land, one or two club members can be assigned one or more rows to plant. The rows should be numbered or marked in such a way that they can be identified with the planters after the September checkup. Each member can be credited with the survival of the trees he planted.

TOPICS FOR DISCUSSION

- (1) Illustrate the proper method of planting forest tree seedlings by a diagram made on a blackboard or a large sheet of paper.
- (2) What are the differences between evergreens and broad-leaved trees in leaves; the way seed is produced; texture of wood and structure of wood?
- (3) Give several reasons why evergreens are used more for reforestation purposes than broad-leaved trees.
- (4) What is the difference between a transplant and a seedling?
- (5) Why are transplants more desirable for windbreak plantings?

MAY OR JUNE

ACTIVITY

A field trip to see forest fire detection and suppression equipment at a fire tower or conservation department headquarters.

A lecture or motion picture on fire prevention given by a Conservation Officer or a Forest Ranger.

TOPICS FOR DISCUSSION

- (1) What is the usual causes and effects of forest and grass fires?
- (2) What form of preventative measures are usually applied?
- (3) Discuss the field fire organization of the state.
- (4) Discuss the method of detecting and reporting fires.
- (5) Discuss the methods used in suppressing fires.

JUNE OR JULY

ACTIVITY

A tree identification trip. Learn to identify 20 native trees. Collect the leaves of these trees to be pressed and mounted for the leaf exhibit. The leaves can be easily carried between the sheets of paper in a loose leaf notebook.

TOPICS FOR DISCUSSION

- (1) Describe the difference in the needles of white pine, red pine, jack pine, hemlock, balsam fir, spruce and tamarack. Number in cluster, color, length and shape.
- (2) Discuss simple and compound leaves.
- (3) Discuss the difference in the leaves of the following trees, red maple and sugar maple, white oak and black oak, white ash and black ash, trembling aspen and largetooth aspen, basswood and yellow poplar, slippery elm and American elm, black walnut and butternut, beech and birch, wild black cherry and choke cherry or pin cherry.

JULY OR AUGUST

ACTIVITY

- (1) A hike in the woods, review tree identification. Take food along to cook over an open fire. Learn how to build a campfire with no danger of starting a forest fire. Build the fire near a lake or a stream where it can be put out with water before leaving. If the fire hazard is too great, go to a state or township park for supper.

- (2) Tell stories and sing 4-H club songs around the campfire.
- (3) Summer club members make a birdhouse, a feeding shelter for song birds or a forest fire prevention sign.

SEPTEMBER

ACTIVITY

- (1) Count the survival of forest tree seedlings that were planted last spring on the home farm or on the school forest land. Each club member should report to the club leader the number of trees living and the number dead in the trees that he planted.
- (2) Collect forest tree seeds and store them over winter so they will be in good condition to plant next spring.

- (3) Summer clubs should end this month, and winter clubs should be organized.
- (4) Prepare a club exhibit for the local fair using articles made, and material collected by the club members or make an original exhibit pertaining to some phase of forest conservation.
- (5) Winter club members should make leaf collection this month.

TOPICS FOR DISCUSSION

- (1) What percentage of planted trees are living? If survival is less than 60%, replanting will be necessary.
- (2) Determine the reason for losses.
 - (a) Dry weather
 - (b) Excessive heat
 - (c) Careless planting
 - (d) Trees not well suited to planting site
 - (e) Grass and weed competition
- (3) If it is necessary to replant, how many trees will be needed and what species should be used?

OCTOBER

ACTIVITY

- (1) Invite the local conservation officer to discuss the game laws with the club members.
- (2) Make a wildlife census of a farm where one of the club members lives or in the school forest. Keep a record of the number and kinds of birds and animals seen. See the local conservation officer for information on census taking.
- (3) If they were not gathered last month, leaves for the achievement day exhibit should be collected early this month by winter club members.
- (4) Forest tree seeds, if not gathered last month, should be collected now.

NOVEMBER

ACTIVITY

- (1) A hike to the woods to identify 10 trees and shrubs that have fleshy fruit for wild bird and animal feed.

TOPICS FOR DISCUSSION

- (1) What do the following birds and animals eat during the winter: squirrels, rabbits, deer, grouse, pheasant, bear, beaver and muskrat.

DECEMBER

ACTIVITY

- (1) Treat pine cones with chemicals to cause them to burn with a colored flame or dip the cones in paint for Christmas decorations. Sell the cones or give them to friends for Christmas presents.

TOPICS FOR DISCUSSION

- (1) In what country did the Christmas tree custom originate?
- (2) Have the club members report on how girls and boys observe Christmas in other countries and how they use Christmas trees and greens.
- (3) Discuss the kinds of trees and shrubs that are used for Christmas trees and greens.

JANUARY

ACTIVITY

- (1) Make a germination test of seed collected by cutting a given number of seeds and keeping account of the good ones or by planting seeds in a box and count the number that germinate.
- (2) Build a feeding shelter for song birds, place it near your home or in the school yard, keep it supplied with bread crumbs and grain.
- (3) Arrange for the local or district Conservation Officer or Forest Ranger to show moving pictures on conservation at your school.

TOPICS FOR DISCUSSION

Study the following parts of a tree and give their function; crown, leaves, stem, pith, heartwood, sapwood, cambium layer, inner bark, outer bark, roots and root hairs.

FEBRUARY

ACTIVITY

- (1) With the local Conservation Officer, take a snowshoe trip to a deeryard to see how these animals live in the winter.
- (2) Arrange with the county agricultural agent or club agent to have the extension forester give an illustrated lecture on growing and planting forest tree seedlings.

TOPICS FOR DISCUSSION

- (1) How many cubic feet in a standard cord?
- (2) How many stove cords in a standard cord?
- (3) Discuss the relative fuel value of a cord of the different kinds of wood as compared to that of a ton of coal.

WHERE TREES SHOULD BE PLANTED

Light very sandy soils, blow sand, grazed woodlands, eroded hillsides and small stony or rough patches not suited to agriculture are good places to plant trees. Land of this type that cannot be profitably farmed will grow a valuable crop of timber if it is planted with the right kind of trees. Almost every farm has a "thin" woods, a field with poor soil, or some rough patches that should not be farmed.

Why Plant Trees?

Tree planting is the best use that can be made of non-agricultural land. Planted land will increase in value every year; thus it will soon carry its part of the tax burden of the farm. Eroded hillsides should



Fig. 3. This hillside and gully should be planted with trees.

be planted to save the little topsoil that is left and to prevent subsoil from washing down on a field that is being farmed. Blow sand and light very sandy soils should be planted. Many good fields have been destroyed or covered by blowing sand. Growing useful products on land not suited to agriculture and using every acre on the farm for the crop to which it is best suited is a worthwhile purpose.

A windbreak on the north and west sides of buildings will make the home more comfortable in winter. Wind erosion and excessive drying of the soil can be prevented by planting trees on the west, or south and west sides of a field.

Size and Age of Planting Stock

Forest trees are grown to various sizes and ages, depending on the kind of trees and the place where they are to be planted. Jack and Scotch pine seedlings are nearly always planted at two years of age. Two- and three-year-old seedlings of white pine, red pine, and spruce are commonly used for reforestation. Seedling ages are indicated in this manner, 2-0, 3-0. The figure 2-0 means two years in the original seedbed and the seedlings have not been transplanted; 3-0 means three years in the seedbed.

Transplanted trees are most desirable for blow sand, sandy soil and windbreak plantings. They are one- or two-year-old seedlings that have been lifted from the seedbed, root-pruned and planted again in rows about 2 by 6 inches apart. They are left in the transplant row for one or two years, depending on the age of stock desired. The age of these trees is indicated thus, 2-1 or 2-2. The figures 2-1 mean two

years in the original seedbed and one year in the transplant row. The bushy root and large stem diameter of a transplant give it the ability to live and grow faster through adverse conditions than seedlings. Transplants would be excellent to use for reforestation but they are too expensive to use on large plantings.

WHERE SEEDLINGS CAN BE PURCHASED

Trees for forest planting including windbreaks and Christmas tree plantations can be obtained at a nominal cost from the Forestry Department of Michigan State College, East Lansing; the Forestry Division of the Michigan Conservation Department, Lansing, and from private nurseries.

Order blanks can be obtained from your county agricultural agent or by writing to the Extension Forester at the college or the State Forester in the Conservation Department.

Mixed and Pure Planting

A pure forest is one containing only one species of trees. A mixed forest contains several kinds of trees. Nature seldom plants trees in pure stands, therefore, it is well to follow this example and mix plantations. That can be done by planting one row of a kind and the second



Fig. 4. 2-0 seedlings, 3-0 seedlings, 2-2 transplants.

Products in Approximate Number of Years	Blow Sand	Sand	Sand Loam	Clay	Wet Soils
Christmas trees 8-10 years.	Scotch pine Jack pine		Norway spruce Douglas fir *Red pine	White spruce	Black spruce Balsam fir
Fuel** 20 years or more	Scotch pine Jack pine		Red pine Ash Red oak Sugar maple		Elm
Posts 20-50 years.			Black walnut Black locust Japanese larch		Tamarack White cedar
Pulpwood 30-60 years.	Jack pine		Red pine	Norway spruce White spruce	Black spruce Balsam fir
Ties 50-80 years.	Jack pine		White oak Red oak Maple Beech		Cedar Elm
Lumber 50-100 years.	Jack pine Scotch pine		Red pine White pine White ash Red oak White oak Basswood Yellow poplar Sugar maple		Elm Hemlock

*Only a small number of pines can be sold for Christmas trees at the present but there may be more demand for pines 10 years from now.

**Thinnings from all kinds of timber used for fuel.

row of another species or by planting two or three rows of one kind and the same number of rows of another variety. These two methods can be used when two or three varieties are well suited to the planting site. Plantations are usually mixed by blocks, giving most thought to the trees best suited to various parts of the planting site. In a field containing a hill sloping south and level land, a more hardy variety of tree should be planted on the hill than on the flat land because a south slope is usually dry and hot. The sun's rays strike the hillside more directly than level land. Jack, Scotch, or red pine could be planted on the hill but the flat land may be suitable for spruce, white pine, and hardwoods.

Spacing

There is no definite rule for spacing evergreen trees but the general recommendation for Michigan is about 1,000 trees to the acre, based on a spacing of 6 x 7 feet. Close spacing will cause the trees to crowd at an early age and the lower branches on the trees will die from lack of light. Wider spacing is not objectionable if the owner plans to prune the lower limbs off the larger, faster growing trees.

Christmas trees can be spaced closer together than forest trees because it is anticipated that most of them will be harvested in 8 to 10 years, thus a spacing of 5 x 5 feet is recommended. Some plantation owners plant pine and spruce alternately in the rows with the anticipation of cutting the spruce for Christmas trees. A 6 x 7 spacing is recommended for that type of planting. The trees should not be spaced closer because the pine will likely grow faster than the spruce and the owner may not get more than half the Christmas trees out before they are crowded severely or over-topped by the pine. After the spruce is removed the lower limbs should be pruned from half the remaining pine trees.

TABLE OF SPACING

Feet Apart	No. of Trees	Feet Apart	No. of Trees
4 x 4.....	2,722	7 x 7.....	881
5 x 5.....	1,742	8 x 8.....	680
6 x 6.....	1,210	9 x 9.....	537
6 x 7.....	1,037	10 x 10.....	435

Spring is the Best Time for Planting

Spring is the most favorable time to plant trees in all sections of the state. Fall planting is fairly successful north of a line between Bay City and Muskegon but it is not recommended south of that line.

FOREST PLANTING AND WILDLIFE

When planning a plantation, considerable thought should be given to the welfare of birds and animals that are living in or are likely to live in the area. It must be remembered that pine trees provide very little food, but they will give excellent cover for the first 25 or 30 years. After that age the cover value decreases each year because the lower limbs die and gradually fall off, leaving open ground with no undergrowth. It is not wise to plant a large area of land solid with pine. Openings should be left in the plantation where trees and shrubs are growing that will provide food for birds and animals. Food species can be planted on the borders of evergreen plantations. Small wet areas are difficult to plant with evergreens and these areas usually contain an abundant supply of food plants. If the wet spot is partially or entirely surrounded with evergreen planting it is advisable to leave the wet area unplanted. When planning open spaces for permanent wildlife food areas, reference should be made to pages 14 and 15 of Club Bulletin 46 "4-H PHEASANT PROPAGATION AND MANAGEMENT" where a list of native shrubs and vines that supply food for small game can be found.

Ground Preparation Before Planting

It is well known that newly planted seedlings cannot compete with grass and other herbaceous growth for soil moisture. This does not mean that the field to be planted should be cultivated as though a farm crop were being planted, but it is necessary to clear a small patch of ground of existing vegetation where the tree is to be planted. This is done by plowing shallow furrows about 6 feet apart and deep enough to remove roots of the vegetation. The furrows can be plowed any time before planting but it is best to do this work in the fall preceding spring planting. Where it is not practical to plow furrows, a "scalp" about 18 inches square should be made by using a shovel or mattock to peel off a slice of sod and the tree planted in the center of the "scalp". As a rule "scalping" is not as good a ground preparation as furrowing because "scalps" are usually not deep enough to remove all the vegetation roots.

With the "scalping" method of ground preparation, it is necessary to use guide stakes to make reasonably straight rows. Two stakes should be placed in each row to be planted with trees—one stake at the end of the row and the second about 50 or 75 feet from the end, placed on the line between the "scalper" and the end stake. (See Fig. 6.) A



Fig. 5. Furrows for planting trees.

white cloth should be tied on each stake so it will be easy to see. The "scalper" keeps in line with these two stakes as he works down the row. Stakes for the second row should be set in the same manner but at the opposite end of the field. After the first row has been planted the stakes can be moved to the third row. A measuring stick should be used to set the stakes in the third row.

On school forest plantings where eight or ten people are "scalping" it is frequently not practical to place guide stakes in every row. In that case, guide stakes should be placed for the first "scalper". The second man should work along one "scalp" behind the first man and with a stick measure the distance from the first row to his row before making each "scalp". The third man should stay one "scalp" behind the second man. Each additional man should work along one "scalp" behind the man next to him toward the guide line. If 10 people are "scalping," the last man will not start to work until the first man has made at least ten "scalps".

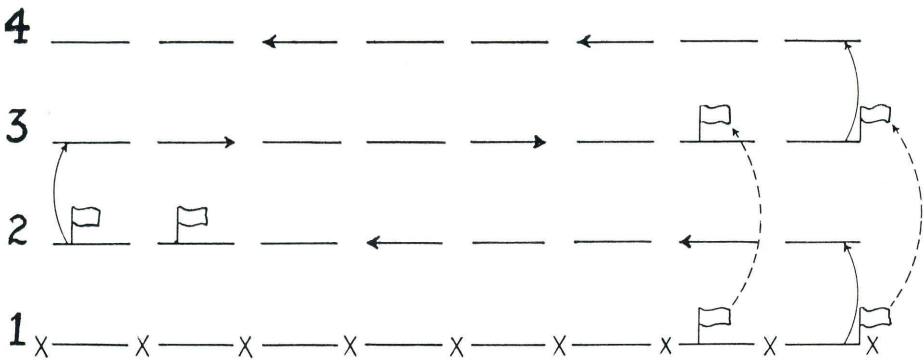


Fig. 6. Method of lining and spacing rows with flags. Dotted arrow lines show placing of flags. Solid arrow lines show direction of planting.

CARE OF TREES BEFORE PLANTING

Before leaving the nursery, the seedlings are tied in bundles of 50 to 100 trees each, and packed with wet moss in crates or burlap rolls so the roots will remain damp until the trees have arrived at their destination. Seedlings are usually shipped by express so they will travel fast and they are not likely to "heat" before they reach their destination. If the trees are not planted immediately after they are delivered from the express office, they should be heeled-in so as to keep in good condition until they are planted.

For heeling-in trees a V-shaped trench having one side sloping more than the other should be dug. The strings fastening the bundles should

be cut and the trees spread out along the trench. The roots should be covered with moist earth and tramped until the ground is well packed, thus excluding excess air from the roots.

PLANTING METHODS

There are two methods of planting in Michigan—the slit and the deep hole method. The slit method is ordinarily used in setting two- and three-year-old seedlings in sand and loam soils. The tools used for this method of planting are spade, shovel and Michigan planting bar.

The deep hole method is best for planting large three-year-old seedlings and transplants in loam and clay soils. This type of hole is made with a mattock or grub hoe and it has one straight side that the tree can be planted against.

When setting the tree in either the slit or the deep hole, the opening should be deep enough so the roots will extend straight down in the ground and not be curled up in the bottom of the hole. Proper heights



Fig. 7. Heeling-in trees.



Fig. 8. Tools used in planting trees.

of planting the seedling can be easily gauged by holding the little tree between the first and second fingers with the palm of the hand up and the fingers clamping the tree at the ground line where it stood in the nursery. Place the roots of the tree in the hole or slit allowing them to spread naturally, continue holding the tree with the fingers with the back of the hand against the surface of the ground until the slit is closed or the hole nearly filled with dirt. Holding the trees in this manner while planting is important in order to have all of them planted the proper depths.

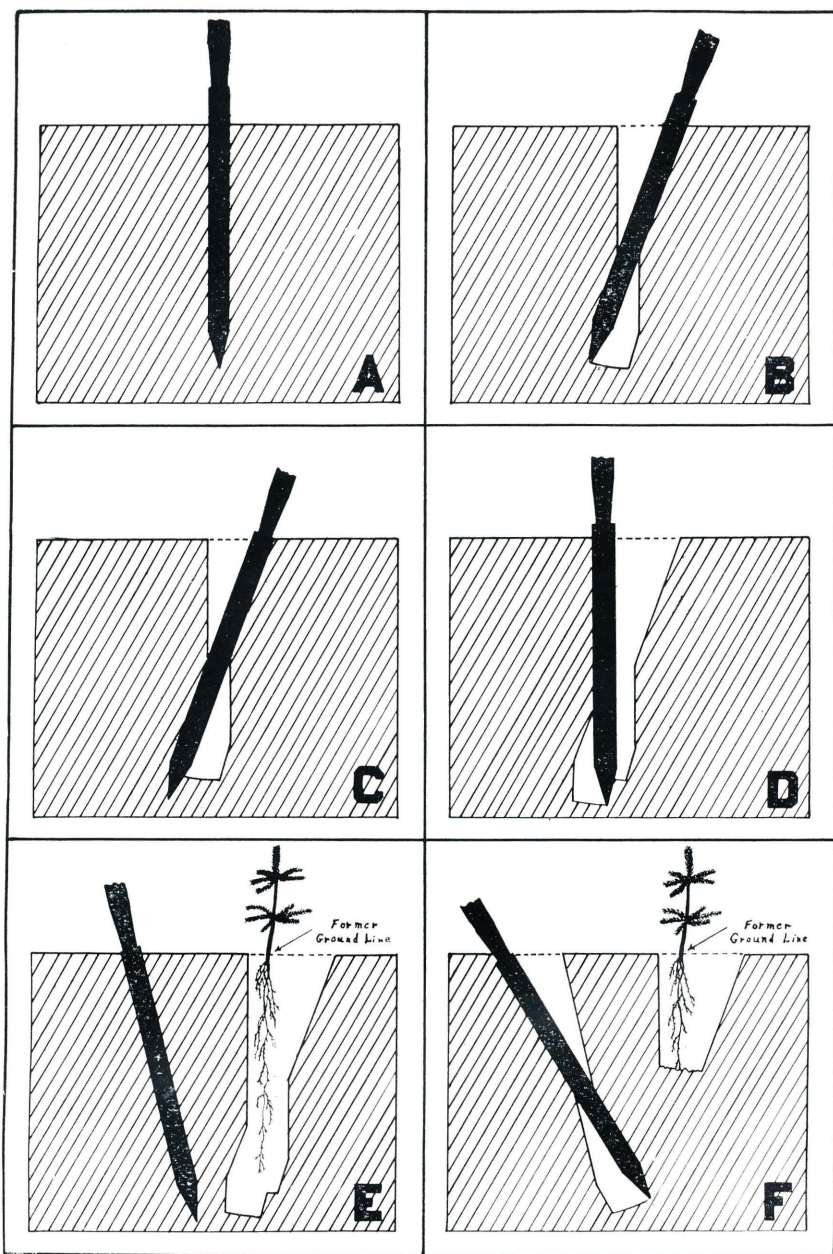


Fig. 9. Procedure in planting by the slit method. (a) The tool is driven straight into the ground. (b) Tool is pushed forward to the extent of the arm. (c) Tool pushed deeper in the ground for a new leverage. (d) Tool pulled back to a vertical position. (e) Seedling placed in slit with roots well spread. Tool driven into ground behind newly placed tree. (f) Tool pulled toward planter to close bottom of slit. Tool pushed away from planter to close top of the slit. Ground is firmed well with planter's heel.

Care of Plantation

Forest trees require very little care after the plantation has been successfully established. A successful planting means 60% of the planted trees should be living, and they should be well distributed over the area. A careful inspection should be made every year for the first three or four years to count the survival of trees and to determine that grass and weeds are not encroaching. Heavy grass and weed growth should be hoed away from the trees. The trees must also be protected against fire, insects, disease, and grazing animals. The best method of fire protection is to keep a close watch to see that no fires start near the plantation, and enlist the cooperation of neighbors to use care when burning brush and other refuse. Grazing animals can be excluded from the plantation by a fence but fencing is not necessary unless cattle or sheep have easy access to the plantation.

Insects and disease may injure the trees, but the subject is too broad to discuss in this bulletin. The normal precaution is to watch the planting carefully to observe that no trees or parts of trees are dying or being defoliated. For identification of the insect or disease damage send a branch showing disease or an insect found working on the trees to the Forestry Department of the Michigan State College, East Lansing.



Fig. 10. The hole method of planting.



Fig. 11. Pruning red and white pine in the Negaunee School Forest.

White pine is subject to a disease called the white pine blister rust which spends part of its life on currants and gooseberries. For that reason, white pine should not be planted within 1,000 feet of wild currant and gooseberry or one-half mile from cultivated black currants. If the currant and gooseberry bushes are removed, white pine can be planted with safety.

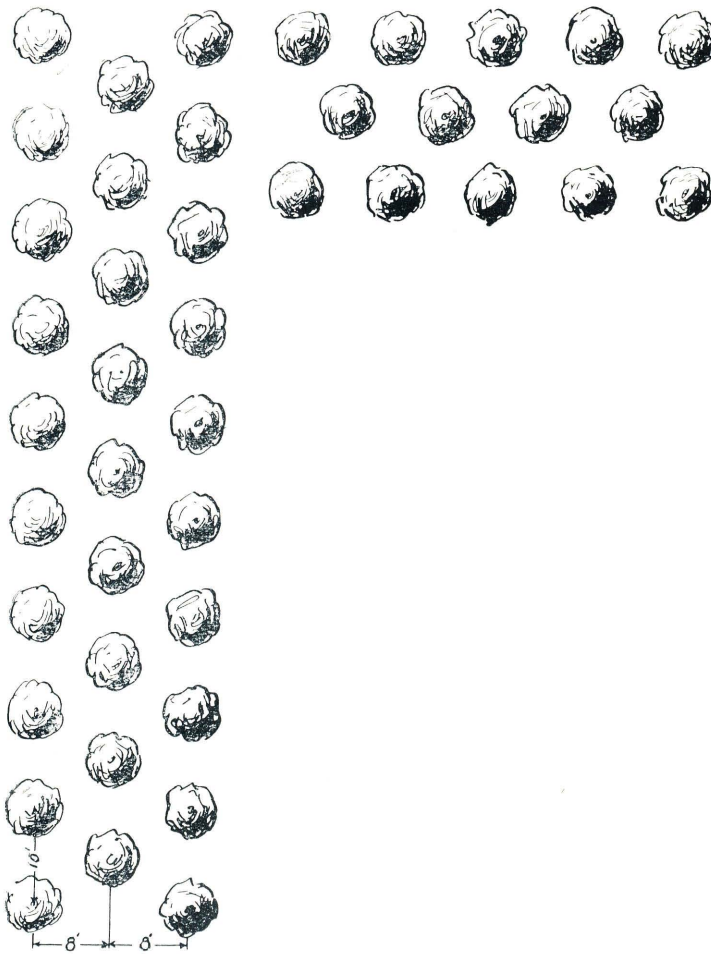
When the trees grow larger, pruning of the lower limbs may be necessary. Even with 6 x 7 feet spacing, the trees will grow limbs $\frac{3}{4}$ inch in diameter. After these limbs die it will be 15 to 25 years before they decay and fall to the ground. It is, therefore, desirable to prune the largest trees, or about $\frac{1}{4}$ the number of trees in the planting to clear the bolls of the dominate trees of limbs while they are still small in diameter. Dead limbs make blackknots in the wood as the tree grows larger. Blackknots are a more serious defect in lumber than knots made from live limbs. Pruning is usually not started until the trees are 15 to 20 feet tall because at that height the limbs can be cleared from 6 feet of the boll without reducing more than half the green leaf area of the tree.

PLANNING A WINDBREAK

Before planting the trees a careful study should be made of the general arrangement of the farm buildings so the windbreak can be planted where it will give some protection to all buildings. To get the



Fig. 12. A windbreak will protect the home or a field.



*Fig. 13. An L-shaped windbreak.



*Fig. 13a. A belt planting.

maximum benefit from a windbreak, it should be planted about 75 to 100 feet from the buildings; this will also allow adequate room for the snow to drift behind the trees without causing inconvenience. The prevailing winds in Michigan blow from the west so the windbreak should be planted on the west or north and west sides of the building. An L-shaped windbreak is more effective than a straight line of trees because a northwest wind will blow around the end of trees unless they are planted well beyond the buildings. To protect a field or orchard, a belt containing two rows of trees on the west side of the field is usually satisfactory.

*From "Windbreaks for Illinois Farmsteads," by J. E. Davis, Illinois Extension Forester

SPACING AND ARRANGEMENT OF ROWS

Windbreak trees should not be spaced closer than 10 feet in the rows and the rows should be planted at least 8 feet apart. Two rows of trees are satisfactory for a windbreak on the edge of a field or orchard but three rows are more effective for home protection. The trees in the second row should be spaced alternately with the trees in the first row.

Kind of Trees to Plant

There are several varieties of trees that are well suited to windbreak plantings: White pine, red pine, Scotch pine, Austrian pine, white cedar, Norway spruce, and white spruce. The trees most commonly used are Norway spruce, white pine, and red pine. Transplants of these species are grown in the college nursery purposely for windbreak plantings. Norway spruce should be used in the southern three-fourths of the lower peninsula and white spruce in the northern part of the state. Spruce and pine make a very good tree combination for a windbreak. Spruce should be planted on the windward side because it usually holds its lower limbs longer than the pine. This will prevent wind from blowing through the windbreak under the tree limbs.

PLANTING SHADE TREES

The transplanting of native hardwood trees is limited because there is a law that prohibits moving trees with the roots attached on the highways unless the trees are inspected by a representative of the Nursery Division of the State Department of Agriculture. This does not prevent trees from being moved from one part of the farm to another.

Kind of Shade Trees to Plant

There are several native trees that are very desirable for shade planting:

American elm
Sugar maple
Red maple
Yellow poplar

Red oak
Pin oak
Sycamore
White ash

Location and Spacing

When planting trees in the lawn or on the school grounds, it is well to remember that they should be planted around the edges of the lawn or yard and not in the middle or close to buildings. If the trees are to be planted in a row, they should be spaced from 40 to 60 feet apart.

American elm should be planted 60 feet apart, it requires the widest spacing of any tree on this list.

After deciding on the location for the trees, holes should be dug about three feet in diameter and two feet deep. The top soil should be placed in a separate pile so it can be used to fill in around the roots.

Selecting and Lifting Trees

When entering the woods, make a careful survey to locate seedling trees that have a single straight stem or leader, which has not been injured. (A seedling is a tree that has grown from a seed and has no connection with the roots of a stump or other trees.) Avoid sprout growth because trees of that origin will not have well developed root systems. Trees growing in opening in the woods will have the best crown development, and they will be easier to lift.

With a square-pointed shovel, dig straight down around the tree about 2 feet from the trunk until the lateral roots are all cut. Then tunnel under the tree, loosening the deeper roots from the earth and leaving a cone-shaped ball of dirt on the roots of the tree. When the tree has been loosened, a hard pull on the stem will usually bring it out of the ground. Lift it carefully to a piece of burlap or an old blanket in order to hold all the dirt that will adhere to the roots. Fold the ends of the burlap or blanket over the roots and tie it around the trunk of the tree. This will help hold the dirt on the roots and will prevent the roots from drying while being moved. The tree should then be carried carefully to the hole where it is to be planted.

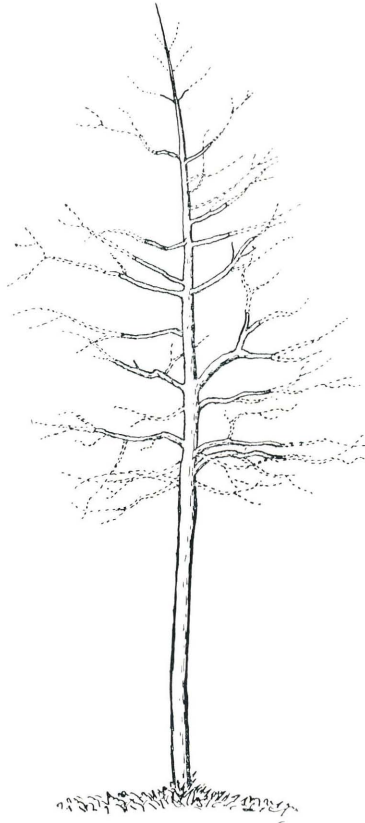
Planting

After opening the burlap or blanket the form of the root can be determined and the shape of the hole changed to accommodate long roots. The hole may be filled in a little if necessary in order to have the tree about 2 inches deeper than it stood in the woods. When the tree is placed in the hole for planting be certain the roots are straight and not curled at the ends. One person should hold the tree while another fills in the top soil and packs it firmly around the roots. When the hole is partly filled with dirt, add three or four pails of water until the ground is well soaked. Fill in the depression with fine soil; no more compacting is necessary.

Pruning

All trees growing in the woods or the field have a balance between the root system and the top. When part of the roots are cut off the tree is out of balance and the top must be trimmed to compensate for loss of root. Top pruning will reduce the demand for moisture, thus

enabling the smaller root system to supply the water needed when the plant starts growth. Usually this means that half the top of the tree should be cut away. With a pruning shears or saw remove as many whole limbs as desirable and cut off the ends of the remaining branches so as not to change the shape of the plant any more than necessary. Do not cut off the top or leader of the tree. The dotted lines in Fig. 14 illustrate the limbs and parts of limbs that should be removed when pruning a tree for transplanting.



*Fig. 14. A tree pruned for transplanting.

Frequently newly transplanted trees are killed by wood borers entering and girdling the tree near the ground. This damage can be prevented by wrapping the stem of the tree from under the ground to the limbs with a crepe paper made for that purpose. If this special paper cannot be procured, heavy wrapping paper cut in strips about 6 inches wide can be used to wrap the trunk of the tree.

*From U.S.D.A. Bulletin 1591, "Transplanting Trees and Shrubs," by Furman Lloyd Mulford, Bureau of Plant Industry.

COLLECTING AND STORING TREE SEEDS

Pine and spruce cones should not be picked from the tree until the seed is ripe. This can usually be determined by the color of the cones. Light brown or purple color is an indication of ripe seed. To make sure the seed is ripe, open a cone to see if the seed is plump brown in color and not milky inside. The time to collect cones usually extends from August 15 to late in October. White spruce and white pine cones ripen early. They must be picked about the time they ripen because the scales will open while the cones are on the tree and the seed will blow away.

Red and Jack pine cones can be picked later in the fall because the cones scales do not open as soon after ripening as the white pine. The easiest way to get pine cones is to pick them from the ground after the squirrels cut them off the trees.

Soon after the cones have been gathered they should be dried by placing them on a sheet or a piece of canvas in the sun. When extracting the seed from a small number of cones it may be easier to put them in a tight cardboard box and place the box behind the kitchen stove to dry. After the scales are open the cones should be pounded lightly to make sure all the seed has been extracted. The seed should be cleaned and stored in a jar in a cool damp place until time for planting. Save the pine cones for Christmas decorations.

Broad-leaved tree seeds such as oak, walnut, hickory, sugar maple and white ash should be stratified over winter to keep them in good condition to plant the next spring. To stratify, the seed should be placed in a box between layers of sand and the box buried in the ground. Well drained soil should be selected and sand or gravel placed in the bottom of the hole so the water will drain away easily. A layer of sand should be placed in the bottom of the box, then a thin layer of seed which will be covered with sand, and another layer of seed until all is stored. Cover the box with sand or straw. The box should be tight so as to prevent access of squirrels and mice.

EXHIBITS

Leaves collected should be pressed and dried immediately following the tree identification trip. Place the leaves between pages of a large book. Be sure each leaf is straight and smooth. Place as much weight on the book as possible to hold the leaves perfectly flat. Let the leaves dry for a month or two before mounting. After the leaves are thoroughly dry, mount them on a piece of cardboard or plywood



Fig. 15. Club leaf and wood section exhibit.

with transparent tape that has glue on one side. A simple leaf can be well fastened with two or three pieces of tape—one or two pieces on the point and one on the stem end of the leaf. A compound leaf, such as white ash, will need two pieces of tape on the midrib and one on the point of each leaflet. Print the name under each leaf.

The bird house, bird feeding shelter, forest tree seedling tray should be left in the natural wood, no finish being necessary. Plans for these articles will be found in the various 4-H club handicraft bulletins.

For a club exhibit at a county or local fair, the members should plan an original exhibit featuring some phase of forest conservation. Figure 15 illustrates some attractive leaf and wood section mountings.

SUGGESTIONS FOR CLUB EXHIBITS

1. Leaves may be mounted in an attractive manner on a heavy piece of cardboard or plywood. A variation from this mounting can be made by placing the seed of the tree alongside the leaf in a cellophane bag or fastened to the board with cellophane tape.

2. Leaf and wood sections can be mounted on pieces of plywood cut in interesting shapes like those shown in Fig. 15.
3. Exhibit articles made by club members under suggested activity (f).
4. Draw a large scale map of the school forest showing the plantings that have been made and the dates. The areas to be devoted to reforestation, recreation and wildlife culture can be illustrated by name or by drawing a tree, a cabin and a bird. Show other interesting physical features on the school forest by drawings or pictures.
5. Draw a map of one of the club members' farm, locating windbreaks for proper wind protection of the home and fields. Locate a forest tree planting and a wildlife food and cover area.
6. Exhibit planted seedlings and transplants of different varieties with two enlarged pictures in the background of well established plantations. Write to the Extension Forester for seedlings.

SUGGESTIONS FOR DEMONSTRATIONS

1. Show how to press, dry and mount leaves of forest trees.
2. Demonstrate the different methods of planting forest tree seedlings. A box with glass in one end can be used to show the root spread of the tree.
3. The effectiveness of a windbreak in controlling wind erosion can be shown by using an electric fan to blow sand out of one tray into another. Place a double row of evergreen boughs to represent windbreak trees across the tray. When the electric fan is turned on again, no sand will move. White cedar boughs are usually best to represent windbreak trees because the foliage is more compact.
4. A tree identification demonstration can be given by comparing the difference in leaves of various trees. It is probably best to show two leaves at a time in the form of contrast such as sugar maple and red maple, white ash and black ash, butternut and black walnut, etc.
5. Transplanting and pruning a native broad-leaved tree can be easily demonstrated.
6. Show how to stratify broad-leaved tree seeds. Tell why it is necessary to stratify these seeds.

FUEL VALUE OF WOOD

Approximate fuel value of one stand cord of air-dry wood compared to the fuel value of a ton of good quality soft coal.

One ton of coal =	Black locust	One cord of wood
	Hickory	
	Oak	
	Ironwood	
	Beech	
	Rock elm	
One ton of coal =	Sugar maple	One—one-half cords of wood
	Birch	
	Slippery elm	
	Tamarack	
	Black cherry	
	Red maple	
One ton of coal =	American elm	Two cords of wood
	Black ash	
	Norway pine	
	Jack pine	
	Spruce	
	Aspen (popple)	
One ton of coal =	Pin cherry	Two cords of wood
	Balsam fir	
	White pine	
	White cedar	

CHEMICALS FOR TREATING CONES

Pine cones may be made to burn with colored flames by impregnating them with salts of certain metals, according to J. H. Herrick of the U. S. Bureau of Chemistry and Soils. Since cones do not readily absorb water solutions, it may be advisable to apply the salt suspended in a solution of resin or turpentine. The following compounds may be used for particular colors:

Red—Strontium chloride
 Green—Barium chloride
 Bluish-green—Copper oxide or copper sulphate
 Orange—Calcium chloride
 Lavender—Potassium chloride
 Yellow—Sodium chloride

REFERENCE MATERIAL

- *Extension Bulletin 147—Forest Planting on Michigan Farms
- Farmers Bulletin 1405, U.S.D.A.—The Windbreak as a Farm Asset
- Farmers Bulletin 1591, U.S.D.A.—Transplanting Trees and Shrubs
- *Club Bulletin 31, M.S.C.—Forest Fire Study for 4-H Clubs
- University of Michigan—"Michigan Trees," by Charles Herbert Otis
- Farmers Bulletin 1123, U.S.D.A.—Growing and Planting of Hardwood Trees on the Farm
- Farmers Bulletin 1453, U.S.D.A.—Growing and Planting of Coniferous Trees on the Farm
- Michigan Conservation Dept.—Winter Feeding Station for Ground Feeding Birds in Michigan
- U. S. Forest Service Poster—How a Tree Grows
- *Club Bulletin 40, M.S.C.—Michigan Deeryard
- *Club Bulletins 11a, 11b, 11c, M.S.C.—Handicraft Club Work
- *Club Bulletin 36, M.S.C.—4-H Pheasant Propagation and Management Project
- U.S.D.A. Misc. Pub. 127—Forest Trees and Forest Regions of the United States
- *Club Bulletin 41, M.S.C.—Soil Conservation Program for 4-H Clubs
- *Club Bulletin 29, M.S.C.—Conservation Program for Michigan 4-H Clubs

*May be obtained from Bulletin Room, Michigan State College, East Lansing.