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W. Ira Ball, Extension Forester  
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# MICHIGAN 4-H FOREST RANGER CLUB

## *Nursery Project*



MICHIGAN STATE COLLEGE :: EXTENSION DIVISION  
EAST LANSING

Michigan State College of Agriculture and Applied Science and U. S. Dept. of Agriculture cooperating, R. J. BALDWIN, DIRECTOR EXTENSION DIVISION, Michigan State College, East Lansing. Printed and distributed under acts of Congress, May 8 and June 30, 1914.

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# MICHIGAN 4-H FOREST RANGER CLUB

## NURSERY PROJECT

*By W. Ira Bull,  
Extension Forester*

All 4-H club members should visit the Hartwick Pines, near Grayling, or the Newton Woods, northeast of Cassopolis, where they will see the beautiful pine and hardwood trees that one time covered most of the land in Michigan. It is difficult to realize that such big trees grew from tiny seeds like those that are gathered to plant in a forest tree nursery.

Every 4-H forest ranger will be anxious to grow some of these little trees when he realizes that millions of them are being grown every year by the United States Forest Service, the Forestry Division of the Conservation Department, and the Forestry Department of the Michigan State College to plant on forest land and other non-agricultural land in Michigan. Club members may help with this great work by growing trees from seed and planting them on their home farm. It is not advisable for club members to grow more seedlings than they can plant at home because the Michigan Insect-pest and Plant Disease Act requires that anyone growing, and desiring to sell any nursery stock in this state, shall apply on or before September 15 each year to the Commissioner of Agriculture for a license. Inspection of all growing nursery stock for sale is required, and applications for inspection must be filed before March 1 each year.

To make this project suitable to all groups of young persons, two options are offered. Individual nurseries may be established for club members who have land at home that should be planted to trees, or a club nursery may be started for boys and girls who do not have land in need of reforestation.

Reforestation includes planting evergreen seedlings and transplants for farm windbreaks and erosion control, as well as for Christmas tree and timber production. Broad-leaved trees, commonly called hardwoods, are planted for erosion control and timber production, and also for food cover for wild animals and birds. Shrubs have no commercial value but are used mainly for erosion control and wildlife food and cover.

Most of the work on this project can be done in one year, but two or three years may be required for completion. One-year-old hardwood seedlings and shrubs may be planted in the field, but evergreens should be two years old before they are moved from the seedbed. At that age they may be transplanted or planted in the field. Nursery care the second year will require only about half the time needed the first. Transplanted trees may be planted in the field the third or fourth year after the nursery project is started.

### DUTIES OF LEADER

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

1. Assistance should be given in organizing the 4-H Ranger Club and electing officers. The leader also should make certain that club meetings are conducted in regular parliamentary form.
2. Prepare a list of members and give it to the county agricultural agent or 4-H 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 in getting necessary reference material for meetings.
6. Make certain that club members get their forest tree seed in time to make a germination test before planting.
7. Make certain that club members complete the required work before achievement day and send the stories of the year's work to the county agricultural agent or 4-H club agent.
8. Assist club members in designing and making exhibits for county and local fairs.
9. Assist in gathering material and subject matter for demonstrations and also help train demonstration teams.
10. Perform all other duties that should be done by a 4-H club leader.

### REQUIRED ACTIVITIES

1. Collect or purchase seed of forest trees and shrubs to plant in a nursery.
2. Make a germination test on the seed and determine how thick it should be sown in the seedbed.
3. Option (a)  
Each club member should plant seeds of evergreen trees, hardwood trees or shrubs in a small nursery containing not less than 12 square feet and grow seedlings large enough to plant in the field.  
Option (b)  
All club members should assist in building and seeding a club nursery containing not less than 45 square feet. Each member should spend at least 4 hours during the year in nursery care, weeding and watering the seedbed.
4. Write a story of the year's work, including the following points:
  - (a) Kind and quantity of tree seed planted.
  - (b) Give a brief description of how the seedbed was made and planted.
  - (c) Describe the problems experienced in nursery care such as weeding, watering, damping-off, bird damage, rodent damage, etc.

## THE YEAR'S PROGRAM

### August and September:

Collect seed of forest trees and shrubs to plant in a nursery in the fall or store over winter for spring planting.

Collecting seed for the club exhibit of seed from 20 different kinds of trees and shrubs should be started in August.

The following seeds ripen the last of August or the first of September: White pine, red pine, white spruce, black spruce, Norway spruce, balsam fir, white ash, sugar maple, basswood, yellow poplar, black cherry, gray dogwood, red-osier dogwood, elder, juniper.

### October:

Finish seed collecting from the trees mentioned under the heading "August and September" by the first of October. The following seed should ripen this month: red pine, Jack pine, white cedar, hickory, oak (all kinds), black locust, honey locust, black walnut, butternut, wild grape, hazelnut, hawthorn, wild rose, sumac, and viburnum.

In upper Michigan a nursery preparation and seeding demonstration should be given this month for the benefit of members who are starting their nursery in the fall. Another demonstration on stratifying seed and storing seed that does not need to be stratified should be given all club members.

Visit the nearest forest tree nursery\* to see how trees are grown from seed and the methods of building seedbeds and sowing seed.

Before the nursery trip the leader should make arrangements for the club members to receive the following instruction:

1. How forest tree seed is extracted and cleaned.
2. How the various kinds of tree and shrub seeds are stored until time for sowing.
3. How and with what implements the land is fitted for forest tree seed sowing.
4. What fertilizer or other materials are added to the soil.
5. How seedbeds are built.
6. Treatment, if any, given the soil for disease or insect control.
7. A demonstration should be given, showing how to sow the seed, cover the seed and mulch the seedbed.
8. See the equipment used for cultivating and weeding seedbeds.
9. Examine the operation of the irrigation system.
10. A tour should be made of the nursery to see the various kinds of trees at all ages.
11. If this nursery trip cannot be taken, arrangements should be made with the 4-H club agent or county agricultural agent for the extension forester to give a nursery building and tree seed sowing demonstration.

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\*The following are the public nurseries in Michigan: Bogue nursery at East Lansing, Dunbar nursery near Sault Ste. Marie, Higgins Lake nursery near Roscommon, Chittenden nursery at Wellston, Beal nursery at Tawas City, Wyman nursery at Manistique, and Toumeay nursery at Watersmeet.

**November:**

Late seed collection of hickory, walnut, locust, oak, sumac, Jack pine, can be made this month. Seed collecting should not be delayed longer, owing to difficulty of finding the seed. A demonstration on preparing and seeding a nursery should be given club members in lower Michigan who are starting their nursery in the fall. Another demonstration on stratifying seed and storing seed that does not need to be stratified should be given all club members.

**December:**

Pine and spruce cones from which seed has been extracted should be used for Christmas decorations. Cones painted or dipped in a coloring solution make attractive decorations as clusters or with evergreen boughs.

Treat pine cones with chemicals to cause them to burn with vari-colored flames. A list of these chemicals will be found near the end of this bulletin.

**January:**

Arrange for the local conservation officer or forest ranger to discuss the value of trees and shrubs for providing food and cover for birds and animals in winter. Request him to show motion pictures to the club or at the school on forestry, wildlife or other conservation subjects.

Place a bird feeding station near your house or school house and keep it supplied with grain. Information on feeding stations can be found in Club Bulletin 49, "Wildlife Conservation for 4-H Clubs".

**February:**

Arrange with the 4-H club agent or county agricultural agent to have the extension forester give an illustrated lecture on growing and planting forest tree seedlings.

The germination test by sprouting seed should be started early this month in order to determine the results before seed-planting time.

A field trip should be taken to determine what food there is available for birds and animals that live in the community.

**March:**

Complete the germination test of seed that is to be planted this spring. Make cuttings from branches of poplar and willow trees or red-osier dogwood to plant soon after the frost leaves the ground. These cuttings should be buried in cold damp sand until planting time.

**April:**

If a germination test has not been made, a cutting test should be made to determine the percentage of good seed. The seed should be planted before a germination test can be completed.

Plant cuttings the latter part of this month.

If in lower Michigan, give a demonstration of seedbed preparation and planting seed. All 4-H seedbeds should be planted the latter part of this month or the first of May.

**May:**

After a seedbed preparation and planting demonstration has been given, every member in the club should plant a seedbed at home or help to plant the club nursery. Cover the seedbed with burlap until the seedlings appear above the ground. In the Upper Peninsula, seedbeds should be prepared by the end of this month.

Shade frames should be made now so they may be put over the seedbed as soon as the burlap mulch is removed.

**June:**

Regulate shade over the seedbed according to the weather. Remove the shade frame during cloudy, wet weather and replace it as soon as the ground dries slightly below the surface.

A field trip should be taken to the nearest forest tree seedling nursery to learn the following points of nursery management:

- (1) The time when the mulch should be removed from newly planted seedbeds.
- (2) See the equipment used for shading seedbeds.
- (3) Determine what precautions are taken to prevent damping-off disease.
- (4) Have the nurseryman explain how the irrigation system works. How often are the seedlings watered?
- (5) Determine how weeding can be done to be most effective and cause the least damage to the small seedlings.
- (6) Have the nurseryman show the group a transplant board and how it is used in transplanting seedlings.

**July:**

Nursery care is most urgently needed in mid-summer. Weeding, watering, shading and protection against damage by birds, chickens, and moles are very important. The nursery should be examined at least every other day to determine what needs to be done.

## FOREST TREE NURSERY PROJECT

### KIND OF SEED TO PLANT

The use that will be made of the trees and the products to be grown may be an important factor in selecting the kind of seed to plant in the 4-H nursery. Climatic conditions must also be considered because some kinds of trees, such as yellow poplar and black locust that are native to southern Michigan, cannot be grown successfully in the northern part of the state.

Principal uses for forest tree seedlings on the farm are erosion control, windbreaks, non-agricultural land planting, wildlife food and cover, and to fill openings in the farm woods. Products to be made from the trees to be considered are Christmas trees, fence posts, pulp wood, and saw timber.

In general, evergreens are better suited to sandy soils than hardwoods. On heavier soils with fair fertility hardwoods may be preferred, but on badly eroded clay soils pine trees may grow better than hard-

woods. For general reforestation and planting openings in the woods, the species of tree should be selected according to the texture and quality of the soil and for the products wanted. The Extension folder "*Forest Trees and Shrubs, What and Where to Plant,*" available at the county agricultural agent's office, will help solve those problems. Evergreens should be used for windbreaks because they afford more effective wind protection all year than hardwoods and the transplants will grow better than seedlings.

For Christmas trees the short-needed evergreen trees, such as spruce, fir, Jack, and Scotch pine appear to sell best. Fence posts should be made of decay-resistant timber, such as white cedar and black locust. For pulpwood and saw timber, the kind of trees planted will depend on the local market. Pulpwood species, such as spruce, balsam fir, and poplar, should not be planted unless there is a paper mill near or other industries that will use the wood produced.

It is best to plant seed of trees that are growing naturally or have been planted successfully in the neighborhood. Sugar maple, white ash, and white, red or Jack pine, can be grown throughout the state. White spruce and white cedar grow naturally in the northern half of the state, but they have been planted successfully in the southern half. Red oak, white oak, and Scotch pine may be planted almost any where in the Lower Peninsula, but black walnut, black locust, honey locust, yellow poplar, Norway spruce, and Douglas fir grow best in the southern half of the Lower Peninsula. Balsam fir grows best further north although it may make a satisfactory Christmas tree if planted on moist soil in the southern part of the state.

## GROWING EVERGREEN SEEDLINGS

### COLLECTING AND CARE OF EVERGREEN TREE SEED

Tree seeds may be collected from the trees or purchased from forest tree seed companies. Seed of conifers is found under the scales of the cones. The cones must be picked from the trees after they ripen and before the scales open. Time of year to collect cones varies with the kind of trees and the season but usually extends from August 15 to late October. White spruce and white pine cones ripen early. They must be gathered about the time they ripen because the scales will open while the cones are on the trees and the seed will be blown away.

Time of ripening of white and red pine can be judged in two ways, by color and specific gravity. White pine seed should be ripe when the cones are yellowish green in color with brown scale tips. The specific gravity test can be applied by dropping five freshly picked cones into linseed oil. If most of the cones float the seed is ripe. For red pine the color of the cones should be deep purple with brown scale tips. The specific gravity test for red pine is to drop five cones in kerosene. If most of them float the seeds are ripe. Care must be taken to use only freshly picked cones for the specific gravity test; else the results will not be correct. The date of cone ripening on individual trees will vary, so it is advisable to test five cones from each tree.

No specific gravity test has been found for Jack pine and white

spruce, so cone color alone will have to be used in determining ripeness. When the cones begin to turn brown the seeds are nearly ripe. They should be picked between that period and the time the scales open.

If the cones disappear from the trees before the scales open it is very likely that squirrels have cut them off and stored them away. By locating the squirrel hoards, the cones can be obtained without the difficulty of picking them from the tree. It is advisable not to take all the cones found because the squirrels may need some pine seed for winter food.

Soon after the cones have been gathered they should be dried so that the scales will open and the seed can be extracted. Spread the cones on a sheet or piece of canvas in sunlight to dry. After sundown the cones should be covered or taken indoors where they will be kept dry until spread in the sunlight again. When extracting seed from a small number of cones it may be easier to put them in a tight cardboard box and place it behind the kitchen stove. After the scales are open the cones should be pounded lightly to extract all the seed out from under the scales. The seed should be cleaned by rubbing between the hands to remove the "wings" and then by pouring from one container to another on a windy day so that the wind will blow away some of the fine material. Use care to prevent the seed from blowing away along with the fine dirt. Larger pieces of the cones that do not blow away may be removed by hand. The seed should be placed in a small fruit or mayonnaise jar, tightly covered, and stored in a cool damp place until time for planting.



Fig. 1. Collecting pine cones.

### GERMINATION TEST OF SEED

It is advisable to make germination tests on all evergreen tree seeds before planting to determine how much seed will be required to get the desired number of 70 to 80 evergreen seedlings per square foot. This is especially true with seed collected by club members.

The most accurate germination test is to plant 100 or more seeds in a flower pot or a shallow wooden box (a flat) and count the number of seedlings that appear above ground. If one knows the number of seeds planted, the percentage of good seed can be calculated. The flower pot or flat containing the planted seed should be well watered and kept in a warm place. Seed corn germinating equipment may also be used to test evergreen tree seed.

The cutting test, which consists of cutting 100 seeds and counting the ones that appear to be good, is not so accurate as the germination test but it is better guide than none.

After the percentage of good seed is obtained, one uses the information in calculating the amount of seed needed to plant a seedbed of a certain size.

$$\frac{\text{Number of ounces of seed} = \frac{\text{Square feet seedbed} \times \text{number of trees per sq. ft.}}{\text{Number of seeds per pound} \times \text{percentage of good seed}} \times 16 \text{ (ounces in a pound)}}$$

*Example:*

12 square feet area of the seedbed to be planted  
 80 seedlings per square foot are wanted in the seedbed  
 25,000 white pine seeds per pound  
 0.60 per cent of good seed shown by germination test  
 16 ounces in one pound

$$\frac{12 \times 80}{25,000 \times 0.60} \times 16 = 1.024 \text{ ounces of seed needed to plant 12 square feet of seedbed.}$$

For planting a seedbed containing 12 square feet with seed that tests 60 per cent viable, the following table gives the number of ounces or fraction of an ounce required for each species.

Species	Approximate Number of Seed per Pound	Number of Ounces Required to Plant 12 Square Feet of Seedbed	Teaspoonfuls of Seed
White pine.....	25,000	1.024	26
Red pine.....	54,000	0.46	9
Jack pine.....	130,000	0.19	4
Norway spruce.....	59,000	0.43	9
White spruce.....	180,000	0.14	3

### LOCATION OF NURSERY

Location of the nursery should be carefully selected with regard to soil, drainage, water supply and possibility of damage by birds and chickens. A sand or sandy loam soil should be selected where clean cultivation has been practiced at least one year before the nursery is planted. Clay soil is not desirable for a nursery because the hard crust that forms over the surface after a rain makes cultivating and weeding difficult. If the drainage is poor, damage is likely to occur from heaving and difficulty will be experienced in lifting seedlings without damage to their roots.

The nursery should be located in the open sunlight where air drainage is good and on level ground but not in a low place where water is likely to stand on the surface. It should be located near a good water supply because the beds must be watered frequently. It also should be near buildings so that it can be conveniently inspected. Proper care given at the right time, such as watering, weeding, regulating shade, or protection against birds and rodents, is necessary for a successful nursery.

### SIZE OF NURSERY

The average-sized nursery bed is 4 feet wide and as long as convenient or necessary for the amount of seed to be sown. Most club members will prefer to make their seedbeds 3 feet wide because it is much easier to reach half way across a narrow seedbed when pulling weeds. An individual nursery of 12 square feet would be 3 feet wide and 4 feet long. A club nursery of 45 square feet would be 3 feet wide and 15 feet long.

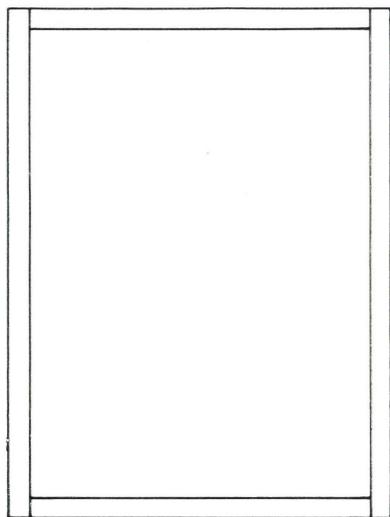
### TOOLS AND MATERIALS NEEDED FOR NURSERY

Tools needed to build the nursery bed are usually available on every farm and consist of a round-pointed shovel, a rake, and a heavy hammer. The border of the seedbed may be framed with odd pieces of boards that can be found around the farm. For the small individual nursery, the following material will be required:

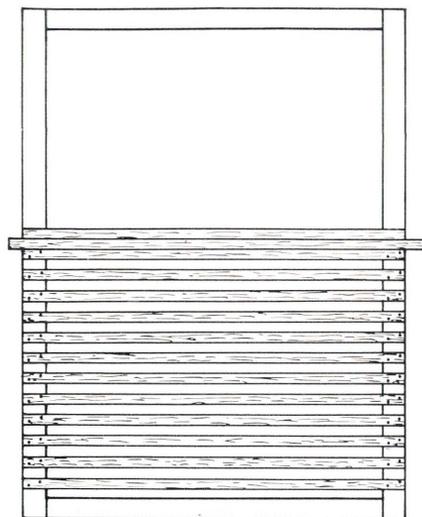
- 2 boards 3 feet long, 1 inch thick, and 6 or 8 inches wide.
- 2 boards 4 feet long, 1 inch thick and 6 or 8 inches wide.
- 8 nails to fasten the ends of the boards, or, in place of nails, 16 stakes, about 18 inches long to hold the ends of the boards together.

For the club nursery, the same tools and material will be needed except two of the side boards will be 15 feet long. If shorter boards must be used they can be spliced by nailing together or overlapped and stakes driven on each side of the board to hold them together. Enough burlap or thin cloth will be needed to cover the surface of the seedbed.

To make the shade frame, four pieces of "2 x 4's" will be needed. Two pieces should be 3 feet 2 inches long, and the other two pieces may be made exactly the same length as the seedbed. The shade frame should be 2 inches wider than the frame of the seedbed so that it will



**A**



**B**



Fig. 2. Making a seedbed and shade frame. (A) The foundation of the  
(B) Notice the piece of lath used to space the lath, (C) The completed fr

have sufficient bearing on the seedbed frame. For a 15-foot seedbed, it will be more convenient to make two shade frames each  $7\frac{1}{2}$  feet long.

Narrow boards less than 4 inches wide or lath 3 feet 2 inches long should be nailed to the frame, leaving a space between each board equal to the width of the board. Figure 2 shows how a lath can be used to measure the distance between the lath.

### PREPARATION OF NURSERY

The ground should be spaded about 8 inches deep and leveled carefully with a rake, removing all stones, sod and lumps of dirt. When the soil is well worked and level, it is ready for seeding. A board frame around the seedbed to make the edges of the bed straight is convenient when spading and weeding. The level of the seedbed inside the frame should not be much higher than the ground outside. After the seedbed settles, it should be the same height as the ground. (See the cover page picture of Kent County 4-H club members making a seedbed.)

### TIME OF PLANTING

Most conifer tree seeds may be sown in the spring, but white pine and white spruce will germinate better when fall planted.

For spring planting, seed should be sown before May 1 in the lower part of the state and May 15 in upper Michigan.

Fall planting may be done just before the ground freezes—October in the Upper Peninsula and November in the Lower Peninsula. The seedbed should be mulched with straw or leaves for winter protection instead of using burlap that is used on spring-planted seedbeds.

### PLANTING SEED

After thorough preparation of the seedbed, evergreen seed should be sown lightly and evenly over the surface of the bed. To insure even distribution of seed, it is advisable to broadcast it lightly, both lengthwise and crosswise of the seedbed or to mix the seed in dry sand and broadcast the sand and seed over the bed. It may be easier to use a seeder made by punching as many holes as possible through the metal top of a glass jar. The holes should be made large enough to allow the seed to sift through freely.

After being planted, the seed should be pressed into the surface by placing a board flat on the ground and tramping on the board. This should be repeated several times to cover the surface of the seedbed. The weight of one or two people on the board will be enough to pack the surface soil against the seed. The seed should then be covered not more than one-eighth of an inch with sterile sand sifted over the bed. Sterile sand means sand that contains no plant disease commonly found in surface soil. Sand taken from a pit 18 inches or more below the surface of the ground is likely to be free from disease.

After the seed has been covered one-eighth of an inch or less with fine sand, the bed should be covered with one thickness of burlap. This burlap mulch will keep the surface soil moist and prevent the seed from being uncovered by hard rains or when the bed is watered.



Fig. 3. Seed planted and covered with burlap (Kent County).

About two or three weeks after planting, the seeds should begin to germinate. After the first week has passed, a careful watch should be kept for germinating seed. As soon as the first little trees are seen, the burlap should be removed and the shade frame placed over the seedbed.

#### DAMPING-OFF DISEASE

The most serious disease of evergreen seedlings is damping-off. It is likely to attack the seedlings just as they appear above ground and for a period of four to six weeks after. It is a fungous disease similar to mold on bread. The mass of tiny thread-like fungus growing on and in moldy bread can be easily seen, but similar material growing inside the stem of a little tree, which kills plant tissue, is difficult to see.

Fungi causing damping-off disease are present in the top 6 inches of most agricultural soils. To help prevent occurrence of this disease, the seed should be covered with sterile sand. As mentioned previously, sand taken from a pit 18 inches or more below the surface of the ground is usually free from disease.

Chemicals are sometimes used to kill these fungi or to make the soil unfavorable for development of this disease.

Damping-off is most likely to occur during warm wet weather. Seedlings are affected at the surface of the ground where the stems wither and the seedlings fall over. At the first sign of damping-off, the shade frame should be removed immediately and not replaced until the ground surface of the bed is dry to the depth of  $\frac{1}{8}$  inch.

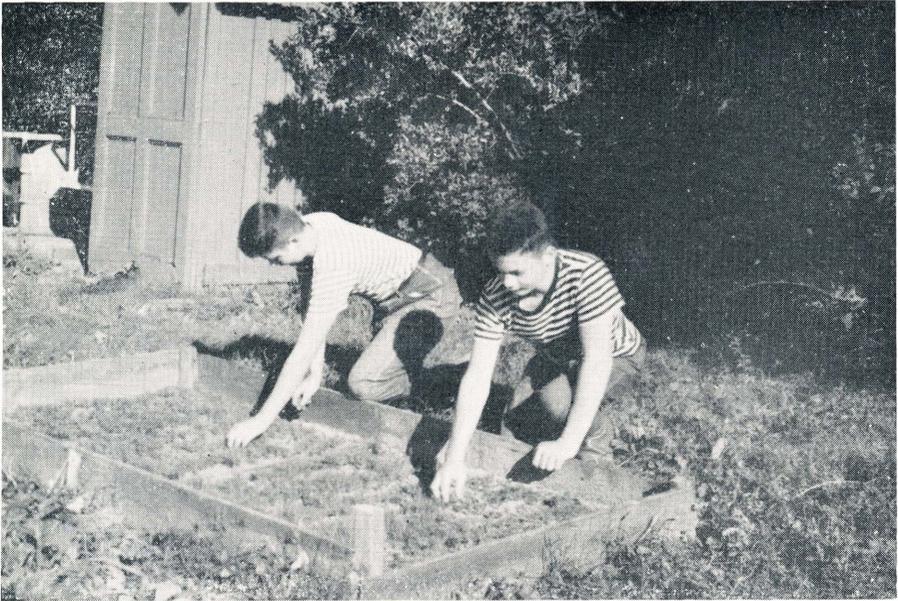


Fig. 4. Weeding the seedbed.

#### CARE OF THE NURSERY

Weeding is one of the most necessary tasks in nursery care. To prevent uprooting the little trees, weeds should be pulled as soon as they appear above ground. It is necessary to weed the seedbed several times during the summer.

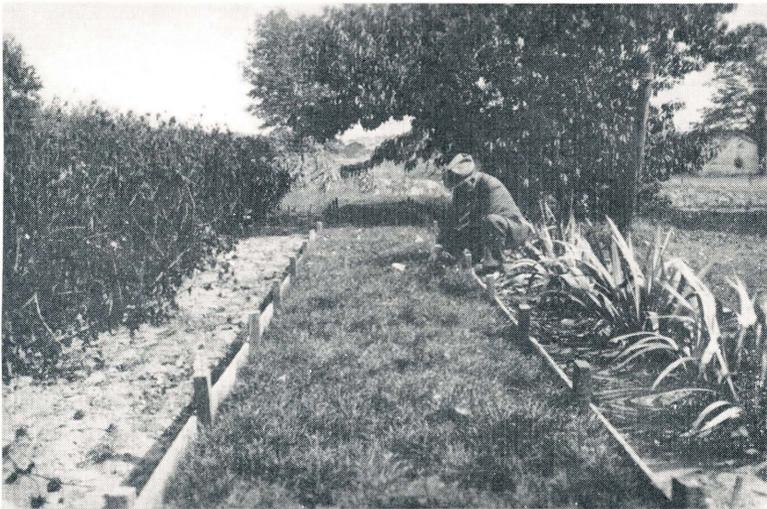


Fig. 5. Two-year-old Scotch pine seedlings.

Watering the seedbed during the dry part of the summer is another necessary part of nursery management. The seedbed should be well soaked once or twice a week, depending upon the amount of rainfall. One heavy application of water is much better than frequent sprinklings, because a small amount of water applied daily will keep the surface soil wet even though the soil may be dry 2 inches below the surface. This will make the roots grow toward the top of the ground for moisture, thus making the trees shallow rooted.

Winter care consists mainly of mulching the one-year-old seedlings with a light covering of clean long straw. Wheat straw is best because it is less likely to contain weed seeds. If straw cannot be obtained, dry leaves will make a fairly satisfactory mulch, but they are more likely to mat down and smother the seedlings than long straw.

One- or two-year-old seedlings that will be planted in the field or transplanted in the spring need not be mulched.

## GROWING HARDWOOD SEEDLINGS

### COLLECTING AND CARE OF HARDWOOD TREE SEEDS

Most seeds of hardwood trees ripen in the late summer or fall. They should be collected soon after ripening and planted or stored in such a way as to keep the fleshy part of the seed fresh and moist. This type of storage is called "stratifying". Oak, hickory, walnut, sugar maple, white ash, and yellow poplar seeds should be stratified by placing them between layers of sand in a box buried one foot deep in the ground. The box should be buried on the north side of a building where the ground will remain cool later in the spring so as to retard seed germination. Well-drained soil should be selected and sand or gravel placed in the bottom of the hole so that rain water will drain away readily. An inch of sand should be placed in the bottom of the box, then a thin layer of seed covered with another layer of sand. Alternate layers of seed and sand should be placed in the box until all the seed is covered. The box should then be covered with sand or straw.

Black and honey locust seed is usually kept in a dry storage similar to the method used in storing evergreen seed. Because the seed coat is very hard, it should be softened before planting. This may be done

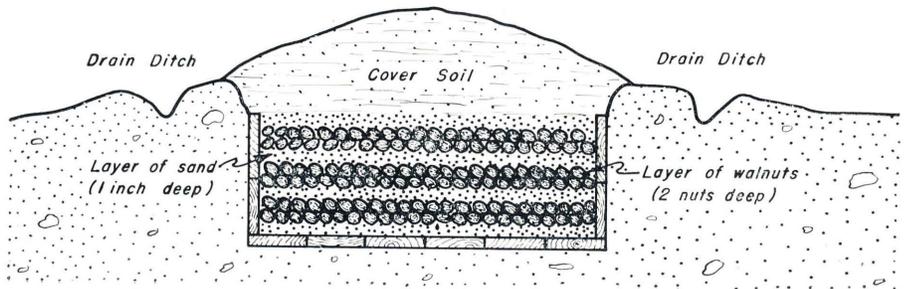


Fig. 6. Stratifying seed.

by placing the seed in water heated to the boiling point and allowing the seed to remain 8 to 10 hours while the water cools. The seed should be planted in moist earth immediately after soaking.

### PLANTING HARDWOOD SEED

General instructions given for the location and preparation of an evergreen seedbed will apply to a hardwood nursery, except for the method of sowing seed. Hardwoods can be grown in a heavier soil than conifers, and the seed is usually planted in rows or drills 8 to 12 inches apart. The depth to which hardwood seed is covered varies with the size of the seed. A good rule to follow is to cover the seed to a depth of 1 or 2 times the thickness of the seed.

Nut trees such as walnut, butternut, hickory, and the oaks produce a long taproot, straight down in the ground. Most of this root is cut off when the trees are moved from the nursery. For that reason, it is desirable to plant the nuts and acorns where the trees should grow. If squirrels are plentiful, direct seeding of nuts and acorns is not advisable because these rodents will dig up the seed. To avoid the squirrel damage, the nuts can be sprouted before they are planted by keeping them in moist sand until the sprouts appear. Pinch off the tip of the root sprout and then plant the seed in a nursery where it can be protected from rodents. The seedlings grown from seed treated in this manner are not likely to have a taproot; therefore, they can be transplanted easier and more successfully.

Hardwood seedlings do not require shading. They should be removed from the nursery and planted in the field after one or not more than two growing seasons.

### SHRUBS

A shrub is a woody plant, usually with more than one stem, that seldom grows more than 20 feet in height. Wood of these plants has little or no commercial value but the plants make good cover and supply food for wild birds and animals. A forest tree growing project should include shrubs because birds and animals are important parts of our conservation program.

Seed of shrubs may be cared for and planted the same as suggested for hardwood tree seed. A list of shrubs suitable for planting in Michigan will be found in the Extension folder, "*Forest Trees and Shrubs—What and Where to Plant*".

### LIFTING AND PACKING SEEDLINGS

Seedlings should be lifted from the nursery soon after the frost leaves the ground for spring planting and after September 15 for fall planting. With a shovel, start digging around the edge of the seedling bed and work toward the center. Dig deep enough to remove all the tree roots with the dirt. Drop the shovel full of dirt suddenly and the dirt will fall apart enough so that the seedling can be obtained without damaging the roots. The seedlings should then be counted and tied together in bundles of fifty. As soon as the bundles are tied, the roots of the trees should be covered with moist earth to prevent their

drying out until the seedlings are ready to be moved for transplanting or field planting. When the trees are to be hauled any distance the roots should be packed in wet shavings or moss, or wrapped in wet burlap. It is necessary to keep the roots moist from the time the trees are lifted from the nursery until they are planted in the field. For information on care of trees before planting and planting methods, refer to Club Bulletin 19, "*Michigan 4-H Forest Ranger Club*".

### TRANSPLANTING SEEDLINGS

A seedling that has been moved from the original seedbed and planted again is a transplant.

Transplants are more satisfactory than seedlings for windbreak planting and reforestation under difficult growing conditions such as blow sand, wet soil or thick grass.

As a result of transplanting, the trees, produce a more bushy root, a larger diameter stem, and a slightly larger top than seedlings. These improved qualities make it possible for the transplant to live better than seedlings through dry seasons, or during the difficult growing conditions previously mentioned.

Each club member should have the experience of transplanting at least 500 seedlings.

### METHOD OF TRANSPLANTING

Seedlings should be transplanted to ground where a cultivated crop has grown the previous year. Spade the ground and rake it smooth the same way the ground was prepared for the seedbed.

Plant the seedlings 2 to 4 inches apart in holes or slits made with a dibble or spade. Space the rows wide enough for easy cultivation. It is very important to make the holes or slits deep enough so that seedling roots will go straight down in the ground and not be curled up in a shallow hole. The seedlings should be planted the same depths as they stood in the seedbed or one-half inch deeper. Never plant them more shallow than they stood in the seedbed because the top roots may not be covered with soil. Pack the ground firmly against the seedling roots by stamping along the row with the heel.

### GROWING TREES FROM CUTTINGS

Cuttings of trees and shrubs should be taken during the early spring before growth starts from wood formed last year near the tips of the branches of older trees. Beginning of growth can be recognized by swelling of the buds. These cuttings should be made 6 to 8 inches long so that they can be planted to the depth of 5 to 7 inches, leaving one bud above the ground. If more than one bud is left above ground the tree that grows from the cutting may have two or more stems. If they cannot be planted immediately after being taken from the trees, the cuttings should be tied in bundles and buried in moist sand.

Forcing the cutting into the ground will damage the growing layer at the butt end; therefore, it is advisable to make a hole with a bar or shovel in which to plant the cutting. Only a few kinds of trees and shrubs can be grown from cuttings. Poplar, willow, and red-osier dogwood are some of the easiest to grow. Planting cuttings is a convenient way to get trees started in wet places where it is difficult for seedlings to grow.

### **WHERE TO PLANT FOREST TREE SEEDLINGS**

Seedlings and transplants grown in 4-H club seedbeds and also cuttings can be used for very good purposes on nearly all farms in the state. Planting on hillsides where the top soil is likely to erode if the ground is plowed or in gullies to prevent additional soil erosion are excellent uses for trees. Fields located too far from the buildings for efficient farming can be planted to spruce or fir for Christmas trees. In a few years this land, which would otherwise be idle, will be producing an income.

A windbreak planting is the cheapest way to insure the value of farm property. This planting should be made on the windward side of fields where top soil is likely to be blown away by the wind, or for protecting the farm buildings from the northwest wind in winter.

Along the borders of these plantations is an ideal place for song and game birds to live and raise their young. By planting low-growing shrubs that produce fleshy seeds, both food and cover can be provided. Corners of fields can also be used very effectively for shrub planting.

In Club Bulletin 19, "*Michigan 4-H Forest Ranger Club*," a more complete description is given of where and how to plant forest tree seedlings.

### **SUGGESTED DEMONSTRATIONS THAT CAN BE GIVEN BY 4-H CLUB MEMBERS**

1. The test of ripeness of red and white pine seed can be demonstrated by using green cones, ripe cones, and over-mature cones with the scales open. As an introduction to this demonstration, the origin of the cone and its function in reproducing the species should be explained. The open cone may be used to illustrate where the seed is borne and the necessity for picking cones when they are ripe. A brief description may also be given of extracting, cleaning, and storing pine seed.

2. A shallow tray, one foot by 18 inches, or 3 by 4 feet in size, filled with sand may be used to represent the seedbed when demonstrating how to make a seedbed and plant seed of forest trees and shrubs.

3. Stratifying hardwood seeds is also a good subject for demonstration by using a small box and enough sand to cover three or four layers of seed. The reason for stratifying hardwood seeds and the procedure to follow is described in this bulletin.

4. The cutting test to determine the percentage of good seed may also be used as a demonstration. While one is cutting the seed, he

should explain that the germination test by sprouting the seed is more accurate and should be used when possible to determine the percentage of good seed. A blackboard or large piece of paper should be available to use in applying the results of the cutting test in calculating the amount of seed to sow in a seedbed of a certain size.

5. Making cuttings from the branches of a tree and methods of planting the cuttings may be shown. The demonstration would be more effective if it were planned far enough ahead to have root growth started on a cutting. Willows will grow roots in water.

### EXHIBITS

1. The exhibit of seeds from 20 different kinds of trees may be displayed by placing the seed in Cellophane bags and fastening them on a plywood background. The exhibit can be made more effective if appropriate leaves are mounted with the seed.

2. The flat or tray of seedlings grown for the germination test can be used to illustrate a seedbed provided the exhibit is to be set up in the late winter or early spring. The flat is preferable to a flower pot because it would represent a seedbed about one-third normal size. A small shade frame could also be made to fit the tray.

### REFERENCE MATERIAL

- Forest Trees and Shrubs, What and Where to Plant—Michigan State College, East Lansing.  
 Growing and Planting of Coniferous Trees on the Farm—Farmers' Bulletin No. 1453. U. S. Department of Agriculture, Washington, D. C.  
 Growing and Planting Hardwood Seedlings on the Farm—Farmers' Bulletin No. 1123. U. S. Department of Agriculture, Washington, D. C.  
 Michigan 4-H Forest Ranger Club—Club Bulletin 19, Michigan State College, East Lansing.  
 Wildlife Conservation for 4-H Club Members—Club Bulletin 49, Michigan State College, East Lansing.

### 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 Bureau of Chemistry and Soils, U. S. Department of Agriculture. Because 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

## OUTLINE OF OTHER CONSERVATION PROJECTS

### FORESTRY PROJECTS

Several years' credit in 4-H club work may be earned by completing the following projects, plus other required activities. Only one project should be carried at a time.

**Forest Tree Planting Project**—Club members interested in general conservation will like this project because it includes tree identification, shade tree and forest tree planting as well as the relationship of wildlife and recreation to forestry. The major activity is forest tree planting which includes reforestation of non-agricultural land, erosion control, windbreak and Christmas tree plantings.

Club Bulletin 19 also contains suggested activities for school and community forest programs.

**Timber Estimating and Log Scaling**—Farm woodland timber is seldom sold by measure because most woodland owners do not know how to estimate the number of board feet of lumber in trees or scale logs. Club members who have a home woodland should select this project to learn how to estimate the volume and value of their timber.

A wood collection is suggested so that club members will learn to identify trees and logs by the appearance of the bark.

### FUR TRAPPING AND MANAGEMENT

This project gives the young trapper an opportunity to learn better methods of trapping and handling pelts. In addition, activities are included which, if completed, will better acquaint the member with fur animals on his farm. This is a year-around project and should be started by December 1. In the second-year's work one activity is required in which some improvement in homes for fur animals must be completed. In addition, complete trapping records must be kept.

For additional details in this project, request the mimeographed bulletin "Fur Trapping and Management for 4-H Clubs".

### DEERYARD STUDY

This is a group project in which club members visit winter deer-yards with an experienced guide. The winter food eaten by deer is observed and samples collected, the quantity of winter food available in the yard is checked, and a map is made of the yard showing its condition as a suitable winter home for deer. This project may be completed during the winter. For further information, see 4-H Club Bulletin 40, "Michigan's Deer Herd".

### SURVEY OF MICHIGAN INLAND LAKES

The objective of this project is to present to members a plan whereby they can obtain interesting information about a lake near their community.

This plan includes :

1. Making a map of the lake,
2. Determining the depth of the lake,
3. Studying the soil and the plant and insect life in the lake,
4. Determining the kind of fish found in the lake,
5. Taking a creel census, and
6. Studying the history of the lake.

This is a group project which may be completed during the winter.

#### **WILDFLOWER PROJECT**

The activities included in this project have the following objectives:

1. To learn the names of some of the common wild flowers of Michigan,
2. To study the conditions causing a decline in numbers and varieties of wild flowers,
3. To become better acquainted with wild flowers through the study of their habits,
4. To learn to conserve and preserve the natural wild flowers of our state.

This is a one-year project. Complete details are found in 4-H Club Bulletin 46, "Wildflower Project Outline for 4-H Clubs".

#### **FOREST FIRE STUDY**

The project is divided into two years' work. The first year's activities are designed to inform each member of the organization the function and responsibility of the state's fire-fighting forces. Forest fire towers are visited, and the methods of observing and reporting fires are studied. An appreciation of the forest fire problem is another objective. During the second year each member must demonstrate the proper way to build and extinguish a camp fire, make a forest fire spot map, and actually take part in forest fire control if possible. These projects are described in Club Bulletins 31 and 31 A "Forest Fire Study".

#### **SOIL CONSERVATION**

The soil conservation project is designed to protect soil from erosion and to build and maintain its fertility. The first and second years' activities include the mapping and surveying of a farm to determine what the soils problems are. In doing this, some simple surveying methods are used. If desired, this may be completed in one year.

Advanced activities include the use of adapted practices, among which are gully and water run-off control, application of materials to the soil, use of green manure and cover crops, and the planting of windbreaks and game cover areas for soil protection. The soil conservation project is outlined in Club Bulletin 33 (first and second year) and Club Bulletin 41 (advanced projects).

**WILDLIFE CONSERVATION PROJECTS AND ACTIVITIES**

In addition to the deeryard study and fur trapping and management projects there is a wide variety of activities which boys and girls can do to learn more about wild animal life. These are described in 4-H Club Bulletin 49. Project credit is given for pheasant rearing and for songbird study. Additional activities include operating winter feeding stations, planting food patches, making wildlife cover plantings, constructing nesting boxes for fox-squirrels, raccoons, or wood ducks, erecting artificial dens for cottontail rabbits, photographing wild animal life, and organizing a controlled-hunting cooperative.

