Growing Seedlings

From Seed

By Jesse A. Randall

Growing trees from seed can be educational and fun. It isn’t a difficult project, but it takes time and patience. You’ll find that the experience is most meaningful and rewarding when you undertake the whole process, from collecting the seed, stratifying and/or scarifying according to known guidelines, germinating and growing the seed to the point of transplanting of the seedling, to watching the tree grow!

Collecting and Storing Seeds

Always collect seed from healthy trees that bear large quantities of seed, show no signs of insect or disease, and have the best possible form (straight trunk, good branch connection angles etc).

Conifers

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.

Seed cones of most coniferous trees open in the fall, usually in September and can open well into October. 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.

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 for too long or you’ll reduce the viability of the seed. A temperature of 120° F for 4 hours should open the cones without seriously injuring the seed.

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After the cones are open, the seeds can be shaken loose by raking the cones back and forth, shaking them in a paper bag, or tumbling them in a smaller tumbler (rock tumbler) or in a cement mixer for larger volumes of cones. 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 will remove the wings and other debris and this process is referred to as removing the chaff. 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 a fruit or vegetable room in the cellar or store in a refrigerator.

**Hardwoods**

Elms, silver maple, cottonwood, and willows have seeds that mature in the spring (May-June). This seed is wind-blown, so look for drifts of seed in sheltered corners, in rain gutters, and along street curbs. Seeds that ripen in the spring can dry out and can lose their ability to grow after just 3 to 4 weeks, so plant the seeds as soon as possible after gathering.

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

Seed dormancy is very common among the hardwoods. Seed dormancy has two main causes: **Seed coat dormancy** caused by an impermeable or hard seed coat that prevents water or oxygen from reaching the embryo, and **internal dormancy** which may be caused by an immature embryo. Seed coat dormancy can be overcome in several different ways including mechanical scarification such as using a file to break through the seed coat, use of concentrated sulfuric acid, and soaking seeds in boiling water. Species which exhibit seed coat dormancy include locust, Kentucky coffee tree, persimmon, cherry, and basswood. Internal dormancy is usually broken by exposing the seeds to moist-cold stratification for a period of time. This process of stratification can be accomplished in a variety of ways. Most hardwood seeds will overcome internal dormancy by planting in the fall where natural overwinter conditions (cool /frozen soils and higher soil moisture regimes are likely). Other techniques which may be used include mixing equal parts of seed and moist sand or peat moss and storing in the refrigerator for at least 90 days. In the case of walnut, dig a pit in sandy soil (2 to 3 feet deep) and alternate layers of walnuts and moist sand. The stratified seeds should be protected with a wire mesh on top to discourage seed predators like squirrels from raiding your cache of seeds. These stratified seeds should be dug up and planted in early spring before they begin to germinate, ideally just as the frost leaves the soil.

Some seed must be planted in the fall, while some may be planted in the fall or stratified. The white oaks (white, bur, swamp white) must be planted in the fall because they will germinate soon after they are mature, sending down a root which may be 3 to 8 inches in length during that first fall. The red oaks (red, black, pin, shingle) will grow best if planted in the fall but do not germinate until the following spring. They can be stratified using refrigeration or in a stratification pit, but germination is often less than with fall planting.
Seedbed

Location of Seedbed
A seedbed takes very little space, but there are some important requirements in the location of a seedbed. Some of these requirements are: (1) an adequate source of water; (2) a well-drained site that is exposed to the sun; (3) a light sandy loam soil which promotes soil drainage and easier extraction of seedlings during transplanting, although it is possible to raise seedlings in almost any type of soil; and (4) protection from animals and livestock.

Seedbed Preparation
Dig and spade or till the soil thoroughly, breaking up all lumps. Remove all debris and stones. There should be little organic matter present. Under no circumstances should you add barnyard manure to the seedbed soil.

Make a wooden frame, 4 feet wide by 12 feet long, out of 1-inch by 4-inch or 1-inch by 6-inch lumber. Set the frame on edge about 1 inch into the ground. Firm 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 to facilitate water drainage. If it is sand, you can leave it flat. Firm, but do not pack, the soil with a board.

Planting the Seeds
You will want to grow 10 to 50 seedlings per square foot of nursery bed. Plant 50 to 150 seeds per square foot. If the seedlings are too thick, they can be thinned to the desired number. For a more defined planting density by species see Table 1.

All fall planted seeds should be mulched. Materials which can be used are sawdust, burlap, ground corncobs, or straw. These mulches will help prevent any erosion and frost heaving and may be left in place to delay spring germination until danger of frost is past. The corncob or sawdust mulch may be left on the seedbeds.

If rodents are a problem for the new seedbed, the seeds may be protected by covering the seedbed with anchored hardware cloth until they begin to germinate in the spring.

Treatment for Damping-Off Fungus
Damping-off fungicides are available from most garden or drug stores. Treat the seedbed immediately after planting and again when 50 percent of the seeds have germinated.

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 lath. You can also use commercially available shade cloth.

Weeding the Seedbed
Weeds will smother the trees if not removed promptly. Weed often so large weeds don’t develop. There are “rescue” herbicides used in commercial nurseries but they are expensive and most are listed as restricted use.
Watering

You will get better growth and survival by watering seedlings if rainfall is low or if it comes at irregular intervals. During the first 2 months, water twice a week. Later, one heavy soaking per week to a depth of 6 inches will be satisfactory.

Fall Mulching

After the first heavy frost, place a 3 to 4 inch mulch of leaves or straw over first-year seedlings. This will help prevent frost heaving. Leave it on the seedbed until the frost is out of the ground in the spring. Check throughout the winter to make sure mice have not taken up residence under the mulch as they will girdle and kill young seedlings through the winter. There is a wide variety of lethal and non-lethal options for controlling mice.

Transplanting

If larger planting stock is desired, transplant 1 or 2 year old seedlings to transplant beds. Transplant into rows 8 inches apart, and 3 inches between seedlings. Continue to weed and cultivate. Watering is not necessary, but it will result in increased growth. During periods of drought watering should be viewed as critically necessary.

Table 1. Seed Collection and Planting Information

<table>
<thead>
<tr>
<th>Kind of Tree</th>
<th>When Seed is Ripe</th>
<th>Seedling Bed Density (seeds/ft²)</th>
<th>Stratification Days (if required)</th>
<th>When to Plant Non-Stratified Seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>Aug-Sept</td>
<td>10-15</td>
<td>60</td>
<td>Fall</td>
</tr>
<tr>
<td>Fir</td>
<td>Aug-Sept</td>
<td>50</td>
<td>30</td>
<td>Fall</td>
</tr>
<tr>
<td>Basswood</td>
<td>Sept-Oct</td>
<td>30</td>
<td>90</td>
<td>Fall</td>
</tr>
<tr>
<td>Birch</td>
<td>Sept-Oct</td>
<td>30</td>
<td>30-80</td>
<td>Fall</td>
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<tr>
<td>Butternut</td>
<td>Sept-Oct</td>
<td>10-15</td>
<td>90-120</td>
<td>Fall</td>
</tr>
<tr>
<td>Red Cedar</td>
<td>Sept-Nov</td>
<td>30-50</td>
<td>30-120</td>
<td>Fall</td>
</tr>
<tr>
<td>Cherries</td>
<td>July-Sept</td>
<td>30</td>
<td>120</td>
<td>Fall</td>
</tr>
<tr>
<td>Cottonwood</td>
<td>May-June</td>
<td>20</td>
<td>-</td>
<td>Spring</td>
</tr>
<tr>
<td>Boxelder</td>
<td>Sept-Oct</td>
<td>20</td>
<td>60-90</td>
<td>Fall</td>
</tr>
<tr>
<td>Hackberry</td>
<td>Sept-Oct</td>
<td>20</td>
<td>60-90</td>
<td>Fall</td>
</tr>
<tr>
<td>Hickories</td>
<td>Sept-Oct</td>
<td>10</td>
<td>90</td>
<td>Fall</td>
</tr>
<tr>
<td>Soft Maples</td>
<td>March-May</td>
<td>20</td>
<td>-</td>
<td>Spring</td>
</tr>
<tr>
<td>Hard Maples</td>
<td>Sept-Oct</td>
<td>20</td>
<td>60</td>
<td>Fall</td>
</tr>
<tr>
<td>White Oak</td>
<td>Sept-Oct</td>
<td>20</td>
<td>-</td>
<td>Fall</td>
</tr>
<tr>
<td>Red Oak</td>
<td>Sept-Oct</td>
<td>20</td>
<td>30-90</td>
<td>Fall</td>
</tr>
<tr>
<td>Pines</td>
<td>Aug-Sept</td>
<td>50</td>
<td>0-60**</td>
<td>Spring</td>
</tr>
<tr>
<td>Spruce</td>
<td>Aug-Sept</td>
<td>50</td>
<td>-</td>
<td>Spring</td>
</tr>
<tr>
<td>Walnut</td>
<td>Sept-Oct</td>
<td>10-15</td>
<td>90-150</td>
<td>Fall</td>
</tr>
</tbody>
</table>

*All stratified seeds can be planted in spring
** Some pines require stratification, some do not. They all can be planted in the fall with moderate success.

Revised and edited by Jesse A. Randall, ISU Extension Forester