

Quercus alba

Fagaceae family

White oak

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Description: *Quercus alba* is a medium to large, slow growing, long-lived, monoecious, deciduous tree. Flowering occurs with the emergence and/or development of leaves. Flowers are wind-pollinated. Trees generally begin to reproduce at 50-200 years of age, although trees growing on good sites may begin as early as 20 years old. Vigorous stump and root sprouting, along with sprouting of latent branch/stem buds (epicormic), can occur following damage and/or disturbance; although, low light levels on a site or the larger a plant is (in stem diameter), the less likely that sprouting will occur.

Variation: *Quercus alba* is highly variable genetically, with distribution across the eastern U.S. Several varieties are recognized, although some recognize these as forms and not varieties. Many ecotypes have also been described. Many hybrids have been reported between *Quercus alba* and many other *Quercus* species. Tirmenstein (1991) reports that within *Quercus alba*'s range introgressive populations are locally common, and hybrid swarms derived from complex mixtures of parental forms are particularly common on disturbed sites, at the margins of its range and where other oak species occur sympatrically.

Size: *Quercus alba* grows to over 60-115 ft. (18-35 m) tall, 50-90 ft. (15-27.4 m) wide, and 36-60 in. (0.9-1.5 m), occasionally 8 ft. (2.4 m), in trunk diameter.

Leaves: Leaves alternate; simple; moderately to deeply pinnately lobed, 7-9 lobes; sinuses 1/3-7/8 distance to midrib. Leaf blades/lamina obovate to narrowly elliptic or obovate; 2.8-9 in. (7-23 cm) long, 1.4-6.5 in. (3.5-16.5 cm) wide; upper surface bright green; lower surface light gray-green; margins entire; petiole 0.1-1.2 in. (0.3-3 cm) long. Stipules present, caducous.

Inflorescence: Separate male and female inflorescences on one plant (monoecious). The female flowers are fertile 5-10 days following the initiation of male flowering. Staminate (male) inflorescence a pendant catkin; yellowish to green; 2-4 in. (5-10.2 cm) long; axillary, in leaf axils of previous year; rachis moderately covered with brown hairs, glabrescent with age; 1-3 sessile flowers per node; each flower subtended by small, sessile caduceous bracteole. Spikes/catkins solitary or fascicled.

Pistillate (female) inflorescence reddish, a spike; consists of a single flower, sometimes 2-3; axillary in new growth; initially sessile, often becoming pedunculate in fruit; surrounded by a persistent cupule (acorn cap).

Flowers:

Staminate (male) flowers: Perianth of one whorl, calyx of fused sepals, campanulate; sepal lobes 5-6; 0.1 in. (0.2-0.3 cm) in diameter; having brown pilosity. No petals.

Stamens 2-16, exserted; surrounding tuft of brown hairs.

Pistillate (female) flowers: Perianth of one whorl, minute, calyx of fused sepals, urceolate; no petals; pistil 1; carpels 3; styles 3, each with 1 stigma.

Fruit: An acorn; sessile or pedunculate to 1.2 in. (3 cm) long; ovoid-ellipsoid or oblong. Cupule enclosing 1/4-1/3 of fruit, dropping off at maturity; cup scales finely tomentose, gray to brown; scales indurate, imbricate, tightly appressed. Nut olive-green to light brown; 0.5-1.4 in. (1.2-3.5 cm) long, 0.4-0.7 in. (0.9-1.8 cm) wide; glabrous; apiculate at distal end; 1, rarely 2-3, seeded.

Bark: Whitish or light gray to dark gray; scaly to irregularly platy/blocky or ridged and furrowed. Twigs green to reddish to brown, becoming gray; initially pubescent, turning glabrous.

Roots: Deep-rooted; initially having a well-developed taproot that disappears with age and replaced by a fibrous root system having well-developed, tapered lateral roots.

Habitat: *Quercus alba* favors coarse, deep, moist, well-drained, slightly acid soils; often on north and east-facing slopes, although occurs on all aspects. Stands are often found in areas having loam or clay soils. It grows in a variety of dry to mesic woodland communities, and in rich uplands, moist bottomlands, sandy plains, on dry, gravelly slopes, along streams. It is not found on ridgetops with shallow soils, on poorly drained flats, nor on very wet bottomlands. It is sensitive to flooding, fire injury, coal smoke, and fly ash deposits on the soil surface. It is resistant to salt-spray and brief submergence in salt water. Its tolerance to shade diminishes with age, and its site needs at least 35% full sunlight for reproduction from seed to occur. Seedlings, saplings, and pole-sized trees can persist for 90 years or more under a forest canopy; seedling die-back can occur repeatedly, with the root resprouting each year, enabling the plant's persistence on a site.

Species distribution in US states: AL, AR, CT, DC, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, ME, MI, MN, MO, MS, NC, NE, NH, NJ, NY, OH, OK, PA, RI, SC, TN, TX, VA, VT, WI, WV.

Species images:

Whole plant:

http://www.uwgb.edu/BIODIVERSITY/herbarium/trees/quealb_aspect01_web400gf.jpg

<http://wisplants.uwsp.edu/scripts/detail.asp?SpCode=QUEALB>

Bark:

http://www.uwgb.edu/BIODIVERSITY/herbarium/trees/quealb_bark01_web400gf.jpg

<http://www.duke.edu/~cwcook/trees/qual.html>

Leaf:

http://www.uwgb.edu/BIODIVERSITY/herbarium/trees/quealb_leaves01_web400gf.jpg

<http://www.cas.vanderbilt.edu/bioimages/species/frame/qual.htm>

Colored leaves:

<http://www.hort.uconn.edu/Plants/q/quealb/quealb1.html>

http://botit.botany.wisc.edu/images/veg/Oak_Woods_I_Tray_I/Quercus_alba_fall_color_VK.html

<http://wisplants.uwsp.edu/scripts/detail.asp?SpCode=QUEALB>

Buds:

http://www.uwgb.edu/BIODIVERSITY/herbarium/trees/quealb_buds01_web400gf.jpg

<http://www.cas.vanderbilt.edu/bioimages/biohires/q/hqual--tw15641.JPG>

Staminate (male) flowers:

http://www.ibiblio.org/openkey/intkey/images/Quercus_alba_staminate_catkins01.jpg

<http://www.hort.uconn.edu/Plants/q/quealb/quealb1.html>

<http://www.cas.vanderbilt.edu/bioimages/biohires/q/hqual--flmale19705.JPG>

Pistillate (female) flowers:

<http://www.cas.vanderbilt.edu/bioimages/biohires/q/hqual--flfemale19712.JPG>

Quercus sp.: <http://botany.cs.tamu.edu/FLORA/dcs420/fa01/fa01073.jpg>

Fruit:

http://plants.usda.gov/java/largeImage?imageID=qual_005_ahp.tif

<http://www.cnr.vt.edu/DENDRO/dendrology/syllabus/factsheet.cfm?ID=35>

Expected timing of growth stages:

Germination: Immediately following seed dispersal; seeds have no dormancies.

Flowering: Late March-June, depending on location. In some areas, pistillate flowers emerge later than staminate flowers.

Bud break/Leaf out: Mid-March to late May, depending on location. Observation of delayed budbreak have occurred on copper, lead, and zinc-mineralized sites.

Leaf/canopy development: Flowering often occurs at leaf emergence or during leaf development. *Need info.

Fruit ripening: Approximately 120 days after pollination. July-November, depending on location.

Fruit dispersion: by September/October.

Leaf coloration: *Need info.

Leaf fall: *Need info.

Phenophases to be monitored for NPN:

Flowering

- *First pollen released* [**Intensive only**]
In at least 3 locations on the plant, pollen is released from a flower when gently shaken or blown. For *Quercus alba*, the male flowers from which pollen is released are arranged on catkins. Where catkins are out of reach, pollen release may be estimated by observing the degree of catkin elongation and looseness. Once the initially compact catkins have unfolded and are hanging loosely, pollen will be released. (Note that *Quercus alba* individuals may not produce catkins every year.)

Leaf out

- *First leaf*
In at least 3 locations on the plant, the very first green tip of a young leaf has visibly moved out of the leaf bud.

Leaf elongation

Note: These measures can be difficult to estimate without a few seasons of practice.

- *25% leaf elongation* [**Intensive only**]
The majority of young leaves have unfolded completely and have expanded to one-quarter (25%) of their mature size. Leaf elongation may also be estimated by viewing the canopy as a whole. At 25% leaf elongation, the canopy appears to be approximately one-quarter (25%) full.
- *50% leaf elongation* [**Intensive only**]
The majority of young leaves have unfolded completely and have expanded to half (50%) of their mature size. Leaf elongation may also be estimated by viewing the

canopy as a whole. At 50% leaf elongation, the canopy appears to be approximately half (50%) full.

- *75% leaf elongation*
The majority of young leaves have unfolded completely and have expanded to three-quarters (75%) of their mature size. Leaf elongation may also be estimated by viewing the canopy as a whole. At 75% leaf elongation, the canopy appears to be approximately three-quarters (75%) full.
- *Full leaf elongation [Intensive only]*
The majority of young leaves have unfolded completely and have expanded to 95-100% of their mature size. At full leaf elongation, the canopy appears to have reached its full density.

Fruit ripening

- *First fruit ripe*
In at least 3 locations on the plant, a fruit has become ripe. In *Quercus alba*, a good test for ripeness is acorn drop; ripe acorns will easily fall into your hand when touched or gently handled. Ripeness may also be indicated by the presence of at least 3 fresh acorns on the ground below the plant (that are not apparently from a nearby tree).
- *50% of fruit ripe [Intensive only]*
For the whole plant, half (50%) of the fruits are ripe. In *Quercus alba*, this occurs when half (50%) of the acorns have dropped.
- *All fruit ripe [Intensive only]*
For the whole plant, virtually all (95-100%) of the fruits are ripe. In *Quercus alba*, this occurs when all (95-100%) of the acorns have dropped.

Leaf color change

Note: If drought seems to be the cause of leaf color change for a plant, please make a comment about it for that plant.

- *First leaf colored [Intensive only]*
In at least 3 locations on the plant, the green leaves have begun to change to their late season colors.
- *25% of leaves colored [Intensive only]*

For the whole plant, one-quarter (25%) of the leaves (including any that have fallen to the ground) have changed to their late season colors.

- *50% of leaves colored*
For the whole plant, half (50%) of the leaves (including any that have fallen to the ground) have changed to their late season colors.
- *75% of leaves colored [Intensive only]*
For the whole plant, three-quarters (75%) of the leaves (including any that have fallen to the ground) have changed to their late season colors.
- *All leaves colored*
For the whole plant, virtually all (95-100%) of the leaves (including any that have fallen to the ground) have changed to their late season colors and there is virtually no green left in the leaves.

Leaf fall

Note: If drought seems to be the cause of leaf fall for a plant, please make a comment about it for that plant.

- *First leaf fallen [Intensive only]*
In at least 3 locations on the plant, a leaf easily falls off into your hand when touched or gently handled. First leaf fallen may also be indicated by the presence of at least 3 leaves on the ground below the plant (that are not apparently from another individual nearby).
- *25% of leaves fallen [Intensive only]*
For the whole plant, one-quarter (25%) of the leaves have fallen.
- *50% of leaves fallen*
For the whole plant, half (50%) of the leaves have fallen.
- *75% of leaves fallen [Intensive only]*
For the whole plant, three-quarters (75%) of the leaves have fallen. For *Quercus alba*, this includes any leaves that have dried and remain dead on the plant.
- *All leaves fallen*
For the whole plant, virtually all (95-100%) of the leaves have fallen. For *Quercus alba*, this includes any leaves that have dried and remain dead on the plant.

Did you know? In the past, *Quercus alba* was considered the source of fine and durable lumber for furniture and shipbuilding in America. Over time it has been replaced by

faster growing and better yielding species lacking tyloses (enabling the wood to be more suited for pressure treating). It is still used for furnishings, barrels, and fuel. The Native Americans used the plant for food and medicinally for a great many symptoms. Many animals feed on the plant, and, for more than 180 species of birds and mammals, its acorns are an important food.

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Notes

The USDA PLANTS symbol for this plant is QUAL.

The ITIS Taxonomic Serial No. for this species is 19290.

BBCH codes for phenophases used for this plant are available from the USA-NPN office upon request.

USA-NPN Plant Phenology Protocol, Quercus_alba_v1.0(beta).doc

Proposed modifications, updates or corrections to this protocol are welcome; please direct correspondence to the USA-NPN National Coordinating Office.

Prior versions of this species protocol will be made available in a documents library on USA-NPN webpage.

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