

Quercus nigra L. Water Oak

Fagaceae Beech family

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Water oak (*Quercus nigra*), sometimes called possum oak or spotted oak, is commonly found along southeastern watercourses and lowlands on silty clay and loamy soils. This medium-sized rapid-growing tree is often abundant as second growth on cutover lands. It is also planted widely as a street and shade tree in southern communities.

Habitat

Native Range

Water oak (figs. 1, 2) is found along the Coastal Plain from southern New Jersey and Delaware south to southern Florida; west to eastern Texas; and north

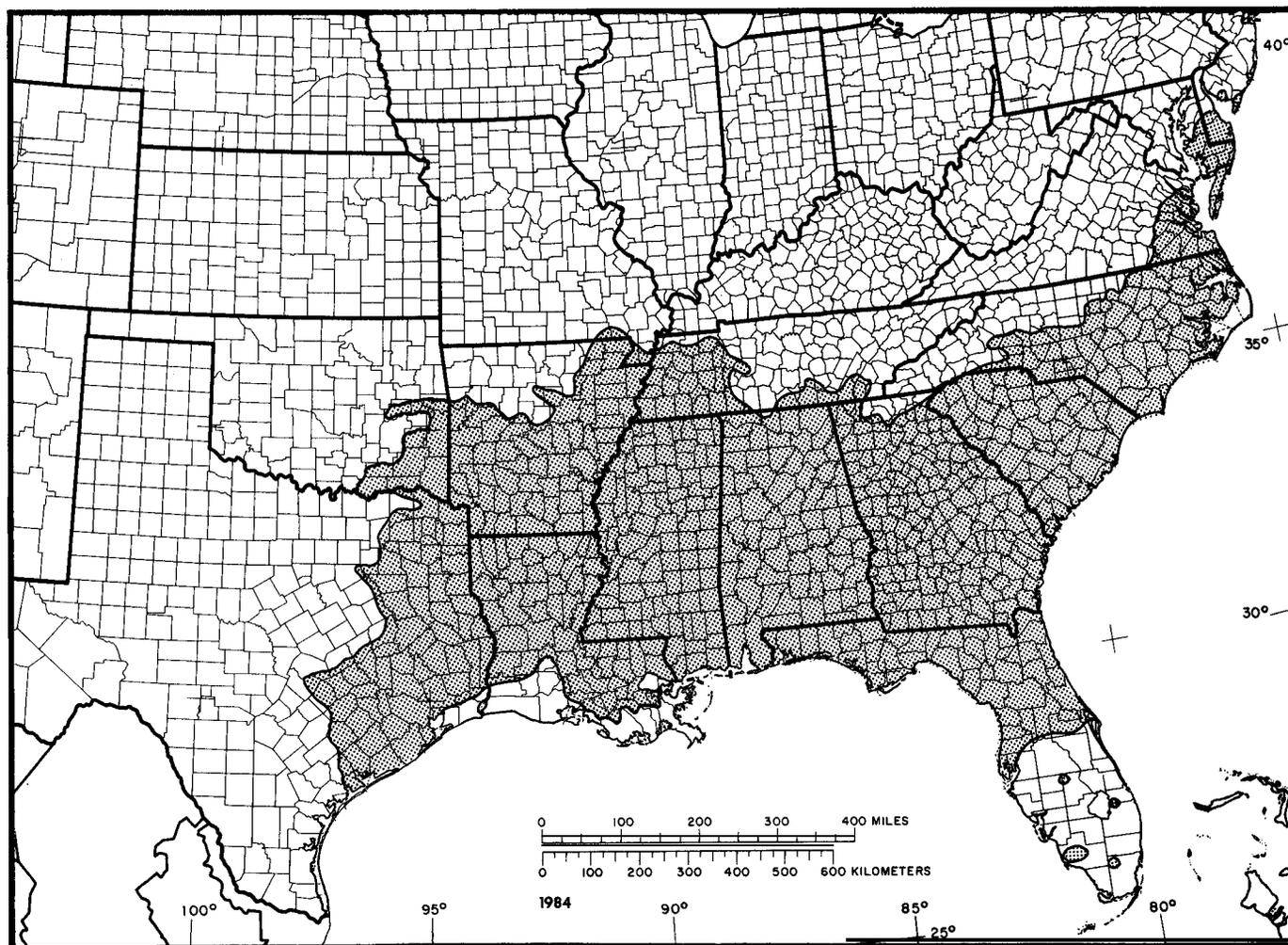


Figure 1--The native range of water oak.

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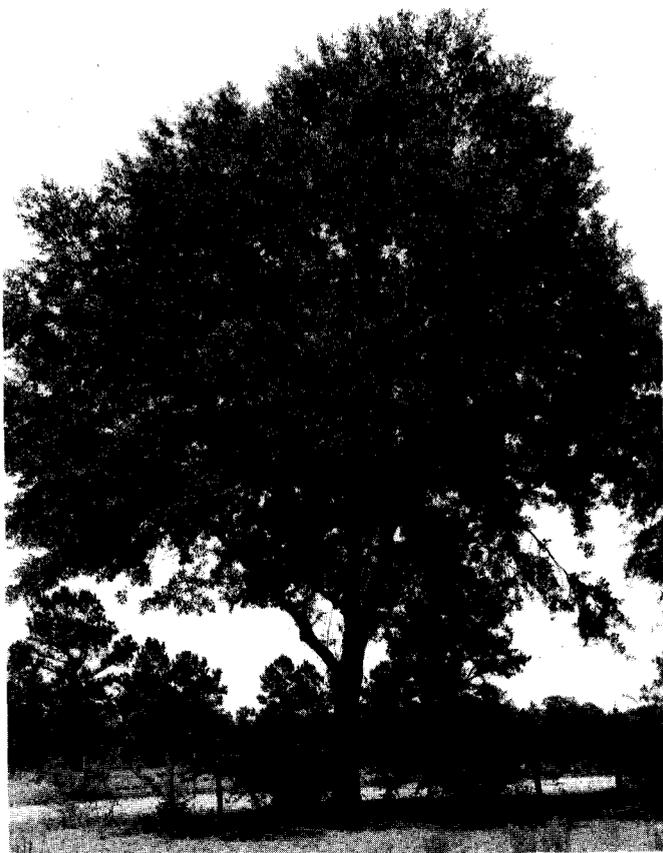


Figure 2-Water oak.

in the Mississippi Valley to southeastern Oklahoma, Arkansas, Missouri, and southwestern Tennessee (3).

Climate

Water oak grows well along small streams or moist upland soils with 1270 to 1520 mm (50 to 60 in) annual rainfall during the frost-free period. Annual snowfall over the range varies from 0 to 50 cm (0 to 20 in) with 200 to 260 frost-free days. Summers of the southern-central range are warm and dry. July high temperatures vary from 21° to 46° C (70° to 115° F) and January low temperatures from 2° to -29° C (35° to -20° F) (7).

Soils and Topography

Water oak appears on a wide variety of sites ranging from wet bottom lands to well-drained uplands. Best development and highest quality are found on the better-drained silty clay or loamy soils on high flats or ridges of alluvial stream bottoms. Water oaks are commonly found on soils of the order Inceptisols

(9). On low flats with poorly drained clay soils, tree form and quality are poor. Water oak can survive on moist upland sites.

Associated Forest Cover

Water oak is associated with the following tree species: willow oak (*Quercus phellos*), laurel oak (*Q. laurifolia*), Nuttall oak (*Q. nuttallii*), cherrybark oak (*Q. falcata*), white oak (*Q. alba*), swamp chestnut oak (*Q. michauxii*), American beech (*Fagus grandifolia*), sweetgum (*Liquidambar styraciflua*), pecan (*Carya illinoensis*), American elm (*Ulmus americana*), slippery elm (*U. rubra*), winged elm (*U. alata*), blackgum (*Nyssa sylvatica*), green ash (*Fraxinus pennsylvanica*), white ash (*I? americana*), yellow-poplar (*Liriodendron tulipifera*), southern magnolia (*Magnolia grandiflora*), flowering dogwood (*Cornus florida*), rough-leaf dogwood (*C. drummondii*), honeylocust (*Gleditsia triacanthos*), Carolina laurelcherry (*Prunus caroliniana*), hawthorn (*Crataegus* spp.), American hornbeam (*Carpinus caroliniana*), sugarberry (*Celtis laevigata*), swamp privet (*Forestiera acuminata*), as well as several softwoods including spruce pine (*Pinus glabra*), loblolly pine (*P. taeda*), longleaf pine (*I? palustris*), and slash pine (*P. elliottii*) (6).

Water oak is classified as a bottom-land forest cover type Willow Oak-Water Oak-Diamondleaf Oak (Society of American Foresters Type 88) (6). It is also an associated species in Live Oak (Type 89) and Sweetbay-Swamp Tupelo-Redbay (Type 104).

Life History

Reproduction and Early Growth

Flowering and Fruiting-Water oak is monoecious; staminate flowers are in hanging catkins and pistillate flowers are in few-flowered, short-stalked clusters on the same tree. They develop shortly before or at the same time as the new leaves. Staminate flowers are produced near the tip of the previous year's growth, while pistillate flowers are produced in the junction of the current year's growth (5). The fruit, an acorn, matures about September of the second year. The embryo has no endosperm but two large, fleshy cotyledons (4).

Flowers are easily killed by late frosts after leaf buds open. The trees then defoliate and develop new leaves but do not generate a second crop of flowers.

Seed Production and Dissemination-Trees bear seed at about age 20 and production seems to alternate between prolific and lean years. Mature trees yield 9 to 53 liters (0.25 to 1.5 bu) of acorns in

a good year, with about 64.4 kg/ha (50 lb/bu). The average for cleaned seeds is 880/kg (400/lb) (4). Generally, viable acorns sink in water, while those that float probably will not germinate. Water oak acorns are naturally disseminated by animals and water.

Seedling Development-Under controlled conditions, water oak acorns require a pregermination treatment to overcome dormancy. Under natural conditions, they germinate the spring following maturation. They may be induced to germinate by stratification for 30 to 40 days in moist sand at 30° to 32° C (86° to 90° F) during light cycles and for a 52- to 73-day period at 20° to 21° C (68° to 70° F) during dark cycles. Expect 60 to 94 percent germination after 31 to 73 days. Germination is hypogeal (4).

Seedlings require abundant moisture the entire growing season but do not tolerate prolonged submersion. Under optimum conditions water oak grows at a rate of 60 cm (24 in) per year for the first 25 years (7).

Sapling and Pole Stages to Maturity

Growth and Yield-Water oak can grow to 38 m (125 ft) on a site index range of 18.3 to 33.5 m (60 to 110 ft) at base age 50 years (1). It prunes itself slowly, developing a straight, slender main trunk. Growing quickly on favorable sites, it can produce 15 to 30 cm (6 to 12 in) of d.b.h. growth in 10 years. It can grow 7.8 cm (3.1 in) in d.b.h. in 10 years while in the 36 to 46 cm (14 to 18 in) diameter class; and 7.4 cm (2.9 in) in the 51 to 71 cm (20 to 28 in) class (7). Water oak has a shallow, spreading rooting habit.

Rooting Habit-No information available.

Reaction to Competition-Water oak does not compete well with other species because of its slow early growth and its intolerance to shade and competition. It is a subclimax tree. Water oak germinates under shade, but seedlings require moderate light for development. Epicormic branching is common for water oak in suppressed to intermediate crown position. Stumps will sprout, but vegetative propagation is not economically practical as a management procedure (7).

Water oak is easily injured by fire and even a light burn kills stems of seedlings. Survivors are extremely susceptible to butt rot.

Damaging Agents-Natural enemies of water oak are primarily insects and microorganisms (2,7,8). Insects include trunk borers (*Enaphalodes* sp. and *Prionoxystus* sp.) and leaf hoppers (*Erythroneura* sp.). The more noticeable diseases include cone rusts

(*Cronartium* spp.), root rot (*Ganoderma curtisii*), and trunk canker and heart rot caused by a variety of organisms. Additionally, water oak is susceptible to parasitism by mistletoe (*Phoradendron flavescens*). Herbicides such as 2,4,5-T and picloram compounds are toxic to water oak. It is also highly susceptible to air pollution, probably to sulfur dioxide in particular.

Special Uses

Water oak is particularly suited for timber, fuel, wildlife habitat, and environmental forestry (4). It has been widely planted in southern communities as a shade tree. Its veneer has been successfully used as plywood for fruit and vegetable containers (8).

Genetics

There are no reported racial variations of water oak. It hybridizes with other oak species as follows (3): *Quercus falcata* (*Q. x garlandensis* Palmer), *Q. incana* (*Q. x caduca* Trel.), *Q. laevis* (*Q. x walteriana* Ashe), *Q. marilandica* (*Q. x sterilis* Trel.), *Q. phellos* (*Q. x capesii* W. Wolf.), *Q. shumardii* (*Q. x neopalmeri* Sudw.), and *Q. velutina* (*Q. x demareii* Ashe).

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