

# Growing Oak Trees From Seed



Oklahoma Cooperative Extension Service • Division of Agricultural Sciences and Natural Resources

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## Introduction

Oaks are among the most common tree species found throughout the world and are found in nearly every forested region of the United States. Twenty-one species have been reported in Oklahoma. Throughout history, oaks have provided humans and wildlife with shelter, enjoyment, and food.

Growing oak trees on suitable Oklahoma sites can provide landowners with soil erosion control, wildlife habitat, and timber. Oaks also take in carbon dioxide and give off oxygen. This process maintains the atmospheric balance so often discussed in conversations about global climatic change.

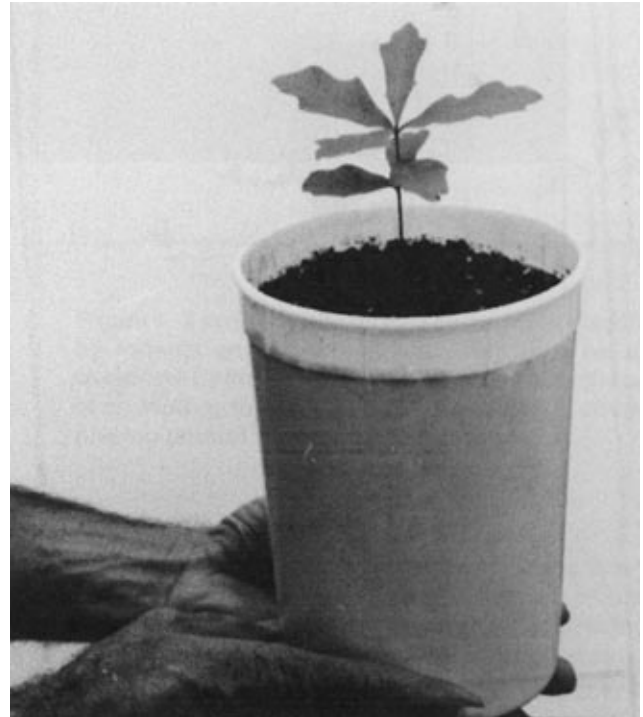
Growing oaks from seed can be an interesting, informative, and inexpensive activity for landowners, scouts, 4-H clubs, and home gardeners. Individuals with the necessary information will find it an enjoyable challenge to grow mighty oaks from tiny acorns (Figure 1). The objective of this fact sheet is to describe the basic steps involved in growing oaks from seed. Discussion will begin by focusing on general oak seed information and then proceed to the two alternative methods of growing oaks: (1) growing your own oak seedlings and (2) directly planting oak seed in the field.

Producing oak seedlings for planting can be a tricky proposition. However, if seedlings are first produced and then planted, higher survival rates will occur when compared to planting acorns in the field.

On suitable sites, direct seeding of acorns may indeed be a more economical method of establishing oaks. Direct seeding eliminates the cost of growing seedlings in the nursery. Furthermore, sowing seed is less time-consuming than planting seedlings.

## Different Types of Oaks

There are 21 different species of oaks found in Oklahoma. Oaks are divided into two groups: (1) red oaks and (2) white oaks. Some of the more common Oklahoma oaks found in the red oak group include northern and southern red, black, Shumard, blackjack, water, willow and pin oaks. Common oaks found in the white oak group include white, post, bur, and chinkapin. Each group has certain unique characteristics that



**Figure 1. Individuals will find growing mighty oaks from tiny acorns to be an enjoyable challenge.**

should be considered when regenerating oaks from seed (see Table 1).













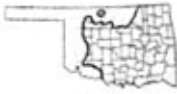


## The Acorn

Acorns of the red oak group take two years to mature on the tree while white oaks mature in one year. Red oak acorns exhibit dormancy. Dormancy means that seeds will germinate slowly or not at all unless subjected to cool, moist conditions for a period of time. Breaking this dormancy through a process known as "stratification" is done by simulating the natural conditions found on the forest floor over winter. Germination is the beginning of visible growth of a seed by rupture of the seed coat and the extension of shoots and roots. The white oak group does not exhibit dormancy and the seeds may germinate and produce young roots soon after seeds fall.



















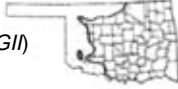


## Seed Collection

Acorns mature and fall from the tree in autumn months. A high proportion of the first to drop are often defective and will not germinate. Defective acorns are seeds which are worm infested or otherwise hollow. Once the main acorn crop starts

**Table 1. Characteristics of major Oaks found in Oklahoma.<sup>1</sup>**

								Germination Test Data <sup>2</sup> Use as guide for germinating acorns TEST DATA SHOWS THAT:		
								Cold (32-41°F)		
Region found in Oklahoma	Leaf	Acorn Shape	Ht. at Maturity (feet)	Min. seed bearing age (years)	between seed crops (years)	Interval Number of cleaned seeds/pound	Stratification period (days)	and Moist Germination period (days @degrees F)	Expected germination rate (percent)	
<b>RED OAK GROUP</b>										
Northern Red ( <i>Q. RUBRA</i> )				100	25	3-5	125	70	20 days @ 68	100
Southern Red ( <i>Q. FALCATA</i> )				90	25	1-2	540	30-90	30-57 @ 73-81	75-100
Black ( <i>Q. VELUTINA</i> )				90	20	2-3	245	30-60	30-50 @ 80/65	47
Shumard ( <i>Q. SHUMARDII</i> )				110	25	2-3	100	60-120	29-50 @ 90/70	72-82
Blackjack ( <i>Q. MARILANDICA</i> )				40	25	NA	500	30-60	NA	NA

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Water ( <i>Q. NIGRA</i> )				80	20	1-2	395	30-60	52-73 @ 86/70	60-94
Willow ( <i>Q. PHELLOS</i> )				100	20	1	462	30-90	45-100 @ 90/70	67
Pin ( <i>Q. PALUSTRIS</i> )				80	20	1-2	410	NA	NA	NA
<b>WHITE OAK GROUP</b>										
White ( <i>Q. ALBA</i> )				100	20	4-10	120	0	30-98 @ 86/68	50-99
Post ( <i>Q. STELLATA</i> )				60	25	2-3	380	0	45-60 @ 86/68	54-98
Bur ( <i>Q. MACROCARPA</i> )				100	35	2-3	75	30-60	40 @ 86/68	45
Chinkapin ( <i>Q. MUELLENBERGII</i> )				80	NA	NA	395	0	45@86/68	98

1 Numerous sources. Distribution maps and leaf shapes are taken from Elbert L. Little's revision of *Forest Trees of Oklahoma*, Oklahoma Forestry Division, State Department of Agriculture, Publication No. 1, Edition No. 12. Oklahoma City, OK 1982. Pages 71-91. Seed data summarized in *Seeds of Woody Plants in the United States*, Agriculture Handbook No. 450, USDA Forest Service, Washington, D.C. 1974. Pages 692-701.

2 Test data has shown that if seeds are stratified for specified period of time and germinated for specified period of time and temperature, the specified germination rate (last column) will be observed.

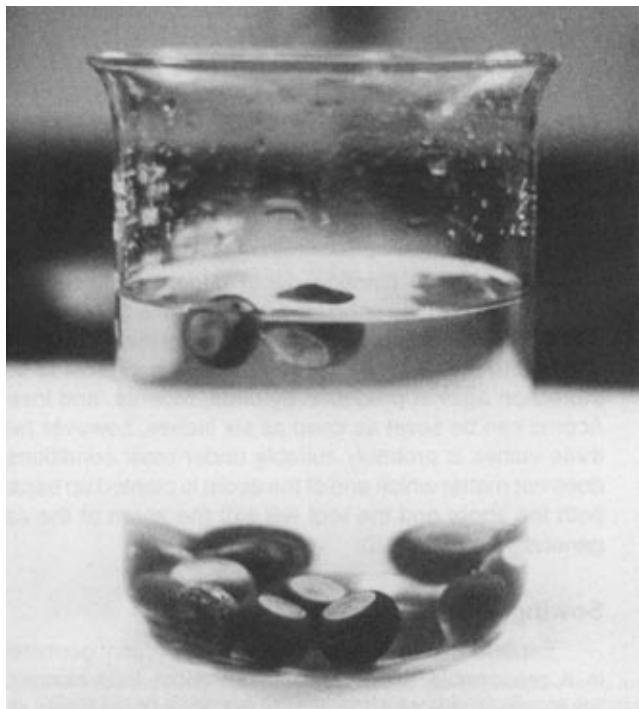
to fall, however, seed should be collected as soon as possible. It is important to inspect the seeds and discard any obviously damaged, moldy, and wormy acorns.

## Storage and Care

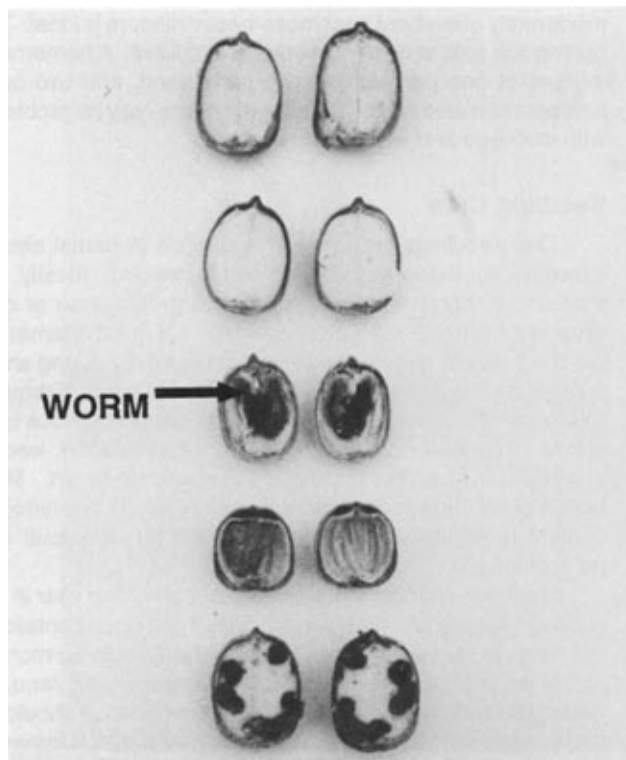
To store acorns for later use, place in heavy, 4-mil polyethylene bags and refrigerate at about 35°F. After a few days in storage, acorns should be “floated” in a container of water (Figure 2). Those acorns that float should be discarded (Figure 3). Floaters are empty seeds and will not germinate. After floating, remove acorns from the water and place back into storage. Maintaining moisture content of the acorns is important. An indication of proper moisture content is the accumulation of a few droplets of moisture on the inside of the storage bag. Bags should be opened periodically during storage and checked. Overly moist or immature acorns may develop a sweet, fermented smell. These should also be discarded. Although storing acorns will reduce germination to some extent, acorns of the red oak group can be stored under controlled conditions for up to three years. Acorns of the white oak group will start to germinate under storage conditions and should not be stored an extended period of time.

## Stratification

As previously noted, acorns of the red or black oak group are dormant and require a cool, moist treatment to stimulate germination. This treatment can be achieved by sowing in the fall or by an artificial treatment known as stratification. For best results, stratify in moist, but well-drained sand or a sand and moss mixture at a temperature of 32° to 41° F for 30 to 90 days prior to sowing (see table 1). After about 30 days in the treatment, the acorns should be checked to see if germination has begun (seed coat has broken and shoot development is



**Figure 2. Floating acorns is a good way to identify obvious rejects.**



**Figure 3. Discard obviously damaged, moldy, and wormy acorns. The above photograph shows the spectrum of oak seeds from healthy and viable acorns at the top to rejects in the middle and bottom of the photo.**

occurring). If germination has started the acorns should be planted.

## Growing Oak Seedlings

### Container Alternatives

A variety of containers can be successfully used to grow oak seedlings. Due to the very long taproot produced by oaks, a deep container (more than eight inches deep) is best. Several large holes in the bottom are necessary for drainage, and these allow the longest roots to emerge from the container where they may be pruned off. Container shape is also important. A square pot is ideal because it reduces the number of roots circling the container.

Specially designed pots for tree seedlings can be bought, but a common household item also meets these specifications; the cardboard milk carton. A quart milk carton with several one-half inch diameter drainage holes works well. A pint carton is somewhat small for season-long growth, while a half gallon is much larger than is needed.

Two or three acorns may be sown in each container, and any extra seedlings removed after a few weeks. Only one seedling should remain because two or more in a pot will result in badly tangled roots which will be very difficult to separate later.

### Growing Medium

The best growing medium for starting oak seedlings is similar to other potted plants. A light textured, rapid draining,

moderately absorbent peat moss-based mixture is ideal. The potting soil sold at most nurseries is excellent. A homemade mixture of one part topsoil, two parts sand, and two parts compost can also work well, although there may be problems with drainage and weed seeds.

### Seedling Care

Oak seedlings can grow well outside in partial shade. However, for indoor growth, full sun is needed. Ideally, the light should come from above, as in a greenhouse or cold frame. A sunny, south-facing window is a good alternative, but the pots will need to be turned almost daily during shoot flushes as the seedlings bend towards the light. Frequent rotating of the containers will prevent a permanent crook from forming in the stem. One month after germination, weekly applications of a dilute liquid fertilizer should begin. Most house plant fertilizers work well, especially if the nitrogen content is equal to or greater than the phosphorous and potassium.

Most oak seedlings are planted out after one year in the nursery. A good alternative, especially if pint sized containers are used, is to plant the seedling out when it is three months old. If the acorns are germinated in December and January, grow the seedlings indoors until March, when they should be moved outside to a sheltered location to harden off. One week later, the seedlings should be moved to a location similar to the planting site, to allow further acclimation to the elements. Removal from the pots and planting outside can occur in late March, allowing the seedlings two months to establish before the heat of summer.

Even if the seedlings are to remain in the pots for a year, they should be grown outside from spring to fall. Exposure to full sun and wind will produce stronger, hardier growth. The containers should at least be moved outside in early fall, and fertilization discontinued. The shorter daylight and cooler temperatures will cause the seedling to become dormant and prepare for winter. Overwintering seedlings in containers can be difficult due to freezing, drying, and rodent damage. Near a window of an unheated shed or garage makes a good overwintering site, as does a location between two buildings sheltered from direct sun and wind. Remember to continue watering the pots. The seedlings should be planted the next February or March.

More information on planting seedlings can be obtained from OSU Extension Facts No. 5024 entitled *Tree Seedling Availability, Planting, and Initial Care* which is available free of charge from you local OSU Extension Center.

### Direct Seeding of Oak Acorns

Another method of establishing oak is to plant seeds directly. This will allow nature to stratify and germinate the seed. Whereas this method is less costly in time and equipment, there are problems which reduce the amount of germination.

#### Site

Oaks and other deciduous tree species are sensitive to soil and site conditions. "Bottomland" oaks such as willow or water oak are better suited to wetter, poorly-drained sites

while "upland" oaks such as white oak or post oak are better suited to drier sites. Like most green plants, a moist but well-drained, loose, friable soil is ideal for trees.

A major problem encountered when attempting to use direct seeding as a method of reforestation is predation of the acorns by animals, especially rodents (Figure 4). This factor makes it impractical to plant acorns under the canopy of an existing forest where there is abundant cover for rodents. Forest openings larger than two acres or old fields relatively free of competing vegetation provide the best opportunities for successful seeding of oak.



**Figure 4. A problem with direct seeding of oak is pilferage by rodents and other animals. This problem can be overcome by not directly sowing seeds under the canopy of an existing forest where there is abundant cover or by placing protective guards around seeds.**

#### Timing

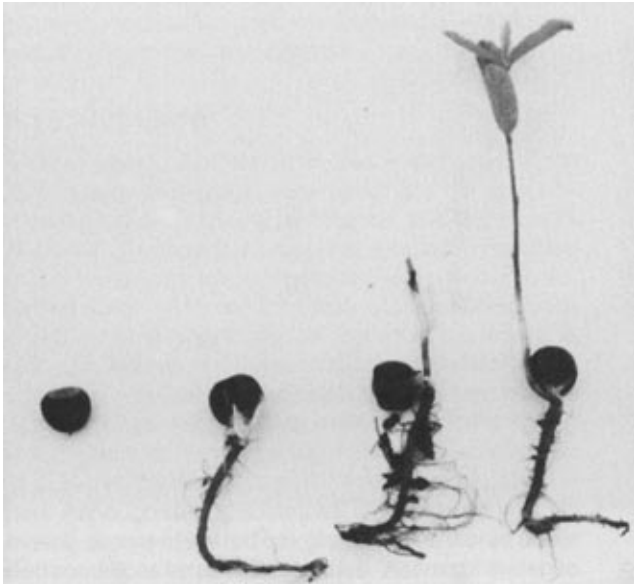
Acorns can be successfully planted at any time of the year. In Oklahoma, late February and March is probably the best time for sowing, earlier in the southern part of the state and later in the northern part. This allows germination to begin as soon as temperatures and moisture conditions are favorable. Direct seeding will provide additional advantages on sites which flood because of timing delays. If conditions such as flooding are restrictive at planting time, seeding can be delayed until the water recedes. Planting bare-root oak seedlings should be done only during the dormant season.

#### Seeding Depth

The optimum planting depth depends on acorn size which varies among species. Larger acorns may be planted deeper than smaller acorns. It is important that the acorns be covered to maintain moisture conditions and provide some protection against predation by birds, rodents, and insects. Acorns can be sown as deep as six inches, however two to three inches is probably suitable under most conditions. It does not matter which end of the acorn is planted up because both the shoot and the root will exit the acorn at the same general spot (Figure 5).

#### Sowing Rates

Experience has shown that about 35 percent germination is a reasonable expectation under most field conditions. Thus, sowing about 1500 acorns per acre should yield about 500 seedlings per acre after the first season. Normal losses should still result in 200-400 seedlings per acre after 10 years.



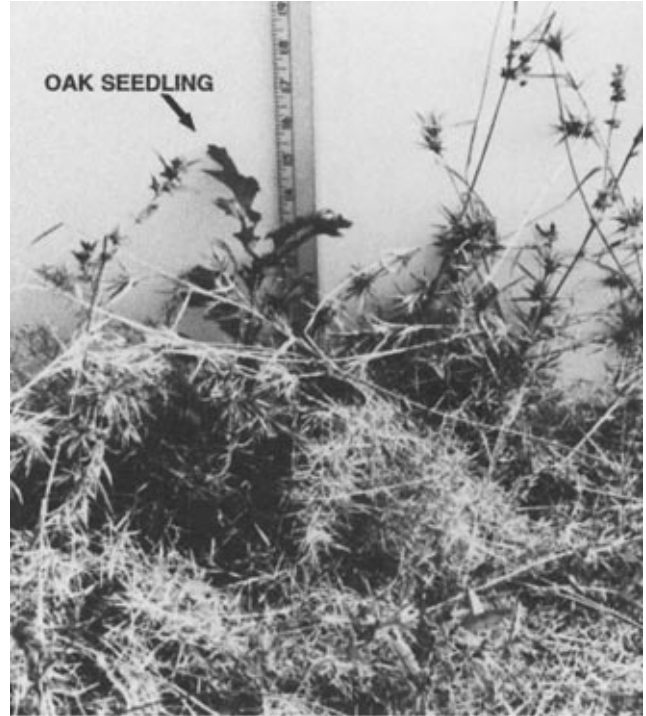
**Figure 5. The photograph above shows the transformation of a water oak seed to a seedling. Note that the shoot and the root exit the seed at the same spot.**

### Plantation Care

Control of competing vegetation has been found to improve the growth of planted oak seedlings and seeded oaks (Figure 6). Oaks, in general, will tolerate some side competition and continue to develop if they receive direct sunlight from overhead. Growth rates depend on species and site conditions. Shoot growth of young oaks is often slow at first. This is due to the tree devoting early energies to the development of a large root system. For more information on plantation care, refer to OSU Extension Facts No. 5025 entitled *Early Protection and Care for Planted Seedlings* which is available free of charge from your local OSU Extension Center.

### Summary

Oak trees provide many benefits to Oklahoma citizens, wildlife and the environment. The planting of oak seeds or



**Figure 6. Oak seedlings need care after planting. Competing vegetation crowds out seedlings and provides cover for animals who pilfer seeds, browse sprouts, and girdle stems.**

seedlings can be an enjoyable activity for landowners, youth groups, and other interested people. Several species of oaks are found in Oklahoma. The collection, storage, stratification and germination of oak seeds are important in bringing acorns to life. Once the oak has emerged from its seed, the type of container, growing medium, and regular care are important factors of successful seedling production.

Oaks naturally regenerate in the forest from seed fall and stump sprouts. Through the careful duplication of natural processes, oaks trees can be successfully raised from acorns.

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