

# THE BEECH FAMILY (FAGACEAE)

S. A. Mori, M. Rothman & R. F. Naczi

Last update: 26 March 2018

The Beech Family (also called the Oak Family) consists of nine genera and 600 to 800 species worldwide. In the Preserve there are two genera, *Fagus*, with one species, and *Quercus* with four species. Another member of the family, chestnut, *Castanea dentata*, was once one of the most dominant tree species in the northeastern United States until it was nearly exterminated by a fungal blight introduced from Europe in 1904. Today, non-reproductive sprouts are the only evidence that this species is still part of this flora, and we have not encountered chestnut sprouts in the Preserve.

## Key to Genera of Fagaceae in the Preserve

1. Bark smooth. Apical buds solitary,  $\geq 15$  mm long. Staminate flowers in pedunculate heads. Nuts angular, enclosed in a spiny cupule.....*Fagus*
1. Bark fissured. Apical buds several,  $< 15$  mm long. Staminate flowers in long catkins. Nuts (acorn) not angular, subtended by a non spiny cupule scales.....*Quercus*

# BARK OF AMERICAN BEECH (*Fagus grandifolia*)



The American beech is distinguished by its thin, smooth, gray bark with numerous small lenticels. With age, the bark may possess cracks but that is usually the result of damage caused by insects, fungi, or other pests. Thick, low buttresses are common but not always present in this species.

# LEAVES OF THE AMERICAN BEECH (*Fagus grandifolia*)



The leaves of the American beech are simple and alternate with the margin distinctly serrate.

The secondary veins are parallel to one another. They depart from the midrib and terminate in the teeth along the margin. The tertiary veins are not well-defined.

The leaves turn yellow or bronze in the fall and on young trees persist for most of the winter.

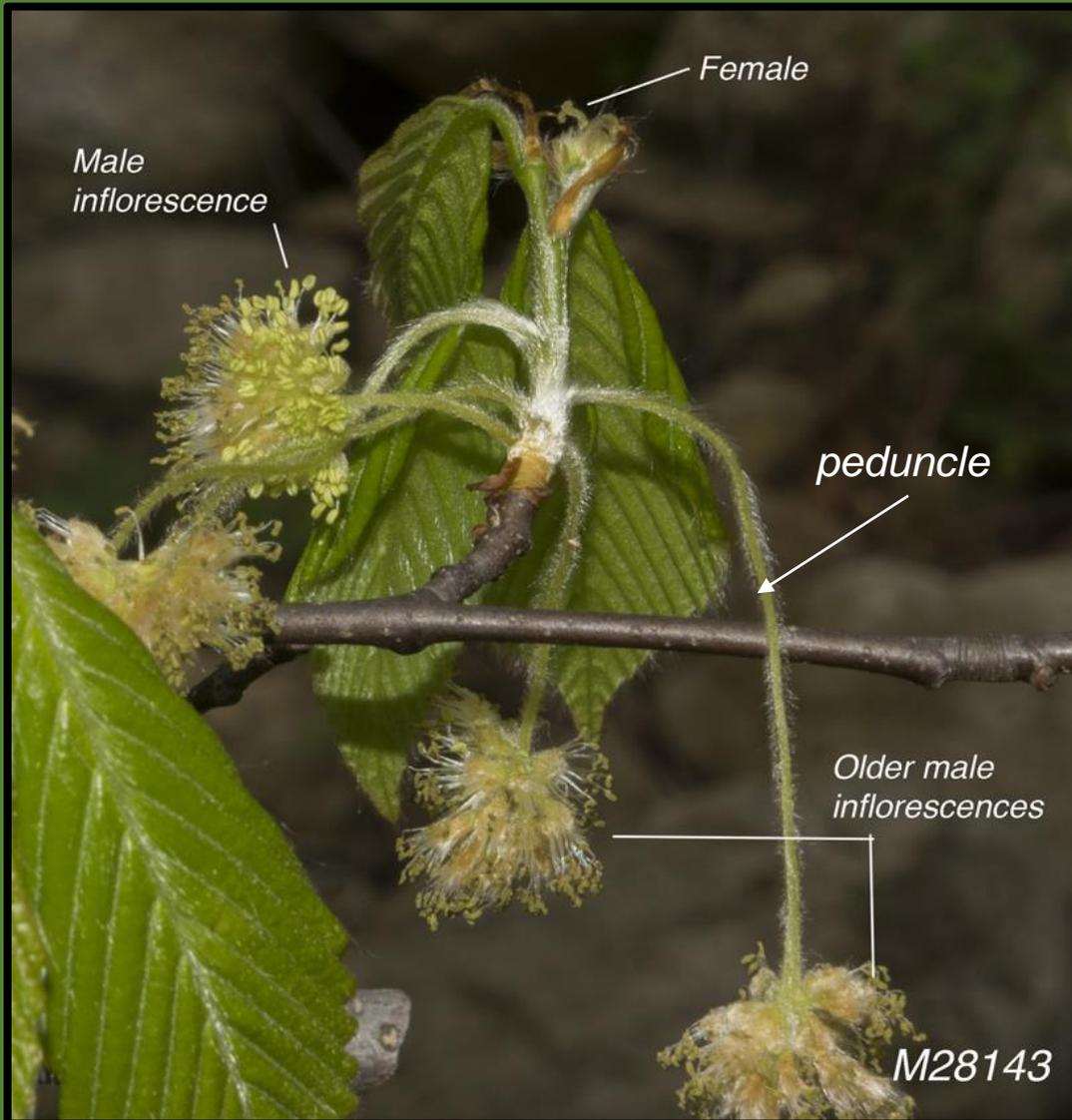
# BUDS OF THE AMERICAN BEECH (*Fagus grandifolia*)



The buds of the American beech are longer than any other species of tree in the Preserve. They are covered by linear leaf bud scales which protect the immature leaves from winter cold. When the leaves flush in the spring they are covered by long white trichomes (hairs).



# INFLORESCENCES OF THE AMERICAN BEECH (*Fagus grandifolia*)



The flowers of the American beech are unisexual. The male flowers are called staminate and the female flowers are called pistillate. The pistillate inflorescences are found above the staminate inflorescences and have one or a few flowers, whereas the staminate inflorescences have numerous flowers and hang below the pistillate flowers. The staminate flowers are grouped together at the end of a long stalk called the peduncle. Both sexes are found on the same tree (= monoecious).

# FRUIT OF THE AMERICAN BEECH (*Fagus grandifolia*)



Two female flowers clustered together. Each pistil has three arched styles. This species is pollinated by the wind.



The 1–3 angular nuts are enclosed by a spiny hull that splits open when mature. Many different animals, such as deer, squirrels, black bears, etc., consume the nuts.

# KEY TO SPECIES OF *QUERCUS* IN THE PRESERVE

We have found five different species of oaks, two with rounded lobes without bristles and three with pointed lobes with bristles in the Preserve.

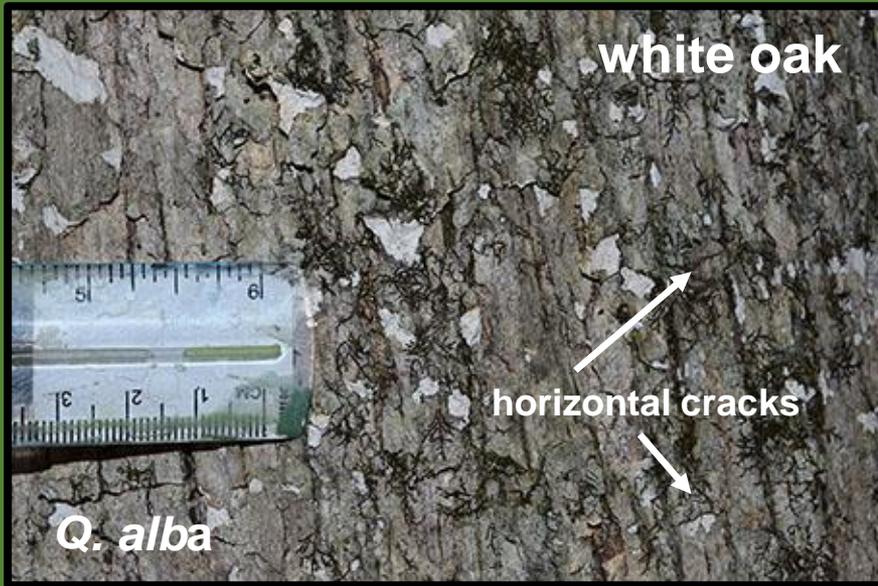
1. Leaf blades with rounded lobes, without bristles.....2
1. Leaf blades with pointed lobes, with bristles.....3
2. Bark shallowly fissured. Leaf blades with deeply cut sinuses, the underside whitish. Scales of cupule knobby.....*Q. alba*
2. Bark deeply fissured. Leaf blades with shallowly cut sinuses. Scales of cupule not knobby.....*Q. montana*
3. Vegetative buds not angular, glabrous. Lateral leaf blade lobes usually 5, the sinuses < 1/3 cut to midrib.....*Q. rubra*
3. Vegetative buds angular, pubescent. Lateral leaf blade lobes usually < 5, the sinuses > 1/3 cut to midrib.....4
4. Bark without ridges markedly flattened, horizontal cracks of ridges well-developed. Leaf blade sinuses usually < 1/2 cut to midrib. Acorns without pitted rings at apex.....*Q. velutina*
4. Bark with ridges markedly flattened, horizontal cracks of ridges present but not well-developed. Leaf blade sinuses usually > 1/2 cut to midrib. Acorns with 1 or more pitted rings at apex.....*Q. coccinea*

# LEAVES OF THE WHITE OAK GROUP



The only white oaks documented for the preserve are *Q. alba* and *Q. montana*. Both species have rounded lobes and no bristles.

# BARKS OF THE WHITE OAK GROUP (*Quercus alba* and *Q. montana*)



The bark of *Q. alba* is shallowly fissured and sheds in thin, small plates while the bark of *Q. montana* is deeply fissured and does not shed. Both species have horizontal cracks but these are difficult to see in *Q. alba*.

# MALE FLOWERS OF THE WHITE OAK (*Quercus alba*)

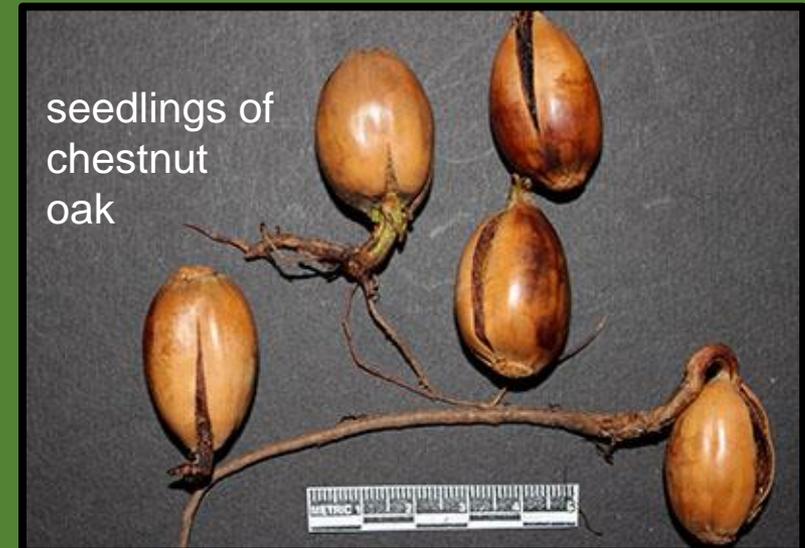


In oaks numerous male flowers are found in long catkins while a few female flowers develop in the axils of the petioles of newly flushed leaves.



The above image is an apical view of a male flower. The anthers are green and the filaments are white. Both staminate and pistillate flowers appear on the same tree (= monoecious). Oaks are pollinated by the wind. Flower morphology is similar in most species; thus, they are usually not useful for identifying species (Nelson et al., 2014). We do not have images of female flowers of any of the five oak species found in the Preserve.

# FRUITS OF THE WHITE OAK GROUP IN THE PRESERVE



The scales of both white and chestnut oaks are knobby. The acorns of the former are smaller (ca. 2.5 cm long x 1.5 cm diam.) and the latter larger (ca. 3.5 cm long x 2.5 cm diam.). The cupule of *Q. montana* has thinner walls than the cupule of *Q. alba*.

# LEAVES OF THE RED OAK GROUP (*Quercus rubra* and *Q. velutina*)



The upper part of the leaf blade of *Q. rubra* is broader than the upper part of the leaf blade of *Q. velutina*. The adaxial surface of the leaf blade is dull in *Q. rubra* and shiny in *Q. velutina*.

# BARK OF THE RED OAK GROUP (*Quercus rubra* and *Q. velutina*)



*Q. rubra* has smoother bark ridges and fewer horizontal cracks than does *Q. velutina*. As a result, the ridges are shorter in *Q. velutina*.

## BUDS OF THE RED OAK GROUP (*Quercus rubra* and *Q. velutina*)



The buds of *Q. rubra* are more glabrous than are the buds of *Q. velutina*. Note the trichomes on the stem and petioles of the black oak.

# INFLORESCENCES OF THE BLACK OAK (*Quercus velutina*)



The inflorescences and flowers of species of the red oak group are similar to one another. For that reason inflorescences and flower characters are seldom used to distinguish species (Nelson et al., 2014).

As in all oaks, the flowers are unisexual and both staminate and pistillate flowers are on the same tree, i.e., the tree is monoecious.

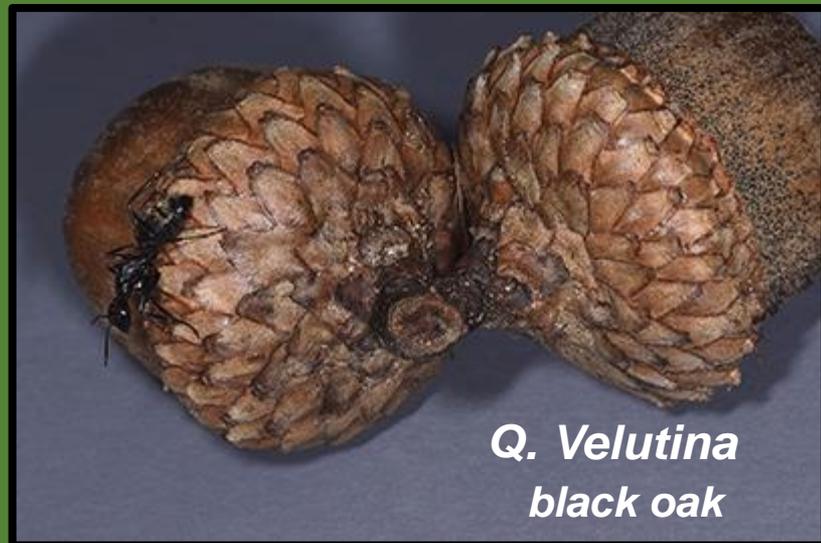
The flowers are difficult to study because they are hard to collect, found only in the early spring, and very reduced in size.

# A COMPARISON OF TWO RED OAK SPECIES

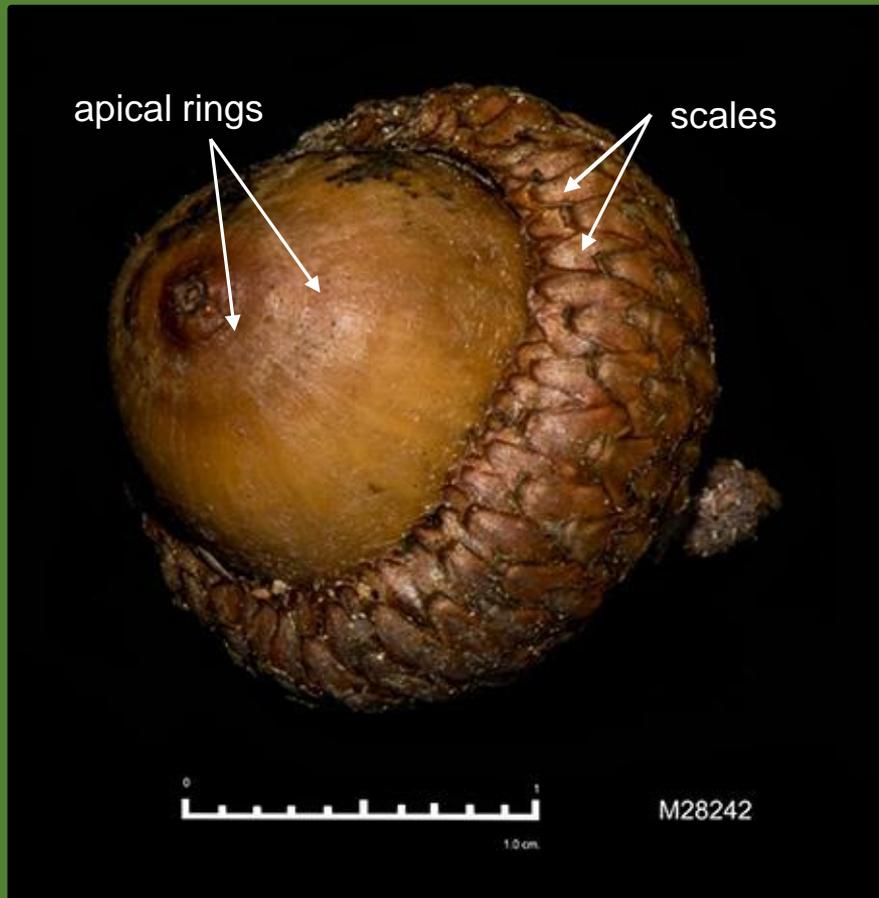


The fruit of oaks is a specialized nut called an acorn which is subtended by a cupule consisting of scales. The fruit wall (pericarp) is hard, does not split open (indehiscent), and has a single seed.

Acorns of different species of oak may differ in their size, shape, and type of scales. For example, the cupule of the red oak looks like a French man wearing a French beret because the scales are more tightly appressed and the rims of the scales of the cupule are more clearly defined. In contrast, the scales of the black oak are less tightly appressed and the scales are curled downward onto the acorn.



# CHARACTERS OF THE ACORNS OF THE SCARLET OAK (*Q. coccinea*), ASPECIES OF THE RED OAK GROUP



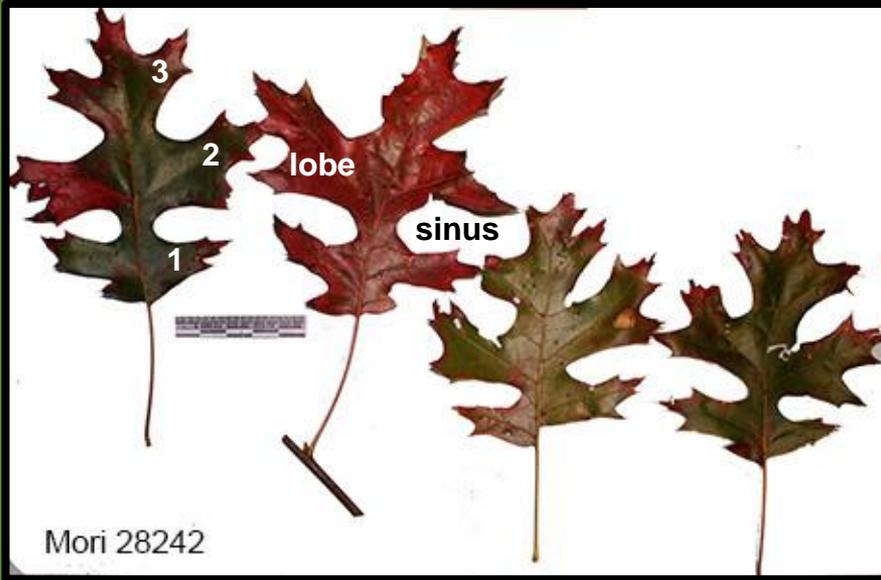
The acorns of this species have difficult to see apical rings at the apex of the acorn and the scales are more fused at the base of the cupule (right side) and less fused on the upper part of the cupule (left side).

# CHARACTERS OF THE BARK OF THE SCARLET OAK (*Q. coccinea*) IN THE PRESERVE



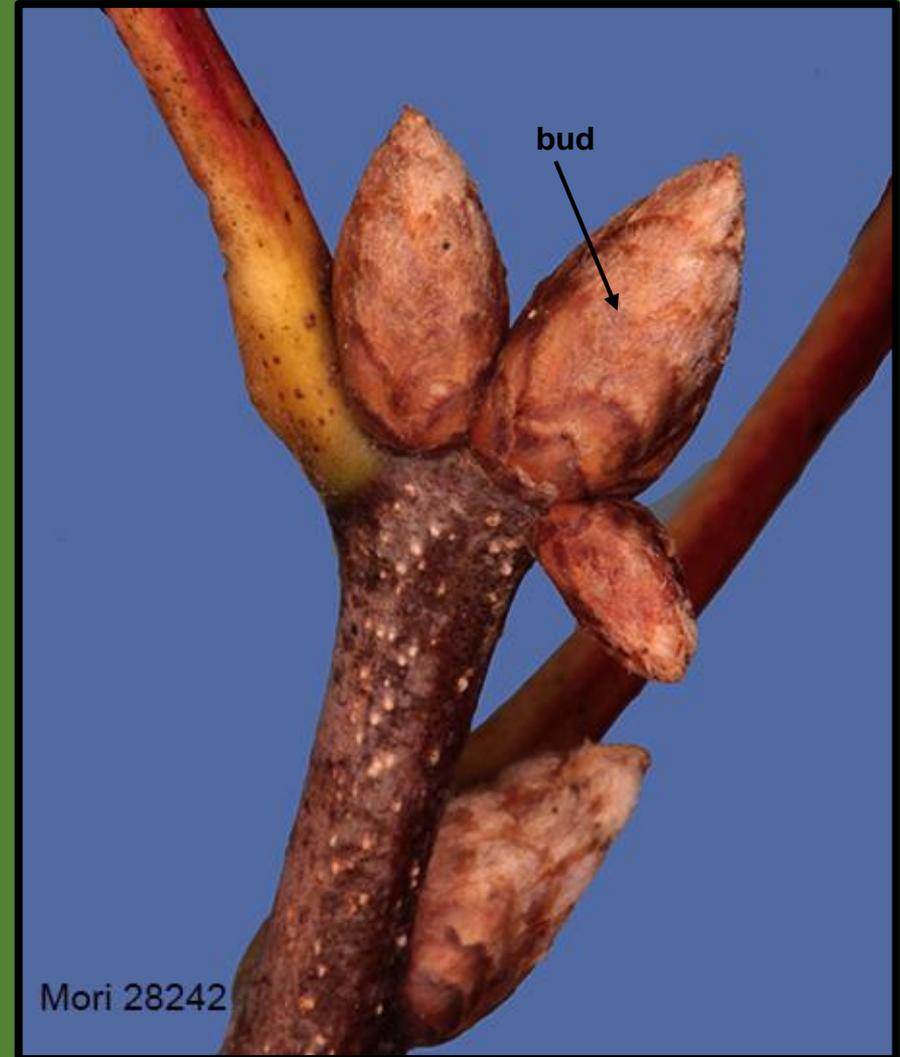
The scarlet oak has irregular, vertically oriented fissures and flattened ridges similar to those of the red oak. The horizontally oriented cracks are similar to those of the black oak.

# CHARACTERS OF THE LEAVES AND BUDS OF ANOTHER RED OAK SPECIES (*Q. coccinea*)

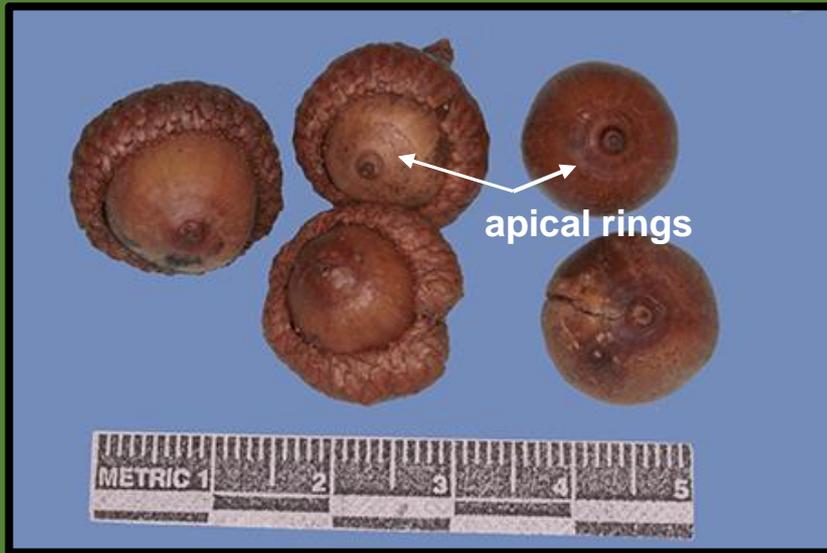


The scarlet oak differs from other species of the red oak in the Preserve by having 3 lateral lobes and sinuses that cut closer to the midrib. In addition, the lower two sinuses are horizontally oriented and rounded on the side toward the midrib.

The buds are very similar to, but less pubescent, than those of *Q. velutina*.

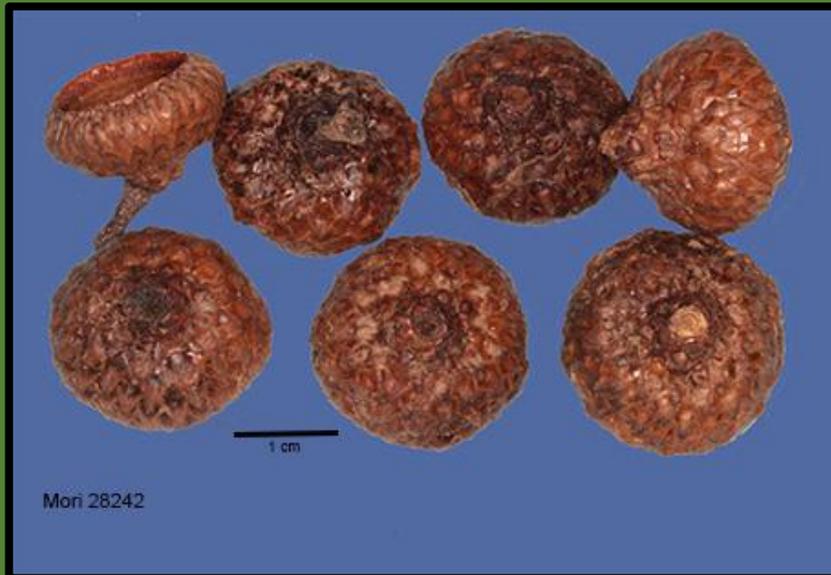


# CHARACTERS OF THE ACORNS OF ANOTHER RED OAK SPECIES (*Q. coccinea*)



Top. The scarlet oak has one to several difficult-to-see concentric rings at the apex of the acorns.

Bottom: In the scarlet oak, the scales covering the cupules are fused together at the base and the lower sides of the cupule. They are the less fused near the rim. The surface of the cupules is shiny to such an extent that they appear to have been shellacked.



The combination of three lateral lobes per side of the leaf blade, the deep sinus to about  $\frac{1}{4}$  the distance from the midrib, the horizontal orientation of the lower sinuses, the fusion of the scales of the cupules, and the concentric ring or rings at the apex of the acorn are features used to identify this species.

# NOTES ON THE WHITE AND RED GROUPS OF OAKS IN THE PRESERVE

1. Species of white oaks have rounded lobes without bristles at the apices of the lobes. In contrast, species of red oaks have pointed lobes and bristles at the ends of the pointed lobes.
2. The two white oaks in the preserve are easy to identify. *Q. alba* has shallow bark fissures, deep leaf blade sinuses, and relatively small acorns, whereas *Quercus montana* has deeply fissured bark, shallow leaf blade sinuses, and larger acorns.
3. The three red oaks in the preserve are harder to identify. *Quercus rubra* has glabrous buds; long, smooth ridges of bark between fissures; and a cupule made of tightly flattened scales, *Q. velutina* has pubescent buds; rough and short ridges of bark between fissures; and a cupule made of loosely placed scales. *Quercus coccinea* buds are less pubescent to those of *Q. velutina* and *Q. rubra*.