Quercus muehlenbergii Engelm. Chinkapin Oak

Fagaceae Beech family

Ivan L. Sander

Chinkapin oak (Quercus *muehlenbergii)*, sometimes called yellow chestnut oak, rock oak, or yellow oak, grows in alkaline soils on limestone outcrops and well-drained slopes of the uplands, usually with other hardwoods. It seldom grows in size or abundance to be commercially important, but the heavy wood makes excellent fuel. The acorns are sweet and are eaten by several kinds of animals and birds.

Habitat

Native Range

Chinkapin oak (fig. 1) is found in western Vermont and New York, west to southern Ontario, southern Michigan, southern Wisconsin, extreme southeastern Minnesota, and Iowa; south to southeastern Nebraska, eastern Kansas, western Oklahoma, and central Texas; east to northwest Florida; and north mostly in the mountains to Pennsylvania and southwestern Massachusetts. There are local populations in the mountains of southeastern New Mexico, Trans-Pecos Texas, and northeastern Mexico (5).

Climate

The climate in which chinkapin oak grows is humid except for the southwestern fringe of its natural range, which is moist subhumid to dry subhumid. The average length of frost-free periods ranges from 120 days in Vermont to 240 days in Texas. Precipitation in the growing season (April 1 to September 30) ranges from an average of about 250 mm (10 in) in southwest Texas to about 2030 mm (80 in) in the southern Appalachians. In southern Indiana and southern Ohio where chinkapin oak grows best, growing season precipitation is from 510 to 640 mm (20 to 25 in) *(4)*.

Soils and Topography

Chinkapin oak is usually found on warm, moist Udalf Alfisols, Dystrochrept Inceptisols, Udoll Mollisols, and Udult Ultisols over much of its range. In the extreme southwestern part of the range chinkapin oak also grows on warm, dry Ustoll Mollisols and Astalf Alfisols (9). Chinkapin oak is generally found on well-drained upland soils derived from limestone or where limestone outcrops occur. Occasionally it is found on well-drained limestone soils along streams. It appears that soil pH is strongly related to the prescence of chinkapin oak, which is generally found on soils that are weakly acid (pH about 6.5) to alkaline (above pH 7.0). It grows on both northerly and southerly aspects but is more common on the warmer southerly aspects. It is absent or rare at high elevations in the Appalachians *(3,4)*.

Associated Forest Cover

Chinkapin oak is rarely a predominant tree, but it grows in association with many other species. It is a component of the forest cover type White Oak-Black Oak-Northern Red Oak (Society of American Foresters Type 52) and the Post Oak-Blackjack Oak (Type 40) *(2)*.

It grows in association with white oak (Quercus *alba)*, black oak *(Q. velutina)*, northern red oak *(Q. rubru),* scarlet oak *(Q. coccineu),* sugar maple *(Acer succhurum),* red maple *(A. rubrum)*, hickories *(Curyu* spp.), black cherry *(Prunui serotinu),* cucumber-tree *(Magnolia acuminata)*, white ash *(Fruxinus americana)*, American basswood *(Tilia americana)*, black walnut *(Juglans nigru),* butternut *(J. cinereu),* and yellow-poplar *(Liriodendron tulipiferu).* American beech *(Fagus grundifoliu),* shortleaf pine *(Pinus echinata)*, pitch pine *(P. rigidu),* Virginia pine *(P. uirginiunu),* Ozark chinkapin *(Custuneu ozarkensis),* eastern redcedar *(Juniperus virginiunu),* bluejack oak *(Quercus incunu),* southern red oak *(Q. falcata)*, blackgum *(Nyssa sylvatica)*, and winged elm *(Ulmus alata)* also grow in association with chinkapin oak. In the Missouri Ozarks a redcedar-chinkapin oak association has been described.

The most common small tree and shrub species found in association with chinkapin oak include flowering dogwood *(Cornus florida)*, sassafras *(Sassafras ulbidum),* sourwood *(Oxydendron urboreum),* eastern hophornbeam *(Ostryu uirginiunu), Vaccinium* spp., *Viburnum* spp., hawthorns *(Crutuegus* spp.), and sumacs *(Rhus* spp.). The most common woody vines are wild grape *(Vitis* spp.) and greenbrier *(Smilax* spp.).

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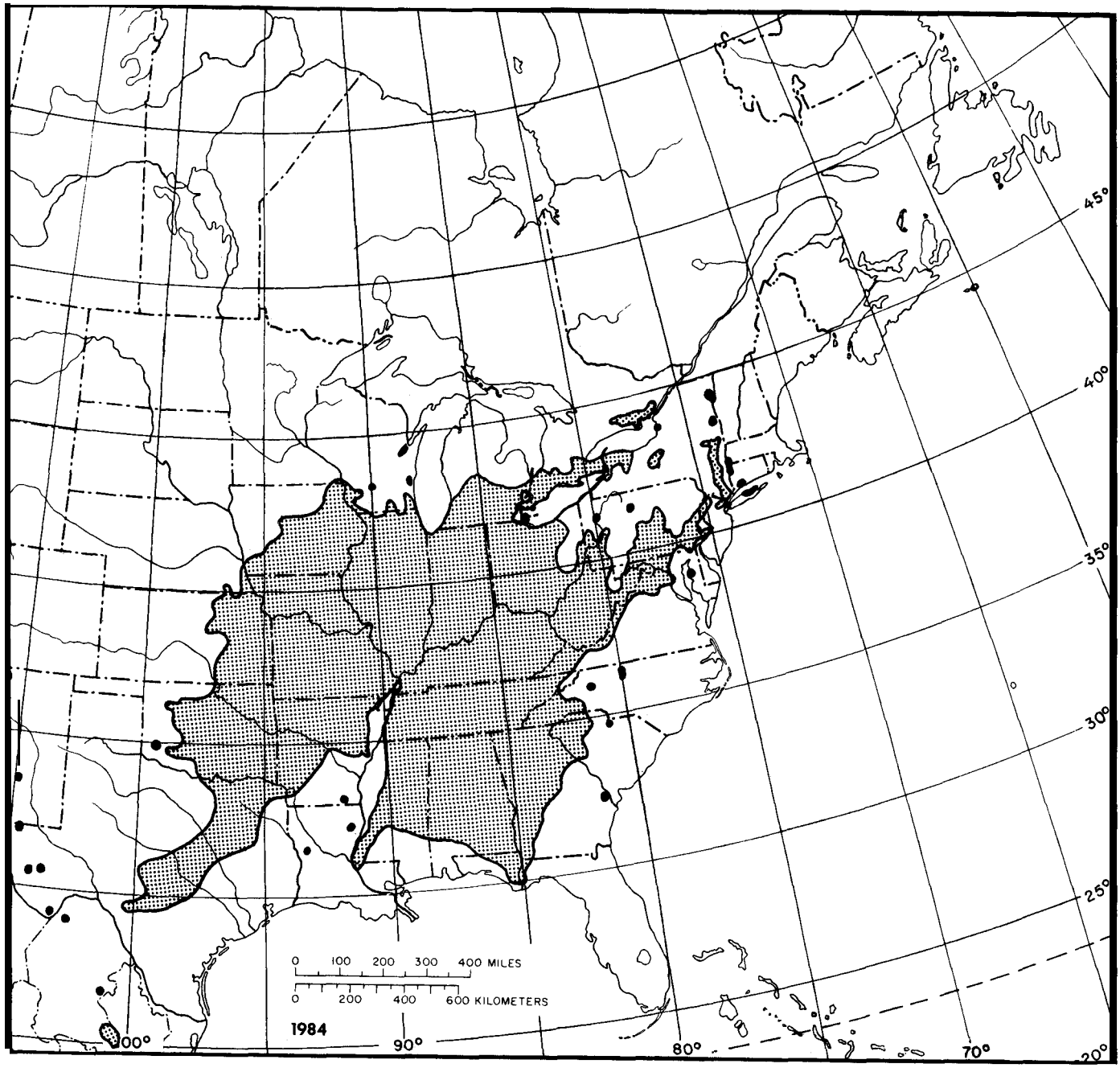

Figure *l-The native range of chinkapin oak.*

Life History

Reproduction and Early Growth

Flowering and Fruiting-Chinkapin oak is monoecious in flowering habit; flowers emerge in April to late May or early June. The staminate flowers are borne in catkins that develop from the leaf axils of the previous year, and the pistillate flowers develop from the axils of the current year's leaves. The fruit, an acorn or nut, is borne singly or in pairs, matures in 1 year, and ripens in September or October. About half of the acorn is enclosed in a thin cup and is chestnut brown to nearly black *(8).*

Seed Production and Dissemination-Because chinkapin oak is not common, its seed production characteristics have not been studied. Observations

in the Central States indicate, however, that good seed crops occur at infrequent intervals. Chinkapin oak acorns are disseminated in the same manner as those of other oaks-by gravity and rodents *(4)*.

Seedling Development-Studies of oak regeneration in the Central States indicate chinkapin oak seedlings are established and grow much as do other upland oaks *(4,7)*. Germination is hypogeal *(8)*. Chinkapin oak acorns germinate in the fall soon after falling, and growth of the radicle continues until stopped by cold temperatures. Growth is resumed when the soil warms enough in the spring, at which time the epicotyl emerges. A light to moderate litter cover does not hinder germination and seedling establishment. Chinkapin oak seedlings tolerate moderate overstory or understory cover but growth is slow. When an old stand is harvested, the species must be present as large advance reproduction if it is to be a component of the new stand.

Vegetative Reproduction-Chinkapin oak sprouts readily and like other oaks the tops of advance reproduction generally are younger than the roots. Stumps of cut trees also sprout but no relation between sprouting frequency and stump size or age has been determined (7).

Rooting of stem cuttings and budding techniques have not been successful in propagating chinkapin oak, but some success has been attained with grafting (4).

Sapling and Pole Stages to Maturity

Growth and Yield-Chinkapin oak attains a height of from 18 to 24 m (60 to 80 ft) and a d.b.h. of from 61 to 91 cm (24 to 36 in) at maturity. In forest stands it develops a straight columnar bole with a dense rounded crown and fairly small branches; in the open it develops a short bole with a broad spreading crown.

Because chinkapin oak is usually found as scattered individuals, its growth characteristics have not been extensively studied. Observations from studies in the Central States, particularly southern Indiana, indicate its growth is similar to that of white oak on similar sites (4). It should respond well to release and there is no reason to discriminate against it in thinnings.

Rooting Habit-No information available.

Reaction to Competition—Chinkapin **oak is** classed as intolerant of shade. It withstands moderate shading when young but becomes more intolerant of shade with age. It is regarded as a climax species on dry, droughty soils, especially those of limestone origin. On more moist sites it is subclimax to climax. It is often found as a component of the climax vegetation in stands on mesic sites with limestone soils. However, many oak-hickory stands on moist sites that contain chinkapin oak are succeeded by the climax beech, maple, and ash *(1,4)*.

Damaging Agents-Severe wildfire kills saplings and small pole-size trees but these resprout. Fire scars serve as entry points for decay-causing fungi, however, and the resulting decay can cause serious losses.

Oak wilt ***(Cerutocystis fagacearum)***, a vascular disease, attacks chinkapin oak and usually kills the tree within 2 to 4 years. Other diseases that attack chinkapin oak include the cankers ***Strumellu coryneoideu*** and ***Nectria gulligenu,*** shoestring root rot ***(Armillureu mellea)***, anthracnose ***(Gnomoniu veneta)***, and leaf blister ***(Tuphrinu*** spp.) (4).

The most serious defoliating insects that attack chinkapin oak are the gypsy moth ***(Lymuntriu dispar),*** the orangestriped oakworm ***(Anisotu senatoria)***, and the variable oakleaf caterpillar ***(Heterocumpu munteo).*** Insects that bore into the bole and seriously degrade the products cut from infested trees include the carpenterworm ***(Prionoyxstus robiniae)***, little carpenterworm ***(P. mucmurtrei),*** white oak borer (Goes ***tigrinus),*** Columbian timber beetle ***(Corthylus columbianus)***, oak timberworm ***(Arrhenodes minutus)***, and twolined chestnut borer ***(Agrilus bilineatus).*** The acorn weevils ***(Curculio*** spp.), larvae of moths ***(Valentiniu glandulella*** and ***Melissopus latiferreunus),*** and gallforming cynipids ***(Cullirhytis*** spp.) attack and destroy the acorns *(4)*.

Special Uses

Chinkapin oak acorns are sweet and palatable and are eaten by squirrels, mice, voles, chipmunks, deer, turkey, and other birds. Acorns may be taken from the tree or from the ground. Because trees are scattered, chinkapin oak acorns are an important source of food only to the extent they contribute to the total mast available (4).

Genetics

Chinkapin oak intergrades with dwarf chinkapin oak ***(Quercus prinoides)*** and both have been recognized as varieties of the same species by some authors. Dwarf chinkapin oak, however, is commonly

a low-growing, clump-forming shrub, rarely treelike, and is a separate distinct species.

Two recognized, named hybrids of chinkapin oak are Q. ***x introgressa*** P. M. Thomson *(Q. muehlenbergii x Q. bicolor x prinoides),* and ***Q. x deamii*** Trel. *(Q. muehlenbergii x macrocarpa).*

Chinkapin oak is also known to hybridize with white oak *(Q. alba)*; Gambel oak *(Q. gambelii)*; and dwarf chinkapin oak *(Q. prinoides)* (6).

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