

Quercus bicolor Willd. Swamp White Oak

Fagaceae Beech family

Robert Rogers

Swamp white oak (*Quercus bicolor*) is a medium-sized tree of the north central and northeastern mixed forests. It is found in lowlands, along edges of streams, and in swamps subject to flooding. It is rapid growing and long lived, reaching 300 to 350 years. The hard strong wood is commercially valuable and is usually cut and sold as white oak. Many kinds of wildlife eat the acorns, particularly ducks.

Habitat

Native Range

Swamp white oak, a lowland tree (figs. 1,2), grows from southwestern Maine west to New York, southern Quebec, and southern Ontario, to central Michigan, northern Wisconsin, and southeastern

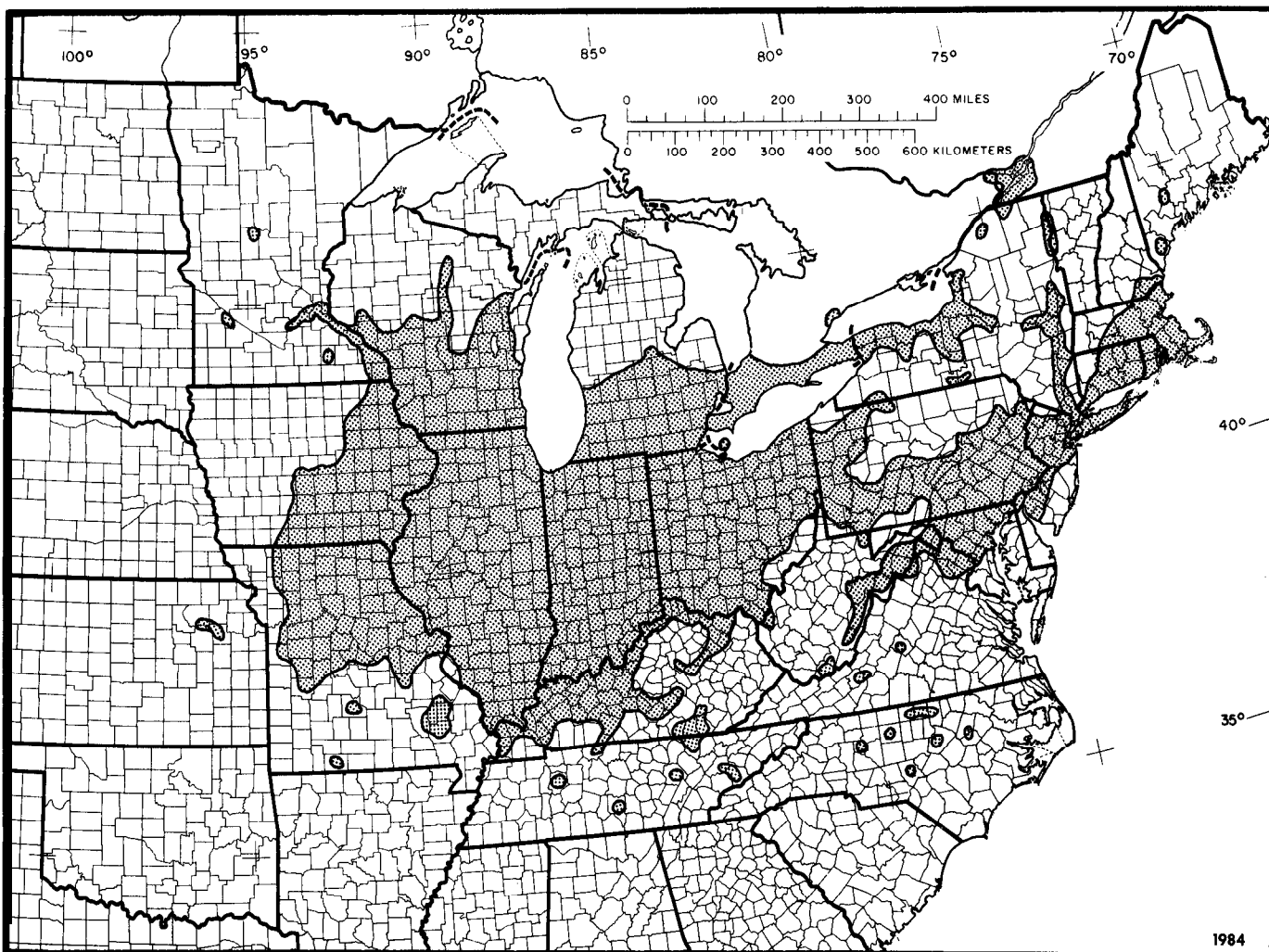


Figure 1-The native range of swamp white oak.

The author is Mensurationist and Professor of Forestry at the University of Wisconsin, Stevens Point.



Figure 2 Swamp white oak.

Minnesota; south to Iowa and Missouri; east to Kentucky, Tennessee, Virginia, and New Jersey. It is scattered in North Carolina and northeastern Kansas. This species is most common and reaches its largest size in western New York and northern Ohio (4).

Climate

Within the range of swamp white oak, mean annual temperatures vary from 16° C (60° F) in Arkansas to 4° C (40° F) in southern Ontario. Extremes in temperature vary from 41° C (105° F) to -34° C (-30° F). Average annual precipitation is from 640 mm (25 in) in southeast Minnesota to 1270 mm (50 in) in northeast Arkansas. The frost-free period ranges from 210 days in the southern part of the growing area to 120 days in the northern part (4).

Soils and Topography

Throughout its range, swamp white oak is typically found on hydromorphic soils. These may be mineral soils that are imperfectly to poorly drained,

as evidenced by high water tables and the presence of glei subsurface layers, or both; organic soils ranging from mucks (well decomposed) to peats (poorly decomposed) in which high water levels have favored organic accumulation; or alluvial soils underlain by a glei layer. These kinds of soils are associated with lands that are periodically inundated, such as broad stream valleys, low-lying fields, and the margins of lakes, ponds, or sloughs. Swamp white oak is not found where flooding is permanent (2,4,5,6,8). In general, the soils on which this oak most commonly is found are in the orders Entisols and Inceptisols.

Associated Forest Cover

Swamp white oak is a consistent though mostly a minor component of hydromesophytic forest communities in which other species usually dominate. Tree species that commonly grow in association with swamp white oak are pin oak (*Quercus palustris*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), silver maple (*A. saccharinum*), American elm (*Ulmus americana*), eastern cottonwood (*Populus deltoides*), sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), bur oak (*Quercus macrocarpa*), shellbark and shagbark hickory (*Carya lucinosa* and *C. ovata*), blackgum (*Nyssa sylvatica*), black willow (*Salix nigra*), and American basswood (*Tilia americana*) (3,4,6).

Swamp white oak occurs in four forest cover types: Black Ash-American Elm-Red Maple (Society of American Foresters Type 39), Bur Oak (Type 42), Silver Maple-American Elm (Type 62), and Pin Oak-Sweetgum (Type 65). It is usually found singly in these types but occasionally may be abundant in small areas (6).

Life History

Reproduction and Early Growth

Flowering and Fruiting—Swamp white oak is monoecious; male and female flowers appear on the same tree in the spring at about the time leaves are one-third developed (May to June). The fruit, an acorn, matures in 1 year and is generally paired and borne on slender stalks from 3 to 8 cm (1.25 to 3.25 in) long. The ovoid acorns, each 19 to 32 mm (0.75 to 1.25 in) long and 13 to 19 mm (0.5 to 0.75 in) in diameter, fall during September and October.

Seed Production and Dissemination—Good

crops of swamp white oak occur every 3 to 5 years, with light crops during intervening years. The minimum seed-bearing age is 20 years, optimum age is

75 to 200 years, and maximum age is usually 300 years. Because the seed of swamp white oak is not dormant, it germinates soon after falling. Seed collections should be made soon after ripening in order to delay early germination. These acorns are difficult to store without germination or loss of viability occurring. Sound acorns have a germinative capacity between 78 and 98 percent. Gravity, rodents, and water are the primary dispersing agents (4,10).

Seedling Development-Germination is hypogeal (10). After acorns germinate in the fall, roots continue to develop until growth is limited by low temperatures. Seedling establishment and early growth seem to be favored on the better drained lowland soils rather than on sites that are poorly drained or subjected to persistent flooding. In any case, adequate moisture and light are necessary for successful early development (4,8).

Vegetative Reproduction-Like most oaks, swamp white oak produces seedling sprouts or stump sprouts when the top is cut or killed. The frequency of sprouting declines, however, with increasing d.b.h. (8):

D.b.h. class		Stumps likely to sprout
<i>c m</i>	<i>in</i>	<i>percent</i>
15 to 27	6 to 10	75
27 to 39	11 to 15	30
39 to 52	16 to 20	10
52+	20+	5

Sapling and Pole Stages to Maturity

Growth and Yield-On the better drained lowland soils, the growth rate of swamp white oak is comparable to that of white oak. The root system is usually shallow, but the tree is relatively long lived—up to 300 years or more. Normally it is a medium-sized tree, 18 to 23 m (60 to 75 ft) in height and 61 to 91 cm (24 to 36 in) d.b.h., although trees up to 30 m (100 ft) tall and 213 cm (84 in) d.b.h. have been reported.

Swamp white oak normally grows in mixtures with other bottom-land species and is abundant only locally. Individual old growth trees may contain as much net volume as 3.4 m³ (600 fbm) but this is uncommon (4).

Rooting Habit-No information available.

Reaction to Competition-The tree is classed as intermediate in tolerance to shade, and seedlings become established under moderate shade. Lowland

forests in which swamp white oak grows are characterized by instability and successional uncertainty because of the variable effects of flooding, together with the presence of saturated soils. Swamp white oak may achieve dominance on the better drained lowland soils together with basswood, northern red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), and sugar maple (*Acer saccharum*) (8). Once established, it is able to compete effectively with American elm, green ash, and black willow. Limited current evidence indicates clearcutting to be an adequate silvicultural system, particularly on the better sites (2,8).

In forest stands swamp white oak has a straight bole with ascending branches and a narrow crown. However, open-grown trees are generally poorly formed and often have persistent lower branches (4).

Damaging Agents-Windthrow may be a problem especially in recently thinned stands.

Disease and insects affecting swamp white oak are essentially the same as those found on white oak. Oak anthracnose can be damaging to individual trees but is generally not fatal. Swamp white oak is susceptible to the oak wilt fungus (*Ceratocystis fagacearum*) and in Illinois *Phomopsis* canker and *Coniothyrium* dieback were found on this oak. In addition, an *Alternaria* fungus was found on blighted petioles (4,7).

Special Uses

The acorns are sweet, like others in the white oak group, and are eaten by squirrels and other rodents (9). In a study in Wisconsin, swamp white oak acorns were found to make up 27 percent of the diet of wild ducks. Several nongame bird species include these acorns in their diet (4).

Genetics

Two forms of swamp white oak have been described: a mesophytic form with leaves that are green and velvety on the lower surface and a more xerophytic form with leaves that are white-tomentulose beneath. The following six hybrids with swamp white oak are recognized: *Quercus x jackiana* Schneid. (*Q. bicolor x alba*); *Q. x humicola* Palmer (*Q. bicolor x lyrata*); *Q. x schuettei* Trel. (*Q. bicolor x macrocarpa*) (1); *Q. x introgressa* P. M. Thomson (*Q. bicolor x muehlenbergii x prinoides*) (11); *Q. x stellata* Trel. (*Q. bicolor x stellata*); *Q. x nessiana* Palmer (*Q. bicolor x virginiana*). Swamp

white oak also hybridizes with chestnut oak (*Quercus prinus*) and English oak (*Q. robur*).

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