

Growing Your Own Oak Seedlings



People often have emotional ties to specific trees and sometimes a strong desire to reproduce these trees, especially historic or family legacy trees like oaks, which can live for more than a century. Emotional ties to trees get stronger with age and stir a desire to grow seedlings from those special trees so that we can share their legacy and beauty with our children and grandchildren.

Growing your own oak seedlings, or any type of tree seedling, is not that difficult and can make for an excellent project. Collecting acorns and growing seedlings makes a fine school project for kindergarten or elementary students. Charities or special interest groups may want to grow and sell seedlings from a memorable tree as a fund-raising project. Neighborhood groups may want to grow seedlings to plant trees along streets and in parks and other common areas. Environmentally conscious homeowners may want to plant long-lived oaks for their carbon sequestration ability or for their shade, which helps lower summer electrical costs. Landowners who simply want a few oaks for wild-life habitat, shade, or aesthetics might also want to grow their own seedlings.

First, you need to be able to tell the difference between red and white oaks, which are the two broad categories of oaks. Most oaks in Mississippi can be easily grouped into these two categories, and their differences are listed in **Table 1**.

The difference between red and white oaks can be seen by examining the lobes, which are the projections along the edge of the leaves, and the sinuses, which are the areas between the lobes (**Figure 1**). White oak leaves have lobes that are usually rounded without bristle-tips, while red oaks typically have bristle-tips on the lobes. White oaks produce acorns in only 1 year, while red oak acorns take 2 years to develop.

In this publication, we are going to show you how easy it is to grow your own oak seedlings in three easy steps:

1. Collect viable acorns;
2. Plant the acorns and grow your seedlings in a protected area; and
3. Transplant the seedlings to your desired planting area.

Table 1. General differences in leaves, acorns, and representative species between red and white oaks in Mississippi.

Characteristics	Red oaks	White oaks
Leaves	bristle-tipped, pointed lobes (usually, but not for water or willow oaks)	no bristle on the lobe tips; rounded lobes
Acorns	2 years to mature; high tannins; spring germination	1 year to mature; lower tannins; fall germination
Representative species	cherrybark, southern red, Nuttall, Shumard, water, and willow	white, overcup, live, post, swamp white, and chestnut oak

Collection and Care of Viable Acorns

The number of acorns produced by both oak groups varies greatly from year to year because of weather conditions, nutrient availability, and acorn-feeding insects. Because of these factors, the quantity of viable acorn production is very inconsistent for all species.

Fortunately, you can visibly judge the acorn crop on a selected tree during the spring. But remember, just because you can see a lot of acorns, this does not mean that all will be viable and capable of producing a seedling. The following guidelines will help you increase your chance of collecting viable acorns:

- Timing of your acorn collection is critical. Don't pick acorns from the tree; these are immature and will not produce seedlings. Ignore the first acorns that fall to the ground because they are often damaged or of poor quality. Wait until the majority of acorns are falling, and then gather a supply of

them. However, you should not wait too long to collect acorns as they will begin to dry as soon as they hit the ground. If the weather is hot and dry, it may take as few as 3 to 4 days to kill the seed (Bonner and Karralt 2008). Acorns are also a favorite food for a variety of wildlife, including numerous rodents, birds, deer, turkeys, and squirrels, and waiting too long could greatly affect the number of available viable acorns.

- Try to collect two to three times as many acorns as the number of seedlings you want to plant. The extra acorns collected will allow you to remove bad ones and ensure enough seedlings even with low germination rates.
- When gathering acorns, use buckets and keep acorns cool and shaded to prevent drying and overheating. If the weather is warm and dry, spray the acorns with water to avoid any moisture loss.

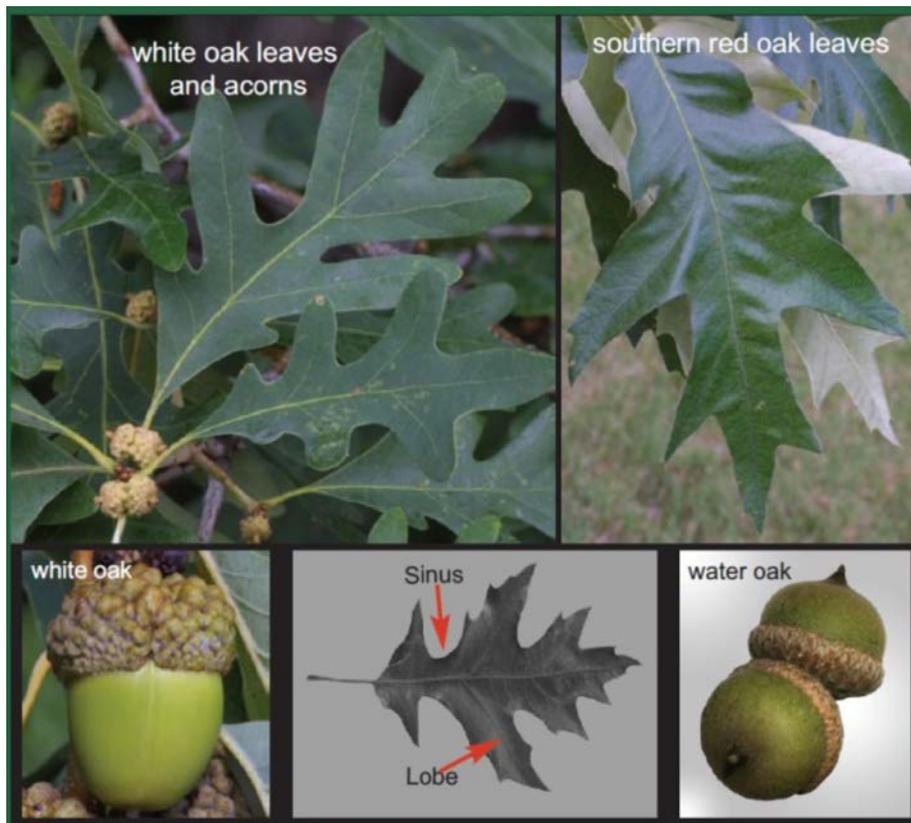


Figure 1. Composite image by Linda W. Garnett.

- Visually examine your collection of acorns. The cap scar should be bright and should feel firm under finger pressure (**Figure 2**). Discard any acorns that still have the cap attached or that show rot, mold, or small holes, as these holes usually indicate insect damage.
- After your initial inspection, drop the acorns (except for overcup oak acorns) into a large container of water. Discard the acorns that float to the top because this indicates that the embryo has not fully developed or is damaged, and the seed is hollow. Soaking in water also helps keep the acorn from losing any moisture and provides moisture to acorns that may have dried somewhat during the collection phase.

Differences in Seed Dormancy and Stratification in Oaks

Because of differences in seed dormancy between red and white oaks, the process of storage and sowing can differ somewhat. Seed dormancy is simply nature's way of delaying germination until the most favorable conditions exist. As shown in **Table 1**, white oaks germinate in the fall, and red oaks germinate in the spring. The spring germination of a red oak acorn is the result of a process known as stratification, which breaks down the heavy seed coat, allowing the acorn to sprout.

Both red and white oaks can be sown immediately to outside seed beds after collection. However, germination of the red oak acorns will not happen until the spring following natural winter stratification.



Figure 2. Composite image by Linda W. Garnett.

- **White oak acorns**—These have no seed dormancy, and, as a result, white oak acorns can be seen on the ground with the root protruding from the seed. If you have decided to sow in the spring, you can store these acorns by placing them in refrigeration at 34–40°F in cool, moist sand, but for no longer than 3 to 4 months.
- **Red oak acorns**—Unless immediately sown to an outside seedbed, the acorns will need to be stratified to satisfy the dormancy requirement before sowing. Stratification of red oak acorns requires cool, moist storage for 4 to 8 weeks, but they can be held in storage for 2½ years.

During storage, maintaining high natural moisture content is the key to maintaining good acorn quality (Bonner 2003). Start by placing the moist acorns in plastic bags (4 to 10 mil thickness), which can either be sealed or partially left open, and put these in a refrigerator. The temperature of the refrigerator should be slightly above freezing, with humidity above 30 percent. Airtight storage can be lethal, so the bags or containers should not be so thick as to limit gas exchange. Keep the acorns moist, but do not allow them to soak in excess water. Every 2 to 3 weeks, you should visually examine the seed for fungus or mold growth and drying by opening the plastic bag, which will also release any gas buildup. Too much or too little moisture during storage will reduce germination.

Planting Acorns

Plant either type of acorn outside in a seedbed or in containers. It is much easier to use an outside seedbed because nature will provide the right conditions most of the time, and watering will be necessary only during dry spells.

Growing Oak Seedlings in a Seedbed

An outdoor seedbed is a good way to produce a large number of seedlings at once. Select an area that is well-drained and in full sun. Find a small space in a flowerbed that you could use for this purpose. Make sure the area is not subject to animal browsing. An abundant squirrel population is also very detrimental, as they will tend to dig up acorns. Deer are quite fond of young seedlings, as are moles, voles, rabbits, and other mammals.

Prepare the seedbed by tilling and incorporating organic material if improved drainage is needed. Plant

the acorns to a density of four to seven acorns per square foot and about an inch below the surface—deeper if the acorns are particularly large. A good rule of thumb for most seeds is to have the planting depth three times the width of the seed.

Water your seedbed thoroughly after planting. In several days or weeks, the seed will germinate and the shoot and leaves will emerge from the soil. Seedlings will not emerge from the soil at the same time; emergence will be spread over 1 to 2 weeks. Following emergence, remove the smaller, inferior seedlings to encourage development of the better seedlings. Make sure each seedling has enough space so that the entire seedling is in full sunlight throughout the entire day. If rainfall is not regular, you should water the seedlings at least once a week so that they do not suffer from lack of available moisture. Grass and other weeds must be removed as they emerge in the seedbed. If weeds and grasses are left unchecked, the seedlings will grow slowly or die.

Growing Seedlings in Pots

Seedlings may also be propagated indoors or outdoors by planting in containers. For oaks, use containers that are at least 1 foot deep. This will allow enough space for good taproot formation and the production of numerous lateral roots that will develop along the length of the taproot. The walls of the container should have ribs to force the lateral roots downward and eliminate root spiraling. The bottoms of the containers should have sufficient drainage holes, or be nearly open, so roots will air prune as they emerge from the bottom of the container.

Fill the containers with a mixture of half potting soil and half topsoil from your yard or garden. You may also add approximately 1 teaspoon of a slow-release fertilizer like Osmocote, Nutricote, or Nursery Special to the soil mix.

Sow three acorns in each container at a depth three times the width of the acorn, and orient the acorns lengthwise. Water once a week, but do not overwater. About 1 week after the acorns germinate and seedlings emerge, clip the inferior (smaller) seedlings, leaving only one dominant (largest) seedling in each individual pot. If a slow-release fertilizer was not added to the planting mix, you will need to water with a liquid fertilizer, such as Peter's or Miracle-Gro, at one-half the rate every 6 weeks.

Indoor-grown oak seedlings in containers may be placed outside around April in a partially shaded location for 4 to 6 weeks, which allows the seedlings to acclimate to outdoor conditions. Then they can be moved to a sunny location for maximum growth. Keep containers off the ground to allow for air pruning. If containers are in direct contact with the soil, the roots will penetrate into the soil and will be difficult to extract later. Water the containers if rainfall has not occurred for a few days.

Five-gallon pots can also be used to grow oak seedlings if you want a larger seedling to plant. These will take more soil media to completely fill the container but will grow larger seedlings that are more suited to yards or open areas. Root spiraling is a major problem with any container, but especially in larger pots. A treatment called SpinOut can be applied to the inside of the pot. This will stop root tip growth and cause root branching throughout the pot. The result will be a more fibrous root system with no spiraling roots and typically better survival and growth. If this treatment is not used, spiraling roots will have to be pruned off or straightened out before planting.

Transplanting Seedlings

Do not dig up seedlings until after several frosts have occurred. This may be in December or January for north Mississippi or as late as February for south Mississippi. The cold weather will harden off the seedlings so you can transplant them to their desired location.

Treat the transplanted seedling like any other plant: dig an appropriately sized hole, add organic matter (if necessary to promote drainage), water, and mulch. You may want to plant two to three seedlings in the desired location and later remove all but the most vigorous. In some areas, you might need to protect seedlings from animal damage such as deer browsing. Fences, tree shelters, and seedling sleeves can help keep the seedlings from being fed upon. Seedling sleeves or shelters are available from forestry or garden suppliers.

Different species of oaks tend to grow at different rates. Slower-growing white oaks and southern red oaks may grow as tall as 20 feet in 10 to 12 years. Fast-growing water oaks may reach 30 feet in that same time. The growth of a tree depends on the soil type, nutrient and water availability, and the amount of light it receives. If seedlings are placed in an open-growing situation, height growth will be reduced because more energy is placed into a larger crown

and greater diameter growth. In addition, the more open-grown the oak tree, the more likely that it will begin producing acorns at a much younger age. So if your objective is to grow oaks for wildlife, you want to ensure that each tree has considerable space for crown development, which will result in greater acorn production as the tree matures.

Especially for Students

Collecting and propagating tree seeds can be a good school or science fair project. Students can collect seeds from one or more trees to determine germination rates, weight and size variations, success under different stratification methods, comparisons of fall and spring sowing, comparisons of seedling development rates, and so on.

The two publications listed in the next section can be valuable resources for any budding young scientist. Science fair participants may benefit from reading *A Student's Guide to Keeping the Science in Your Science Project*, a publication from North Carolina Agricultural and Technical State University Extension Service at <http://www.ag.ncat.edu/extension/programs/dtelscience.pdf>.

Younger students will enjoy learning about the wide variety of seeds found in trees. Seeds can be used to learn a variety of skills such as comparisons, measuring size and weight, and observing color, texture, and smell. Children often enjoy growing their own special seedling to be planted at the family homestead. They may enjoy collecting seeds to establish an arboretum on the school grounds. Student groups may propagate seedlings and sell them for fund-raising projects or plant seedlings for community beautification.

Additional Information

All hardwood tree species have their own unique reproductive and seeding habits. You can modify the guidelines given in this publication to fit many different species of trees. **Table 2** lists some common trees found in Mississippi and information on propagation.

This table was created using information from two U.S. Forest Service websites relating to forest trees and seeds. One site contains the *Woody Plant Seed Manual* found at <https://rngr.net/publications/wpsm>. The chapters on seed propagation have good general—though very technical—information. You can find specifics on individual species by selecting the genera links and selecting the desired species using the genus. For instance, information on oaks is found

in the genus *Quercus*, pines in *Pinus*, cottonwoods in *Populus*, and so on. Agricultural Handbook 654 *Silvics of North America* provides another source of information for those desiring to collect tree seeds and grow seedlings. Find this publication at http://www.na.fs.fed.us/spfol/pubs/silvics_manual/table_of_contents.htm. While the *Woody Plant Seed Manual* has information by genus, *Silvics of North America* has information by species. Instead of learning about hickories (*Carya*) in general, you can select the particular species such as shagbark hickory (*Carya ovata*). The species are listed by both common name and scientific name.

Both books contain much information for teachers and students interested in biology, botany, and other similar fields of scientific study.

References

- Bonner, F.T. 2003. The collection and care of acorns: A practical guide for seed collectors and nursery managers. Available online at: <http://www.nsl.fs.fed.us/collection%20and%20care%20OF%20acorns.pdf>
- Bonner, F.T. and R.P. Karrfalt., eds. 2008. The Woody Plant Seed Manual. Agriculture Handbook No. 727. U.S. Department of Agriculture, Forest Service. Washington, D.C. 1223 p.
- Burns, R.M. and B.H. Honkala, (tech. coords.). 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654, U.S. Dept. of Agriculture, Forest Service, Washington, D.C. Vol.2: 877 p.

Table 2. Seedling propagation from seed for selected common tree species in Mississippi.

Common name Scientific name	Seed type	Collection time	Seed treatment	Stratification	Planting guidelines
Eastern redbud <i>Cercis canadensis</i>	Fruit pods with four to ten reddish to brown seeds.	After ripening—mid-summer to fall. Pull from tree.	Immerse seeds in boiling water for 15 seconds, then soak in cool water for 24 hours.	Place stratified seeds in moist sand in refrigerator for 5–8 weeks.	Plant in seedbeds in early April at a depth of 0.25–1.0 inch.
Red maple <i>Acer rubrum</i>	Double samara (winged seed).	April to July. Seeds can be shaken or pulled from trees.	None needed.	None needed.	Plant seeds in moist mineral soil before the seeds dry out.
Persimmon <i>Diospyros virginiana</i>	Berry with one to eight flat, brown seeds.	September to November. Gather fallen fruits from ground.	Store ripe fruits in plastic bags until pulp turns to juice and can be rinsed away. Air-dry 1–2 days.	Rinse seeds; store in plastic bag in refrigerator for 60–90 days. Soak seeds 2–3 days before planting.	Plant in spring or fall in shallow drills about 0.5 inch deep.
Flowering dogwood <i>Cornus florida</i>	Bright red drupe with one- to two-seeded stone.	September to late October. When fruit can be squeezed and stone popped out. Strip or shake fruit from branches.	Soften fruit by soaking in water; skim off pulp and floating (empty) stones.	Store in plastic bag in refrigerator for up to 120 days.	Plant in fall after collection and cleaning; or stratify and plant in spring to a depth of 0.25–0.5 inch.
Sassafras <i>Sassafras albidum</i>	Dark blue drupe.	Pick from tree or shake tree over sheets of plastic.	Rub fruits over hardware cloth to remove pulp; wash.	Store in plastic bag in refrigerator for 120 days.	Plant in rows 8–12 inches apart and cover with 0.25–0.5 inch of soil.
Southern magnolia <i>Magnolia grandiflora</i>	Rusty, conelike fruits with red seeds.	Pick from trees after fruit turns rusty brown.	Spread fruit to dry until seeds can be shaken out. Rub seeds over hardware cloth to remove flesh; rinse.	Fall sowing provides natural stratification; or store in plastic bags in refrigerator for 90–180 days.	Plant in rows 8–12 inches apart and cover with 0.25 inch of soil. Mulch. Seedlings need half shade during first summer.
Loblolly pine <i>Pinus taeda</i>	Female cones contain winged seeds.	October to November. Collect cones when sample cones float in water or when fallen cones are just beginning to crack and release seeds.	Air-dry cones on trays. When open, shake or knock cones to remove seeds. Rub seeds to remove wings.	Cleaned seeds may be stored in plastic bags in refrigerator for spring sowing.	For fall sowing, press seed into mineral soil and cover with a layer of chopped pine straw.
Sweet pecan <i>Carya illinoensis</i>	Nut with the husk being thin-skinned and four-winged from the base.	September to October. Husks of sweet pecans split to the base at maturity. Nuts should be picked from the ground after shaking the trees or natural seedfall.	Studies show that larger size nuts make larger seedlings, so sizing may be beneficial.	Stratify the nuts in cold, moist sand for 30–150 days at 33–39°F.	Either sow in the fall to avoid stratification or sow in the spring following stratification. Plant in rows 8–12 inches apart. Sow at a rate of 6–8 per foot or 10 per square foot. Plant the nut 0.75–1.5 inch deep.
Green ash <i>Fraxinus pennsylvanica</i>	Elongated, winged, single-seeded samaras that are found in clusters. The wing encloses about 50% of the seed.	Ash seed is usually collected in the fall when the color has faded from green to brown. Clusters of samaras can be picked by hand from the tree or shaken from the tree when dry.	Collected seed should be completely dried; there is no need to de-wing the seed. Seed should be stored at low moisture content at 41°F.	Cold stratification alone is sufficient for sources of southern green ash. For seed sources from the northern U.S., the combination of warm incubation before cold stratification is best.	Seed can be sown in the fall without stratification. For spring-sowing, stratified seed should be used. If the seed is to be drilled, each row should be 6–12 inches apart and sown at a rate of 25–30 seeds per square foot.

Sources: *Woody Plant Seed Manual* and *Silvics of North America*.

The information given here is for educational purposes only. References to commercial products, trade names, or suppliers are made with the understanding that no endorsement is implied and that no discrimination against other products or suppliers is intended.

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