Quercus lyrata Walt. Overcup Oak

Fagaceae **Beech family**

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Overcup oak *(Quercus lyrata)*, also called swamp post oak, swamp white oak, and water white oak, is quite tolerant of flooding and grows slowly on poorly drained flood plains and swamp lands of the Southeastern United States. It may take 30 years before overcup oak produces acorns. Wildlife use them as food. The quality of the lumber varies greatly and the wood may check and warp during seasoning. It is cut and sold as white oak.

Habitat

Native Range

Overcup oak (fig. 1) inhabits the wetter sites in bottom lands of the Coastal Plain from Delaware and Maryland south to Georgia and northwestern Florida; west to eastern Texas. It grows northward in the Mississippi Valley to southeastern Oklahoma,

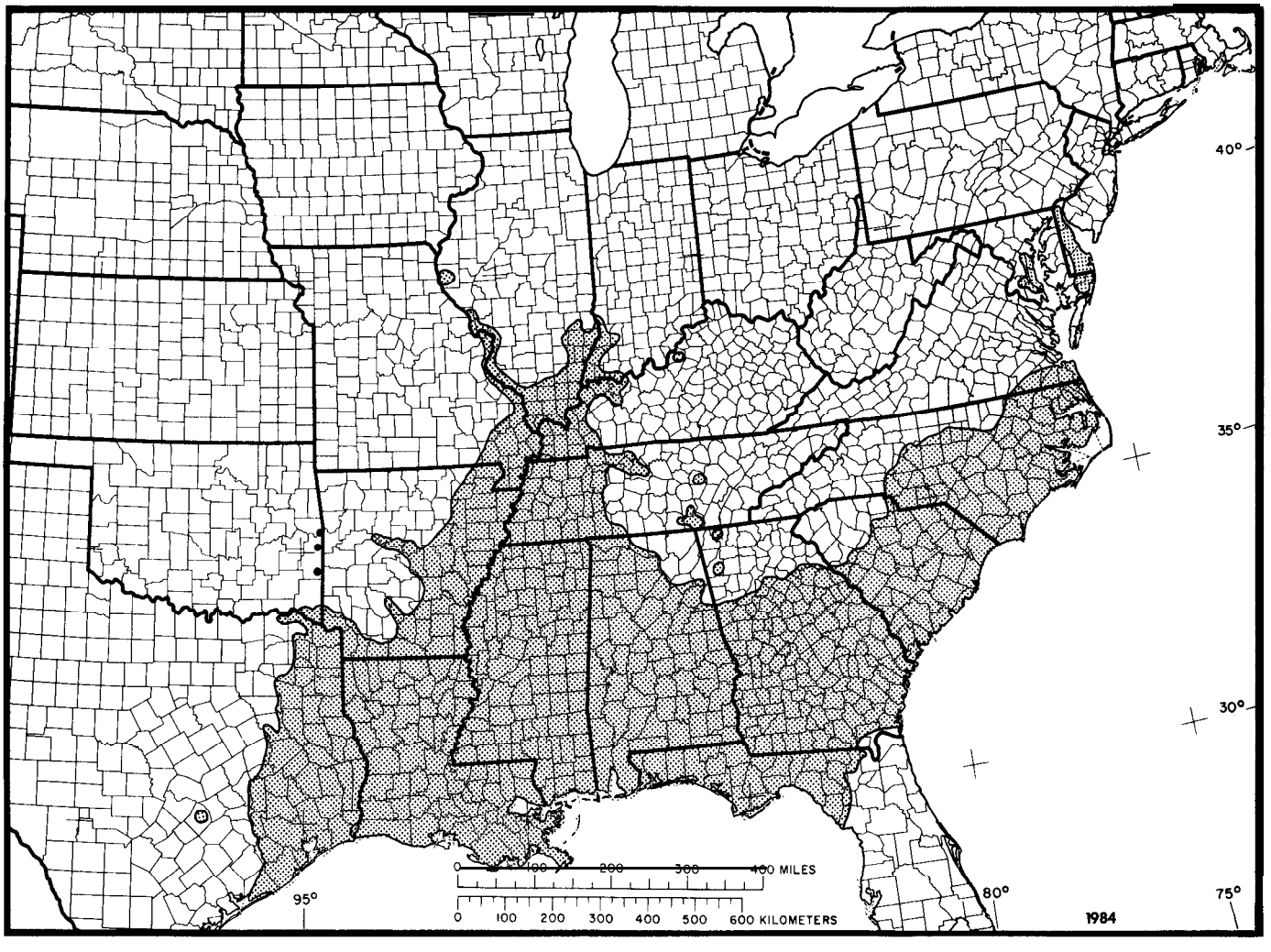

Figure *l-The native range of overcup* oak.

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southeastern Missouri, southern Illinois, southwestern Indiana, and western Kentucky (8).

Climate

The climate is warm and humid throughout the range of overcup oak *(10)*. In the region where the species grows best, total precipitation averages 1140 to 1520 mm (45 to 60 in) per year of which 510 to 760 mm (20 to 30 in) is received during the April-to-September growing season. Snow fall is 2.5 to 12.5 cm (1 to 5 in). The mean January temperature is about 7" C (45" F) and mean July temperature is about 28" C (82" F). Temperature extremes are -29" C (–20° F) and 46" C (115" F).

Soils and Topography

Overcup oak (fig. 2) is found on poorly drained, alluvial, clayey soils mainly on southern river flood plains *(13)*. It is most prevalent on low lying clay or silty clay flats in first bottoms and terraces of the larger streams *(15)*. It is also quite common on the edges of swamps, sloughs, and bayous; in poorly drained depressions or sink holes on ridges; and in shallow swamps and sloughs *(12)*. Overall it is most commonly found growing on soils in the orders Inceptisols and Alfisols. The overcup oak-water hickory type is often predominant on poorly drained backwater flats and small shallow sloughs commonly flooded for a few weeks after the growing season begins *(10)*. Overcup oak is one of the trees most tolerant of flooding (3). Since it leafs out a month or more later than most species, it is better able to endure submergence from late spring floods. In tests, overcup oak survived continuous flooding for at least two growing seasons. In spite of its natural occurrence on wet clay sites, overcup oak grows best on sites with better drainage and soil texture *(10)*.

Figure 2—*Bottom land stand of overcup* oak.

Associated Forest Cover

Overcup oak is usually a dominant species only in the forest cover type Overcup Oak-Water Hickory (Society of American Foresters Type 96) *(4)*. The species most commonly associated with overcup oak are water hickory *(Carya aquatica)*, willow oak *(Quercus phellos)*, Nuttall oak *(Q. nuttallii)*, American elm *(Ulmus americana)*, cedar elm *(U. crussifoliu)*, green ash *(Fraxinus pennsylvunicu)*, sugarberry *(Celtis luevigatu)*, waterlocust *(Gleditsia aquatica)*, common persimmon *(Diospyros virginiana)*, and red maple *(Acer rubrum)*.

Overcup oak is a minor component in the following forest cover types: Sweetgum-Willow Oak (Type 92), Sugarberry-American Elm-Green Ash (Type 93), Baldcypress (Type 101), and Baldcypress-Tupelo (Type 102).

Trees infrequently associated with overcup oak include sweetgum *(Liquidambar styraciflua)*, honeylocust *(Gleditsia triacanthos)*, cottonwood *(Populus deltoides)*, black willow *(Salix nigra)*, water oak *(Quercus nigra)*, and sycamore *(Platanus occident&s)*. Common shrub or small tree associates include swamp-privet *(Forestiera ucuminata)*, hawthorn *(Crataegus* spp.), roughleaf dogwood *(Cornus drummondii)*, buttonbush *(Cephalanthus occident&s)*, and planertree *(Planera aquatica)*.

Life History

Reproduction and Early Growth

Flowering and Fruiting-Male and female flowers appear while the leaves are developing during April and May in the Mississippi Delta. The staminate flowers are borne in naked aments (catkins) with the pistillate flowers in flowered spikes on this monoecious tree *(11)*. The fruit, an acorn, is 12 to 25 mm (0.5 to 1 in) long, has a flattened spherical shape, usually broader at the base than long, and may be entirely covered by a scaly cup-hence the common name of the species, overcup oak. The acorns mature in 1 year, ripen by September or October, and fall soon after.

Seed Production and Dissemination-Trees begin bearing seeds about 25 years of age and good seed crops are produced every 3 to 4 years. Late

freezes, after the flower buds have started to open, have been known to kill the flowers and thus destroy the seed crop. Cleaned seeds average 308/kg (140/lb) *(11)*. The seeds are disseminated to some extent by flood waters. Animals, especially squirrels, spread some acorns, but overcup acorns are less preferred than those of many other oak species. Acorn insects, particularly acorn weevils (Curculio spp.), may destroy a major part of the seed crop during light seed years, but are less important during good seed years.

Seedling Development-In flooded areas the acorns remain dormant over winter and germinate in the spring after the surface waters recede, making overcup acorns one of the few of the white oak group that do not germinate until spring *(10)*. Germination is hypogeal ***(11).*** Natural reproduction is prolific, but many young seedlings are killed by inundation during the first few growing seasons. Seeds germinate readily either in the open or in the shade, but because of the tree's relative intolerance to shade, reproduction persists only in openings *(13)*. Seedlings and stump sprouts generally are able to grow through all competing ground cover except heavy pepper-vine, which sometimes develops into a tangled mat *(10)*. Successful regeneration depends on complete absence of fire and adequate seed.

Growth of seedlings is rated as average but varies greatly with site, soil, and the kind and degree of competition (13). Eight-year-old trees on a backwater flat were found to vary from 12 to 75 mm (0.5 to 3 in) in diameter at groundline *(10)*. There is little information on early height growth, but based on site index figures, height growth might be expected to average 45 to 60 cm (18 to 24 in) per year (2).

Vegetative Reproduction-Stumps of small trees sprout vigorously but not consistently; therefore, stump sprouts cannot be relied upon as a silvicultural practice to regenerate the stand. Successful whip, cleft, and bark grafts of overcup oak and its hybrids have been reported, but T-bud grafts have failed and cuttings from hybrids do not root *(10)*.

Sapling and Pole Stages to Maturity

Growth and Yield-Overcup oak (fig. 3) produces a medium-size tree 18 to 27 m (60 to 90 ft) in height and 61 to 76 cm (24 to 30 in) in diameter *(10,12)*. Maximum height rarely exceeds 30 m (100 ft) and diameters exceeding 91 cm (36 in) are uncommon. Maximum age attained is about 400 years *(6)*. Overcup oak commonly develops a short trunk, frequently crooked or spiraled, and a broad, wide-spreading, open crown or major branches bearing relatively few smaller branches ***(12).*** The bole is rarely clear for any great length; however, on the better sites it may develop a trunk clear of large branches having lengths of 12 m (40 ft) or more. Height growth of overcup oak is slower than many of its associates, causing it to be overtopped easily, which may partially account for the short crooked boles. Diameter growth for trees free to grow in unmanaged stands on average bottomland sites averages about 5.0 to 6.4

Figure ***3-Single large tree of overcup oak.***

cm (2 to 2.5 in) in 10 years ***(13).*** On the best sites it may grow 10 cm (4 in) in 10 years, but old trees on low flats subject to backwater overflow may grow only 5 cm (2 in) in diameter in 50 years. Under management on average or better sites, the overcup oak-water hickory type should yield about 2.8 m^3/ha (200 fbm/acre) (International quarter-inch log rule) or more per year *(1)*.

The quality of overcup oak varies greatly throughout its range but is generally medium to poor due to insects, shake, and other factors. Overcup oak is said to produce only about half as much No. 1 Common and Better lumber as the other white oaks *(5)*. Next to post oak it has been referred to as the

"poorest of the white oaks" *(13)*. In fact, it has been stated that "overcup oak from overflow sites in the Mississippi Delta is one of the most obstinate, cantankerous woods that ever a kiln operator tried to dry" (7). For many years operators discriminated against overcup oak on overflow sites because it could not be dried without serious checking and honeycombing. This no-cut practice reached a point where overcup oak dominated many cutover sites. Quality is generally poorest in the southern half of the Mississippi River Delta. North of the latitude from Eudora, AR, to Greenwood, MS, it is of fair to very good quality. Within these areas, quality tends to be best on the better drained second bottoms and terrace soils and toward the outer edges of the Delta, and especially on the older geologic formations to the north *(15)*. In the bottoms of the larger streams in Georgia and the Carolinas its quality is usually good.

Rooting Habit-Overcup oak develops a shallow, saucer-shaped root system. The heavy clay soils and wet sites where overcup oak typically grows restrict root development to relatively shallow depths. Although the seedlings initially produce taproots, these are replaced by a lateral root system. The root system of one large tree consisted of many small branch ing roots with no large main roots.

Reaction to Competition-Overcup oak is classed as intermediate in its response to competition and shade *(10,13)*. Seeds germinate profusely beneath complete canopy, but the seedlings invariably succumb or at least die back to the root collar within 3 years unless released. Many stands of overcup oak owe their development to tolerance of early season flooding that kills off earlier flushing species. It is frequently a lack of competition rather than an affinity for the backwater sites that allows this species to dominate.

Because of its tolerance of flooding, overcup oak growing on low backwater flats is classified as a climax species *(10)*. But on better sites where it grows in combination with other oaks, green ash, and sweetgum, it becomes a subclimax tree. Because of its slow growth rate, poor quality, drying difficulties, and low commercial value, woodsmen usually try to favor other species of better quality,

Damaging Agents-Overcup oak is notorious for many defects, a reputation due largely to wood borers and the rapid decay of heartwood following fire injuries *(6)*. Loss from insect borer degrade in lumber sawn from sample overcup oak logs in Arkansas, Louisiana, and Mississippi, updated to 1980 lumber prices, amounted to $22.80/m^3$ ($130/ thousand fbm) (9). The carpenterworm *(Prionoxystus robiniae)* and red oak borer *(Enaphalodes rufulus)* are the two most damaging large trunk borers of sawtimber—producing galleries in the wood 12 to 18 mm (0.5 to 0.7 in) in diameter and 15 to 25 cm (6 to 10 in) long (14). The white oak borer *(Goes tigrinus)* is damaging to young trees but limits its attacks to saplings and poles up to about 20 cm (8 in) in diameter.

This oak, growing on sites subjected to backwater flooding from December through June, is sometimes rendered almost worthless by a spot-worm borer *(Agrilus acutipennis)*, which leaves a tiny frass-packed hole surrounded by a dark-stained area, descriptively named grease spot. This defect seriously degrades lumber and ruins its wood for tight cooperage.

Another common defect in overcup oak lumber is bark pocket, caused by several borers but particularly the red oak borer and carpenter-worm, which initiate attacks in the bark and cambium area but succumb before galleries are made in the sapwood. When these spots heal, pockets of ingrown bark and stained wood are formed. These remain in the trunk as the tree grows and appear as defects in lumber and other products.

Other insects, including the defoliators, usually are not very harmful, but periodic outbreaks such as the 1952 outbreak of the basswood leafminer, *Baliosus ruber*, can severely weaken trees and reduce growth.

Except for the heart rots *(Poria* spp., *Polyporus* spp., *Hericium* spp.), which follow injuries, especially those due to fire, diseases are not serious in overcup oak. A viruslike disorder of overcup oak seedlings has been studied but appears to be either physiologically induced or of genetic origin.

Special Uses

The utility of overcup oak varies extremely with site, fire damage, and degree of insect and decay defect *(13)*. Logs harvested from the best overcup oak sites may be used for lumber and sometimes tight cooperage, but the wood is frequently worthless for factory lumber and other quality products. Moreover, checking during seasoning often prevents general use even as ties and timbers. The species is sometimes used for ornamental purposes. The trees provide habitat and the acorns supply mast for wildlife.

Genetics

Population Differences

Wide differences in quality of overcup oak occur over its range-generally the better quality is found

in its northern and eastern range. These differences, however, are probably due to response to site and seasonal flooding patterns rather than to genetic differences. Limited studies of juvenile variation within a small geographic area have not provided any evidence of genetic variation among localities.

Hybrids

Quercus lyrata hybridizes with *Q. alba; Q. durandii; Q. bicolor* (*Q. x humidicola* Palmer); *Q. macrocarpa* (*Q. x megaleia* Laughlin); *Q. michauxii* (*Q. x tottenii* Melvin); Q. *stellata* (*Q. x sterrettii* Trel.); and *Q. virginiana* (*Q. x comptoniae* Sarg.) (8). A cross between Q. *Zyrata* and Q. *virginiana* is reported to be promising for propagation and dissemination *(10)*. This hybrid is a semievergreen and has a higher growth rate than either parent. However, its vegetative propagation has presented problems.

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