

Quercus nuttallii Palmer

Nuttall Oak

Fagaceae Beech family

T. H. Filer, Jr.

Nuttall oak (*Quercus nuttallii*), not distinguished as a species until 1927, is also called red oak, Red River oak, and pin oak. It is one of the few commercially important species found on poorly drained clay flats and low bottoms of the Gulf Coastal Plain and north in the Mississippi and Red River Valleys. The

acorn or winter buds identify Nuttall oak, easily confused with pin oak (*Q. palustris*). The lumber is often cut and sold as red oak. In addition to producing timber, Nuttall oak is an important species for wildlife management because of heavy annual mast production.

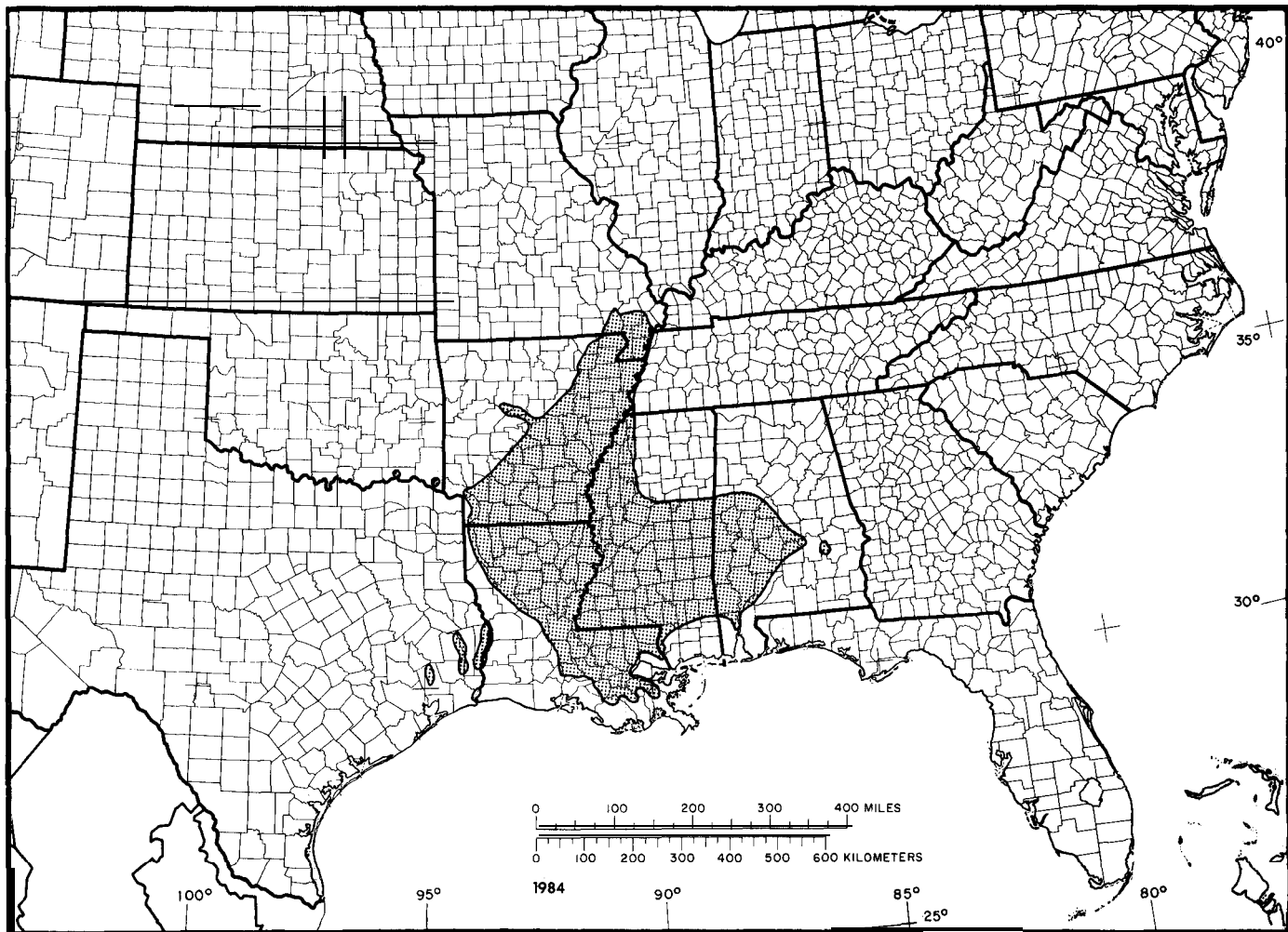


Figure 1—The native range of Nuttall oak.

The author is Principal Plant Pathologist, Southern Forest Experiment Station, New Orleans, LA.



Figure 2—*Nuttall* oak growing on Dowling clay soil on the Tallahatchie National Forest in Mississippi.

Habitat

Native Range

Nuttall oak (fig. 1) grows on bottom lands along the Gulf Coastal Plain from Florida west to southeastern Texas. North in the Mississippi Valley,

it is found in Arkansas, southeastern Oklahoma, southeastern Missouri, and western Tennessee. It develops best on the alluvial bottom lands of the Mississippi River and its tributaries.

Climate

The climate throughout the range of Nuttall oak is humid. Rainfall is between 1270 to 1650 mm (50 to 65 in) per year; 630 to 760 mm (25 to 30 in) fall during the effective growing season, April through August. At the northern limits of the range, 2.5 to 12.5 cm (1 to 5 in) of the total precipitation falls as snow. Maximum summer temperature averages 27° C (80° F) while the winter average varies from 7° to 13° C (45° to 55° F). The extreme high and low temperatures are 43° to -26° C (110° to -15° F) (23).

Soils and Topography

Nuttall oak grows well on heavy, poorly drained, alluvial clay soils in the first bottoms of the Mississippi Delta region (fig. 2) (17,24), performing best on soils with a pH of 4.5 to 5.5 (1,7). It is common on clay ridges but is not found in permanent swamps or on well-drained loam. Typically, it grows on clay flats that are normally covered with 8 to 20 cm (3 to 8 in) of water throughout the winter. The tree is less common on clay or silty clay flats and sloughs on the terrace of major streams. In the Coastal Plain, Nuttall oak grows mostly in alluvial river bottoms on sites similar to those described for the Delta (24). In general, Nuttall oak grows on soils primarily in the orders Inceptisols and Entisols.

Associated Forest Cover

Nuttall oak is a chief component of the forest cover type Sweetgum-Willow Oak (Society of American Foresters Type 92) (8). Water oak replaces willow oak (*Q. phellos*) in the southernmost part of the type's range. The species is found in five other types: Sugarberry-American Elm-Green Ash (Type 93), Sycamore-Sweetgum-American Elm (Type 94), Overcup Oak-Water Hickory (Type 96), Baldcypress (Type 101), and Baldcypress-Tupelo (Type 102).

Other trees associated with Nuttall oak are cedar elm (*Ulmus crassifolia*), laurel oak (*Quercus laurifolia*), bur oak (*Q. macrocarpu*), red and silver maple (*Acer rubrum* and *A. saccharinum*), black willow (*Salix nigra*), honeylocust (*Gleditsia triacanthos*), and persimmon (*Diospyros virginiana*).

Noncommercial tree and shrub associates are roughleaf dogwood (*Cornus drummondii*), hawthorn (*Crataegus* spp.), swamp-privet (*Forestiera*

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acuminata), buttonbush (*Cephalanthus occidentalis*), and water-elm (*Planera aquatica*) (24).

Life History

Reproduction and Early Growth

Flowering and Fruiting-Nuttall oak is monoecious. The male and female flowers appear in March and April at the time of leaf flushing. The male flower appears 10 to 14 days before the female flower. Male flowers are borne in clustered, yellowish-green catkins. Inconspicuous female flowers are borne in the axils of the new leaves and are found only by close examination. The flowers are wind pollinated. The acorns ripen from September to October of the second year and fall between September and February.

Seed Production and Dissemination-Young trees about 20 years old produced good seed crops for several years at Stoneville, MS; this is probably the age at which optimum seed-bearing begins. In the TVA arboretum at Norris, TN, 5-year-old trees bore acorns. There are generally good seed crops every 3 or 4 years, and the average tree yields 6 to 35 kg (13 to 77 lb) of clean nuts in 9 to 53 liters (0.25 to 1.5 bushels). The nuts average 209/kg (95/lb) (27). Water, rodents, and birds disseminate the seed.

Seedling Development-Nuttall oak seeds require 60 to 90 days cold stratification. They overwinter and germinate in the spring when soil temperatures are 21° to 32° C (70° to 90° F) (27). Seed germination percentages average 60 to 90 percent but germination varies by size and may be reduced by acorn weevil damage. Larger acorns had somewhat higher germination rates than smaller ones. The percent of germination was unaffected even when seeds were submerged in water for as long as 34 days (5). Germination is hypogeal (27). The best natural seedbed for most Nuttall oaks is a moist soil, covered with an inch or more of soil or leaf litter with partial shade (12).

Although rodents, turkeys, deer, and hogs eat many of the seeds, natural reproduction in the bottom lands is usually abundant. Seedlings are often killed by high water during the growing season, but seedling survival, date of budbreak, or height growth are not significantly affected. When grown, in saturated soil for 16 weeks in winter and spring (3), Nuttall oak seedlings become established both in the open or in shade, and can survive 5 to 10 years in the shade (15). Strong tap roots are developed (13).

Mycorrhizal roots were common on seedlings growing in green-tree reservoir plots (9).

Vegetative Reproduction-Methods for propagating Nuttall oak from cuttings or by grafting have not been developed. When attempted, air-layering has not been successful (2). Stumps of small trees sprout readily, but those of older trees do not.

Sapling and Pole Stages to Maturity

Growth and Yield-Nuttall oak grows rapidly with a 5-year average of 4.08 m (13.4 ft) height growth and 0.006 m³ (0.2 ft³) increase in stem volume (17,18,19). Second-growth trees reach a merchantable size, 60 cm (24 in) in d.b.h. in about 70 years. Trees 30 to 37 m (100 to 120 ft) tall and 90 cm (36 in) and larger in d.b.h. are common in old stands, but even trees of good quality degenerate rapidly soon after they mature.

A 10 cm (4 in) diameter growth in 10 years is common but 20 cm (8 in) is possible. By impounding winter and spring rainfall, radial tree growth was increased by about 38 percent as compared to that of untreated trees (6).

On poor sites the wood of this oak is knotty, and insect damage and mineral stain are severe. Several successive years of drought and channelization of waterways may lower the water table on what normally would be good Nuttall oak sites and cause trees of all ages to die (24).

Rooting Habit-No information available.

Reaction to Competition-Nuttall oak is classed as intolerant of shade; seedlings survive and grow rapidly only in openings. The tree is almost always dominant or codominant (13,14,16).

Damaging Agents-Acorn weevils (*Curculio* spp.) can reduce acorn germination by causing damage to developing acorns. The carpenterworm (*Prionoxystus robinise*) causes heavy damage to Nuttall oak. Other borers that cause timber defects are the red oak borer (*Enaphalodes rufulus*), the white oak borer (*Goes tigrinus*), others of the genus *Goes*, the oak sapling borer (*G. tessellatus*), and the hardwood stump borer (*Stenodontes dasytomus*). The clearwing borer (*Paranthrene simulans*) creates an entry point for rot and stain fungi, causing additional defects. Estimated loss from borer defects in oak lumber is approximately \$40 million per year (25). Other borers infect twigs, branches and roots, reducing growth and vigor, but do no damage to the merchantable parts of the tree.

A serious insect-caused defect in Nuttall oak lumber is bark pocket caused by the sap-feeding beetles (*nitidulids*) in combination with the carpenterworm and several other borers (22). Periodic outbreaks of defoliating insects such as basswood leafminer (*Baliosus nervosus*) and pink striped oakworm (*Anisota virginiensis*) retard growth rates of oaks over large geographical areas (26).

Nuttall oak is subject to attack by three important canker rot fungi. All enter the trunk through dead branch stubs by germination of airborne spores. The cambium is killed, rough cankers are induced around the entry point, and the heartwood is decayed. The resulting cankers are called hispidus, spiculosa, or Irpex, depending on the causal fungi—*Polyporus hispidus*, *Poria spiculosa*, and *Spongipellis pachydon* respectively (21). Nuttall oak growing north of 35° latitude may be killed by oak wilt (*Ceratocystis fagacearum*). Daily temperatures above 30° C (86° F) reduce development of the disease (20).

Anthracnose (*Gnomonia quercina*) and Actinopelte leaf spot (*Actinopelte dryina*) cause defoliation in some years (26).

Special Uses

Nuttall oak is an important species in green-tree reservoirs, where ducks feed on the acorns (10). Acorns contain 13 percent crude fat and 46 percent carbohydrates (4). In Louisiana, it is considered one of the best mast-producing species. Acorn crops rarely fail (11).

During periods of winter flooding, squirrels find a ready supply of acorns, since many acorns remain on the tree into January. Acorns are favored by deer and also eaten by turkeys.

Genetics

No racial variations or hybrids have been reported. North of Memphis, TN, this tree is easily confused with *Q. palustris* (pin oak).

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