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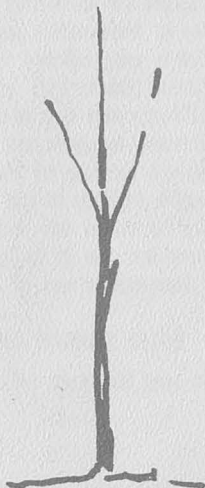
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GROWING TREES FROM SEED



RED CEDAR



BOX ELDER



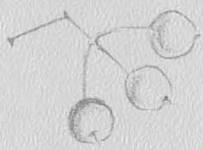
HACKBERRY



ASH



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BLACK WALNUT

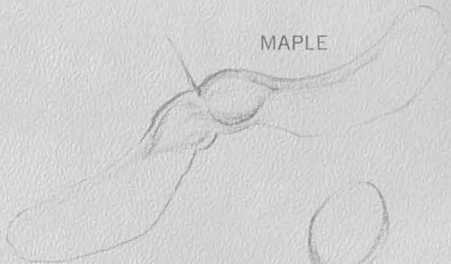
OAK



PINE



MAPLE



BASSWOOD



PLUM



AMERICAN ELM



GROWING TREES FROM SEED

Growing trees from seed can be both educational and fun. It isn't a difficult project, but it does take time and patience. You'll find that this experience is most meaningful and rewarding when you undertake the whole process, from collecting the seed to the final transplanting of the seedling.

By growing trees from seed, you'll learn many fascinating things about trees and how they reproduce. Each species has individual seeding characteristics. Some trees, such as pines, elms, and maples, have seeds with wings, so they can be carried by the wind. Some seeds have barbs or hooks that cling to the fur of animals and are carried to another location, and some are surrounded by a tasty pulp that animals or birds eat and deposit in distant places. Still other seeds are in a fruit that explodes and shoots them out, and others are in the form of a nut or acorn that squirrels bury and forget. Some examples are shown on the inside covers.

Some seeds will grow on moss, rotten wood, or almost any type of forest floor: others must have specific types of soil.

After the seeds start to grow (germinate), you'll discover that each kind of seedling also has its own characteristics. Some have needles, some are broadleaved, and some are susceptible to disease or special insect pests that must be guarded against. Some grow fast, others slowly. Some need lots of sunlight, others need shade.

As you proceed in this project, the wonderful workings of our largest plants will become familiar to you and you'll develop an appreciation for these partners in our environment.

COLLECTING AND STORING SEEDS

Always collect seed from healthy trees that bear large quantities of seed.

Conifers

Conifers (evergreens) have seeds in cones, the fruit of the coniferous trees. The easiest to collect in Minnesota are the cones of white pine, red (Norway) pine, and white and black spruce.

It is the seed inside the cones of evergreen trees, not the cones, that must be planted. Normally, two seeds lie at the base of each cone scale. When the seed has ripened, the cone scales usually spread and the seeds fall out. So you must collect the cones from the trees before they open and release the seed, but not before the seed is mature.

Most coniferous trees have cones with seed that ripens in the fall, usually in September and lasting into October. Immature cones are green and gradually turn brown as they ripen.

There are two good methods for determining whether or not the cones are mature enough to collect. First, you can inspect the seed. If the seeds are not milky, but well filled and solid, they are mature. Secondly, you can observe when squirrels begin cutting and hoarding the cones. When they do, the cones are mature enough to collect.

Remember that the seed source is of utmost importance in forest planning. Follow these simple rules for selecting tree seeds:

- Secure seed from as local a source as possible.
- Gather cones from well-shaped, thrifty trees, preferably those in mature stands.
- Do not gather cones from deformed, suppressed, and diseased trees.
- If you purchase seed, buy it from a reliable dealer who knows his seed source.
- Remember that it usually is safer to use seed from a colder region than seed from a warmer one.

Keep your cones separate if you collect more than one kind. Norway and jack pine cones sometimes can be picked or cut from the lower limbs of standing trees. Do not pick up cones from the ground unless you're sure they were cut by a squirrel and are good. The easiest way to collect cones is from the tops of trees cut down during a logging operation. But be sure to get permission to do so.

Store the cones in a warm, dry room and use either artificial or natural heat to open them. A small number of cones will open readily when spread on canvas in full sunlight. This method is recommended, since there is no danger of damaging the seed during extraction. You can use the oven of a kitchen stove, but be careful not to heat the cones too much or too long or you'll reduce the vitality of the seed. Excessively high temperatures may even kill it. A temperature of 120° F. for 4 hours should open the cones without seriously injuring the seed.

After the cones are open, the seeds can be shaken from them. You can rake the cones back and forth, shake them in a bag, or tumble them in a churn. To remove the wing attached to the seed, gently rub the seeds between your hands or over a screen. Pouring the seeds from one container to another when the wind is blowing or with a fan blowing on them will remove the wings and other debris.

Whether you purchase or collect the seed yourself, store it in an airtight jar or bottle until spring. Place the bottle where rapid temperature changes do not occur, such as in a fruit or vegetable room in the cellar. A cool, dry place is best.

Hardwoods

Elms, silver maple, cottonwood, and the willows have seeds that mature in the spring (May-June). Their seed is wind-blown, so look for drifts of seed in sheltered corners and alongside street curbs. Seeds that ripen in the spring lose their ability to grow after 3-4 weeks, so plant the seeds as soon as possible after gathering. You'll have particularly good luck with elm and silver maple seeds.

Some of the trees whose seed ripens in the late summer or early fall include: sugar maple, boxelder, the oaks, basswood, honey locust, hackberry, the ashes, black walnut, butternut, Kentucky coffee tree, wild plum, lilac, honeysuckle, and Russian olive. Some of these seeds fall to the ground; others can be picked from the trees.

Almost all seed can be attacked by insects while it is still in the fruit, nut, acorn, etc. To check for this possibility, open a few seeds from each tree you collect from. If the seed is damaged, you may wish to try another tree. Healthy seed is firm, greenish-white, dry, and has no indication of insect damage.

Time of flowering and seed ripening for common Minnesota trees

Kind of tree	Flowering period	When seed is ripe
Ash	April-May	August-September
Aspens	April-May	May-June
Balsam Fir	May	August-September
Basswood	June-July	September-October
Paper Birch	April-May	August-September
Yellow Birch	April-May	September-October
Butternut	April-May	September-October
Red Cedar	April-May	September-November
White Cedar	April-May	August-September
Cherries	April-June	July-September
Cottonwood	April-May	May-June
Boxelder	April-May	September-October
Elms	March-April	May-June
Hackberry	April-May	September-October
Hemlock	May-June	September-October
Hickories	April-June	September-October
Ironwood	May-June	August-September
Red and Silver Maples	March-May	April-June
Sugar Maple	April-May	September-October
Oaks	April-May	September-October
Pines	April-June	August-September
Spruces	May-June	August-September
Tamarack	May	August-September
Walnut	May-June	September-October
Willow	March-May	May-June

Storing methods for hardwood seeds collected in the fall vary with the species. Seeds that can be planted in the fall are: sugar maple, boxelder, ash, basswood, lilac, honeysuckle, and Russian olive.

Some seeds should be stratified, which means they should be placed between layers of moist sand or peat moss and kept moist and cool (40° F.) for 2-4 months, depending on the species. Seeds that should be stratified include: black walnut, butternut, oak, hackberry, and wild plum. For complete information on treatment of seeds, see "Woody Plant Seed Manual," U.S. Department of Agriculture Miscellaneous Publication 654.

PURCHASING OR SELLING SEEDS

You may wish to purchase seeds that you can't collect. It is best to order such seeds in the fall to avoid the rush during spring planting time. For a list of seed dealers, write to: Extension Forester, Green Hall, University of Minnesota, St. Paul, Minnesota 55101.

Some nurseries will purchase seeds or cones. You might check with your local forester for potential markets. Selling seeds could be a club money-raising activity.

SEEDBED

Location of the Seedbed

Although a seedbed takes little space, there are important requirements that affect its location. Some of these requirements are:

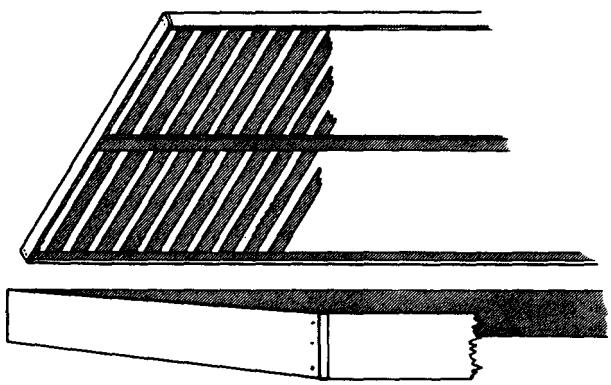
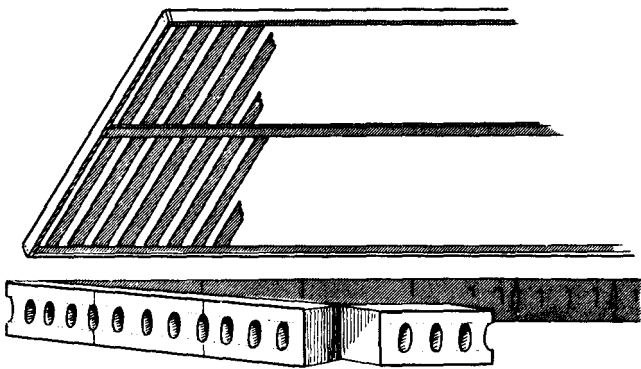
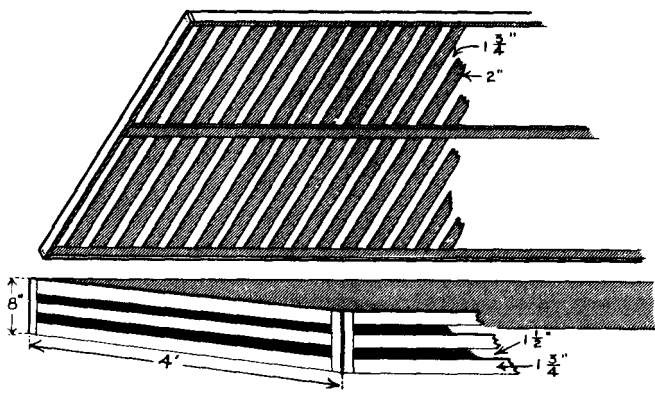
- An adequate source of water.
- A well-drained site that is exposed to the sun and protected from drying winds, but has some ventilation.
- A light sandy loam soil, although it is possible to raise seedlings in almost any type of soil.
- Protection from animals and livestock.

A part of the family garden usually fits these conditions well.

Preparation of the Seedbed

Dig and spade the soil thoroughly, breaking up all lumps. Remove all debris and stones. There should be little organic material present. Under no circumstances should you add barnyard manure of any kind to the seedbed soil.

Now make a wooden frame of 1 inch x 4 inch or 1 inch x 6 inch lumber that will border a seedbed 4 feet wide and 12 feet long. You also can use cement or cinder blocks. Set this frame on edge about 1 inch into the ground. From the surrounding area, add enough soil to raise the surface of the bed about 1 inch. If the soil is loam, round it upwards toward the center of the bed. If it is sand, you can leave it flat. Firm, but do not pack, the soil with a board.



A lath cover over the seedbed provides partial shade and protection from birds. The seedbed frame can be made from lath (top drawing), cinder blocks (center drawing), or solid boards (bottom drawing).



A completed seedbed with a lath covering.

Planting the Seeds

Spruce and pine seeds are so small that thousands of them are required to make a pound.

Species	Number of seeds per pound	Average germinating capacity, percent
White pine	27,000	64
Red pine	52,000	75
Jack pine	131,000	69
Black spruce	404,000	61
White spruce	240,000	49

You will want to grow about 50-75 seedlings per square foot. Even if your seed is better than 75 percent fertile, you should plant about 200 per square foot. If the seedlings come up too thick, you can thin them later.

You can sow the seed broadcast or in drills 3 inches apart. If you broadcast seed, distribute it as uniformly as possible. You can punch holes in the lid of a pint jar and use it as a shaker to apply the seed.

After sowing, cover the seed with $\frac{1}{4}$ inch of clean, dry sand sifted through a sieve with $\frac{1}{4}$ inch mesh. A cover of more than $\frac{1}{4}$ inch sand may keep the small seeds from germinating, while one less than $\frac{1}{4}$ inch permits too rapid drying out. Cover the bed with a layer of burlap, and fasten it securely to keep the wind from blowing it off.

Treatment for Damping-off Fungus

Get ferbam (ferric dimethyl dithiocarbonate) or a similar fungicide. Such fungicides are available from most garden or drugstores.

Mix 2 tablespoons of the fungicide with 1 gallon of water. Apply this solution at the rate of 1 pint to each square foot of seedbed as soon as the seeds are planted and covered with sand and burlap. Use a fine sprinkling can to apply the fungicide, but be careful not to wash out the newly planted seeds. If you don't have a sprinkling can, puncture tiny holes in the bottom of a tin can. Spread the solution north and south and then east and west to assure complete coverage of the bed.

When 50 percent of the seeds have germinated, apply another ferbam treatment to control damping-off disease. Use the same strength and volume as for the first treatment. Then, every 3 weeks until September 1, apply the same mixture and be sure to cover the seedlings thoroughly.

CARE OF SEEDLINGS

Shade Requirements

Seedlings injure easily from too much heat when they are young and tender. Fifty percent shade seems to be about right. You can use a snow fence as a seedbed cover or build a frame covered with wooden laths. Do not space the laths over $1\frac{1}{2}$ inches apart. The frame also will afford protection from birds that pull out tiny seedlings.

Weeding the Seedbed

Weeds will smother the trees if you don't remove them promptly. Also, if you let the weeds get as much as 1 inch tall, it is hard to pull them up without injuring the root systems of the tiny trees. You can cut off large weeds, but it is best to weed often so large weeds don't develop.

Thinning

After the first 6 weeks, you can thin the rows to allow better spacing. Leave at least 50 seedlings per square foot.

Watering

You will get better growth by watering seedlings if rainfall is low or comes at irregular intervals. Prolonged drought will kill seedlings.

During the first 2 months, apply water about twice each week if it doesn't rain. Later, one heavy soaking to a depth of 6 inches will be satisfactory. Be very careful not to wash the tiny seedlings out of the soil.

Fall Mulching

After the first heavy frost, place a 3- or 4-inch mulch of leaves or straw over 1st year seedlings. You also can apply sawdust to a depth of $\frac{1}{2}$ -1 inch, depending on the size of the seedlings. The winter mulch will help prevent frost heaving. Leave it on the

seedbed until all the frost is out of the ground in the spring. You can mulch the seedling; the second winter also if heavy frost heaving occurs in your area. It's best to be safe.

Fertilizing

At the beginning of the second growing season, about April 1, apply a topdressing of 6 tablespoons of 10-6-4 or 10-10-10 fertilizer to each 16 square feet. Repeat this application about June 15. **Don't burn your trees.** To avoid burning them with fertilizer, apply it on a dry day when seedlings are dry. After you apply the fertilizer, immediately sprinkle the seedlings with water to remove all the fertilizer from the leaves or needles.

Transplanting

As a general rule, pine seedlings can be planted directly from the seedbed after 2-3 years of growth. However, spruce seedlings should be transplanted at the beginning of the third growing season. Take great care when handling evergreens: an exposure of roots for even 30 seconds to the direct rays of the sun and wind often is enough to kill the seedlings. After digging up seedlings, immediately place them in a pail with enough water to cover the roots. A garden fork is a good tool for digging seedlings.

You should root-prune the seedlings when you transplant them. The long side roots as well as the tap root should be cut clean so that a small compact system is left to develop numerous fine roots that can be handled without loss at planting time.

For small numbers of seedlings, transplanting with a dibble is satisfactory. Remove only one seedling at a time. The soil should be well packed around the seedling roots to insure good contact and prevent drying out. Transplant beds 4 feet wide with rows 8 inches apart and seedlings 3 inches apart in the row are satisfactory.

Weed and cultivate the transplants. Watering ordinarily is not essential, but it does increase growth. At the end of the second growing season, the transplants should be large enough for forest planting.

For further information on planting trees, see University of Minnesota Extension Bulletin 350, "Planting Trees in Minnesota."

William R. Miles is extension forester and James H. Smith formerly was assistant extension forester, Agricultural Extension Service, University of Minnesota.

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RED
CEDAR



BOX ELDER



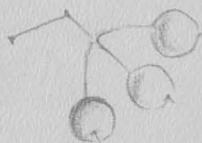
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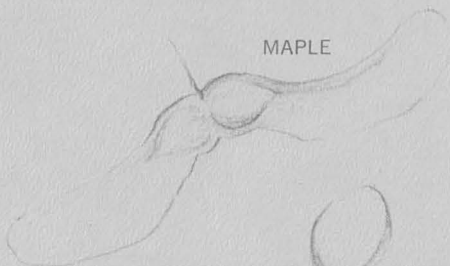
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PINE



MAPLE



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AMERICAN
ELM



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