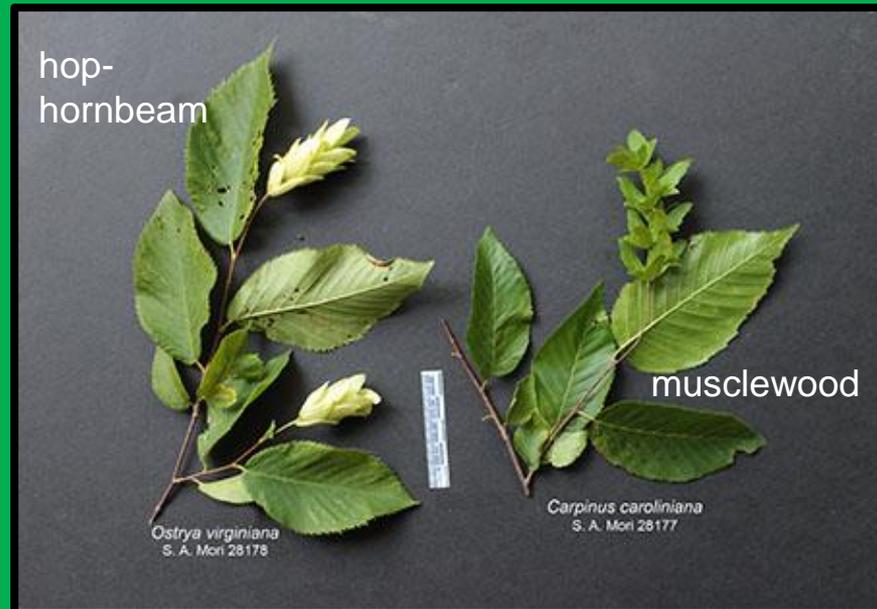


# THE BIRCH FAMILY (BETULACEAE) IN THE WESTCHESTER WILDERNESS WALK/ZOFNASS FAMILY PRESERVE

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Five genera and 31 native species of Betulaceae occur in North America (Nelson et al., 2014). In the Preserve there are four genera and five species. The family is divided into two subfamilies (Furlow, 1997), subfamily Betuloideae (*Alnus* and *Betula*) and subfamily Coryloideae (*Carpinus*, *Corylus*, and *Ostrya*). We have collected species of all genera except *Corylus*. The flowers of all Betulaceae in the Preserve are unisexual and both sexes occur on the same tree (i.e., the species is monoecious). The inflorescences are called catkins and there are many more flowers in the male catkins than are found in the female catkins. Most species of Betulaceae are pollinated by wind and species of *Betula* have small, winged fruits that facilitate seed dispersal. The fruits of *Carpinus caroliniana* are subtended by lobed bracts and the fruits of *Ostrya virginiana* are surrounded by a bladder derived from bracts which may also facilitate wind dispersal. The fruits of *Corylus* are dispersed by animals (Furlow, 1997).



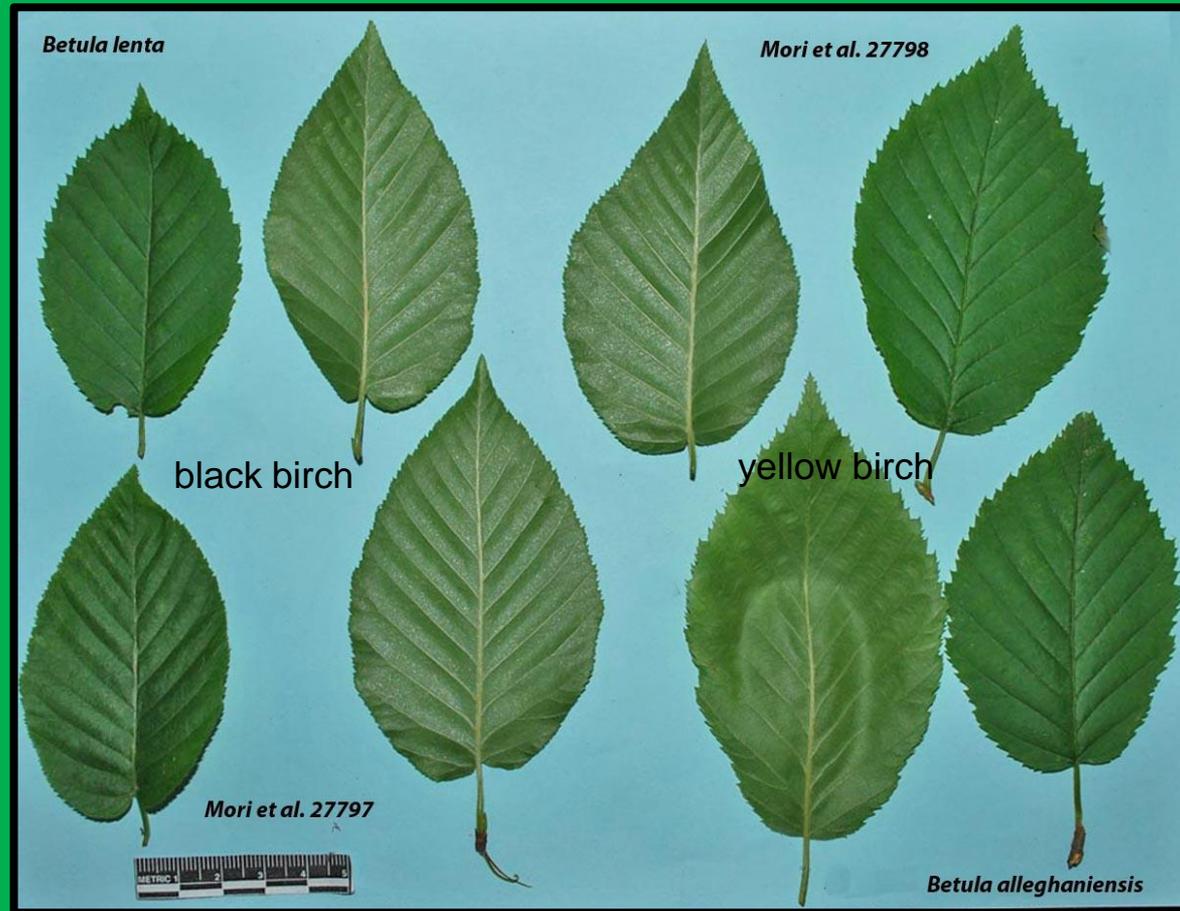
# KEY TO THE GENERA OF BETULACEAE

- 1. Fruits subtended by small scales (< 1.5 cm long); anthers without trichomes at apex. Fruits with membranous wings.....2
- 1. Fruits subtended by large (> 2 cm long), 3-lobed basal bracts (in *Carpinus*) or surrounded by bladder-like structure (in *Ostrya*); anthers with trichomes at apex. Fruits without membranous wings..... 3
  
- 2. Scraped twigs yield wintergreen aroma. Buds not stalked. Scales subtending fruits with 3 distinct apical lobes. Infructescences membranous, the scales shed at the same time as fruit dispersal..... *Betula*
- 2. Scraped twigs do not yield wintergreen aroma. Buds stalked. Scales subtending fruits with 4 very short apical lobes. Infructescences woody, persistent on plants long after fruits have been dispersed.....*Alnus*
  
- 3. Bark smooth. Fruits subtended by a 3-lobed bract..... *Carpinus*
- 3. Bark flaky. Fruits surrounded by bladder-like structure.....*Ostrya*

The following pages of this essay illustrate the characters of the five species of Betulaceae found in the Preserve. *Corylus americana* (American hazelnut) and *C. cornuta* (beaked hazelnut) have not been collected in the Preserve but do occur in other parts of Westchester County.

This key is based on species documented from the Preserve. See Furlow (1997) for keys including all species of Betulaceae found in North America.

# LEAVES OF BLACK (*Betula lenta*) AND YELLOW (*Betula alleghaniensis*) BIRCHES



There are 23 native species of *Betula* in the eastern half of North America (Nelson et al., 2014) but only two native species are found in the Preserve. Based on leaves it is difficult to separate these two species.

## CATKINS OF BLACK BIRCH (*Betula lenta*)



All Betulaceae in the Preserve produce catkins in the early spring as do species of some other tree families, e.g., Fagaceae (oaks) and Juglandaceae (hickories). These species flower before their leaves are expanded, and this facilitates wind pollination (i.e., the leaves do not impede pollen from reaching the stigmas of flowers on other trees).

# MALE CATKINS OF THE BLACK BIRCH (*Betula lenta*)

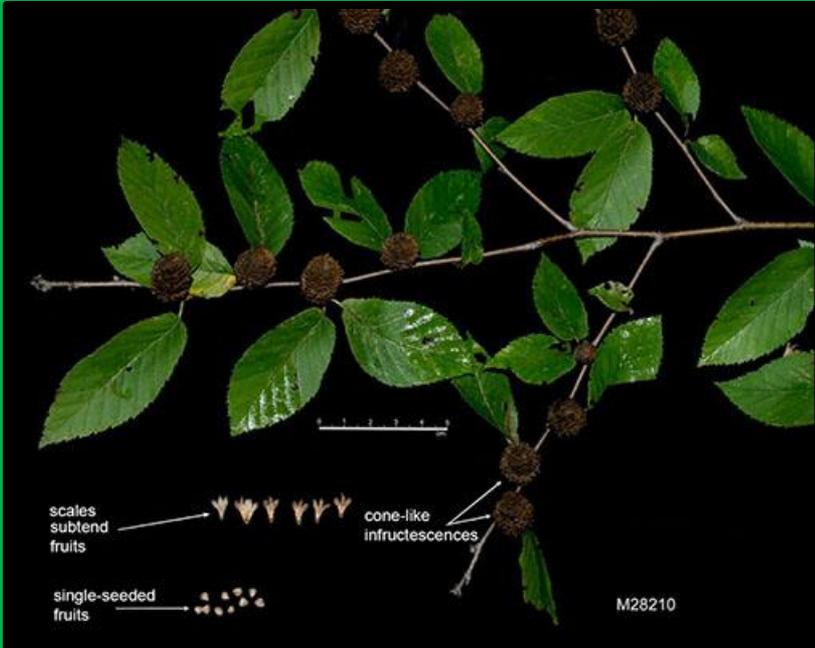


# MALE AND FEMALE CATKINS OF THE YELLOW BIRCH (*Betula alleghaniensis*)



The male catkins are much longer and have more flowers than the female catkins. In addition, the female catkins are erect and are placed lower on the twigs.

# FEMALE CATKINS OF THE YELLOW BIRCH (*Betula alleghaniensis*)



The two species of birch in the Preserve flower in spring and disperse seeds in autumn. The small, laterally winged fruits of *B. alleghaniensis* are carried away by the wind. Images of the fruits of *B. lenta* have not been photographed by us, but most species of *Betula* have similar infructescences and fruits.



**ALTHOUGH CATKINS OF THESE SPECIES ARE  
SIMILAR THEY DIFFER IN SIZE AND SHAPE**



## BARK OF THE BLACK (*Betula lenta*) AND YELLOW (*Betula alleghaniensis*) BIRCHES



Above: bark of the black birch peels in thick, flat plates. It is gray in color and the lenticels are long and horizontally oriented.

Leaves, flowers, fruits, and lenticels are similar among species but the bark makes it easy to identify the two species of birch found in the Preserve.

Below: bark of the yellow birch peels in thin, coiled plates. It is silvery yellow in color and the lenticels are long and horizontally oriented

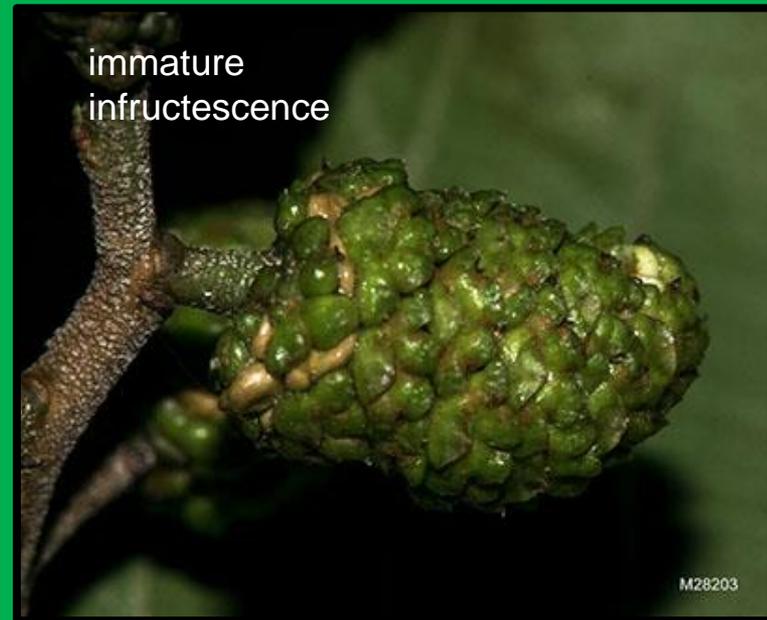


# LEAVES AND INFRUCTESCENCES OF THE SMOOTH ALDER (*Alnus serrulata*)



*Alnus serrulata* is found along wet areas in the Preserve whereas other species of Betulaceae usually occur on well-drained soils. However, outside of the Preserve there are species of birch adapted to wet areas. Infructescences of this species are found in branched groups whereas a single infructescence arises from the leaf axils of species of birches. In addition, the scales subtending the flowers of *Alnus* are not three-parted at the apex or subtended by conspicuous bracts and the fruits lack conspicuous wings. The fruits of *A. serrulata* are woody and persist on the plant for a long time after the seeds are dispersed.

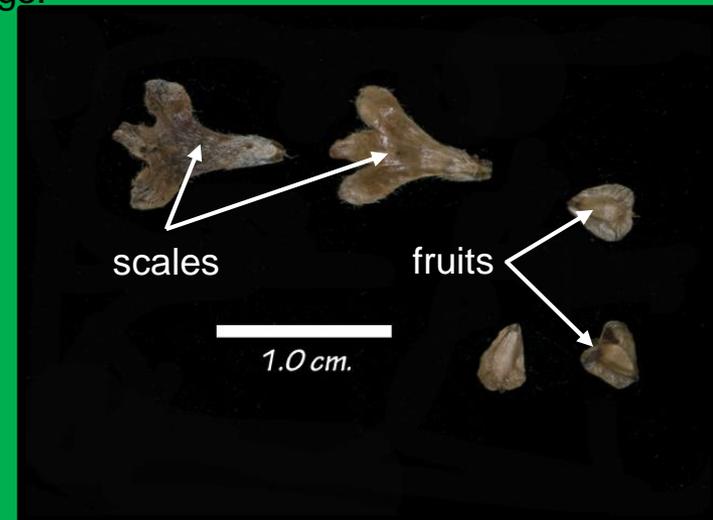
# OTHER CHARACTERS OF THE SMOOTH ALDER (*Alnus serrulata*)



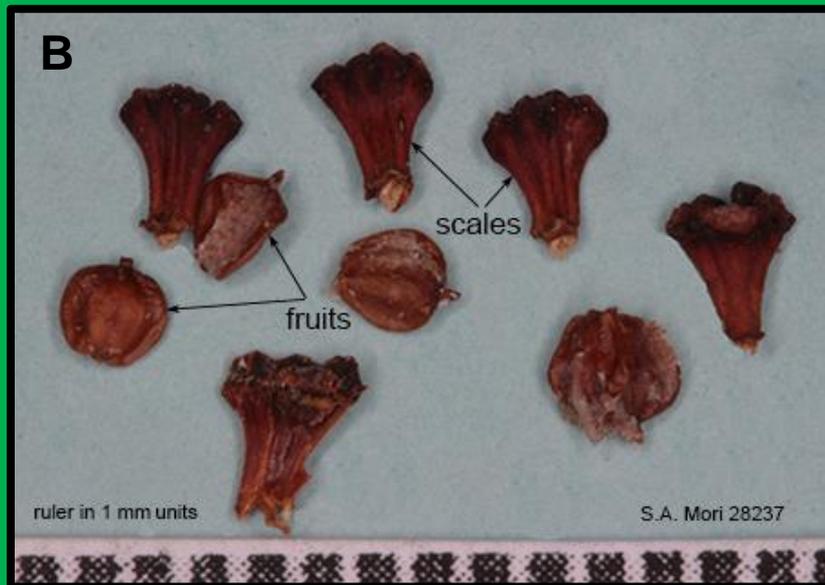
# SCALES AND FRUIT OF THE SMOOTH ALDER (*Alnus serrulata*)



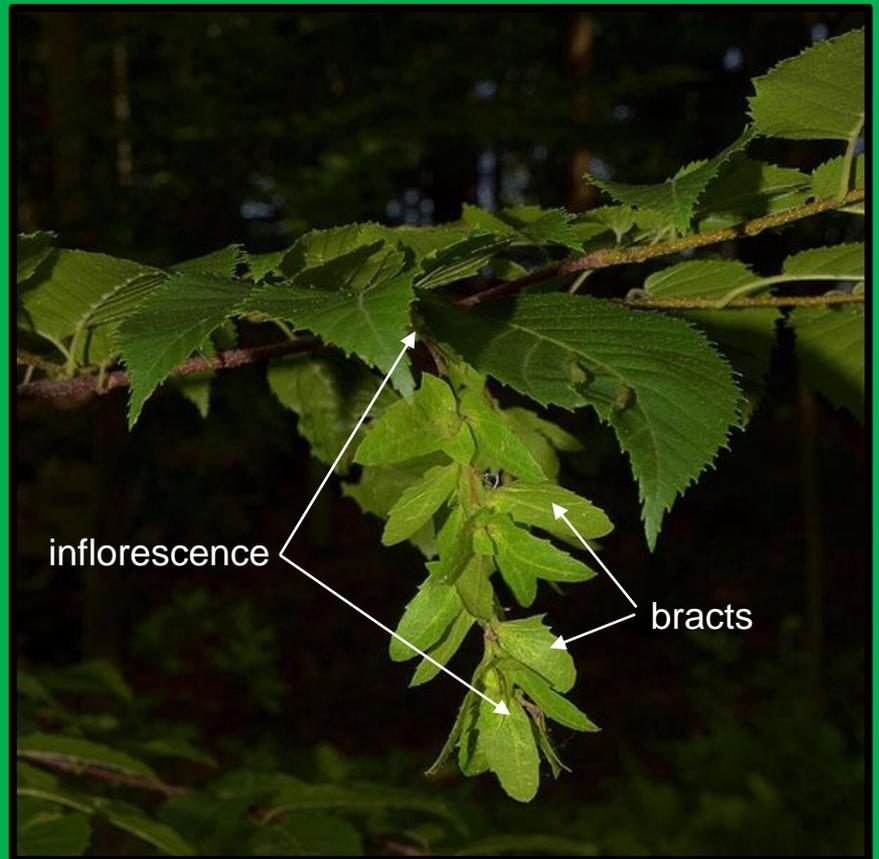
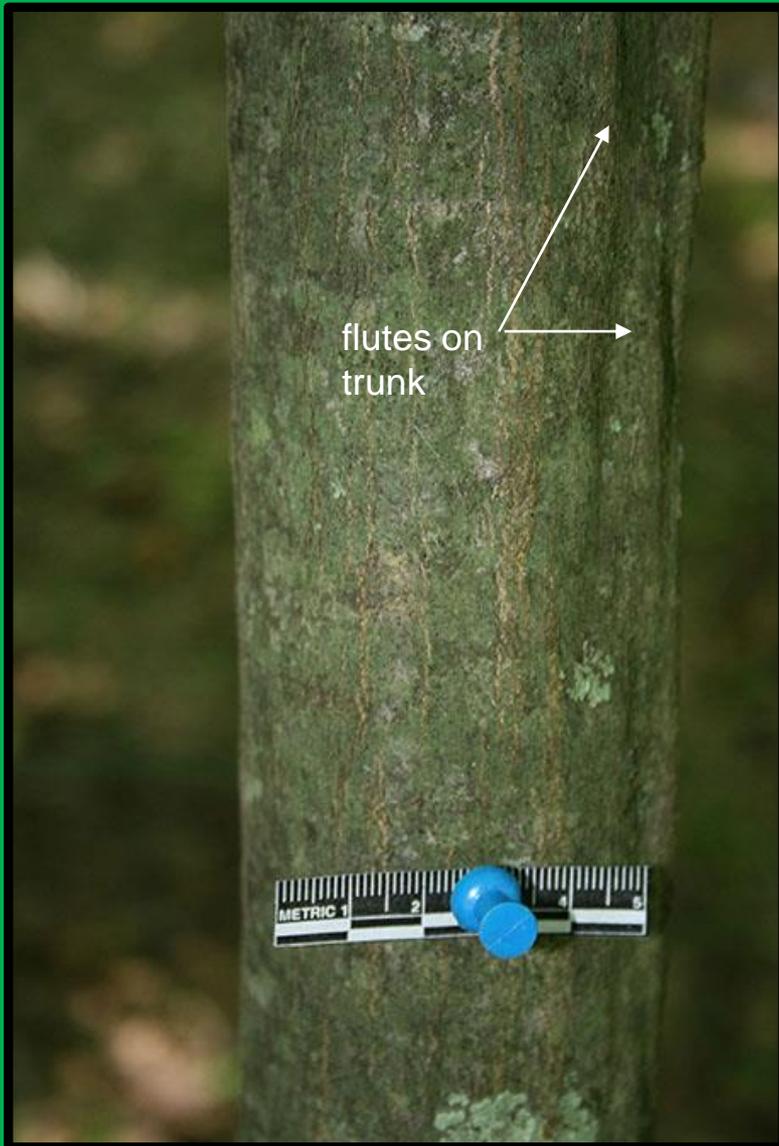
*Alnus serrulata* differs from species of *Betula* by the following morphological features: 1) the cones collectively appear like an infructescence (Fig. A), 2) the scales (Fig. B) are fan-shaped and the apex does not have well-developed lobes as do species of *Betula*, and 3) the fruits are ridged but do not possess membranous wings.



Compare the three-lobed scales and membranous winged fruits of *Betula lenta* with those of *Alnus serrulata*.



# TRUNK AND FRUIT OF MUSCLEWOOD (*Carpinus caroliniana*)

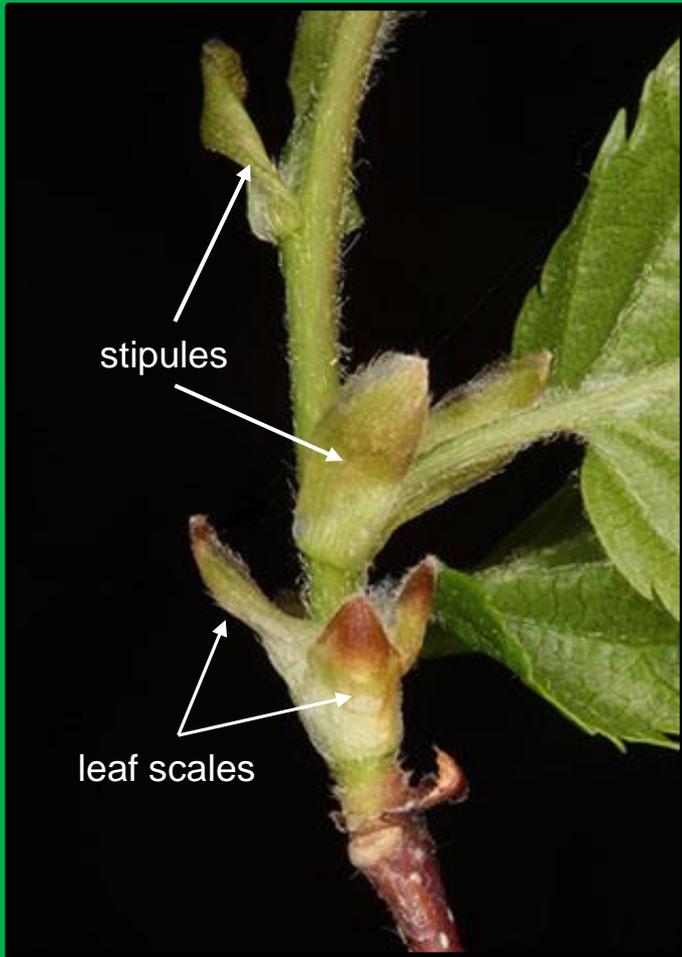


The combination of small tree; gray, smooth bark; irregular trunk surface; and hanging inflorescence with large bracts lobed at the base make this species easy to identify.

## OTHER FEATURES OF MUSCLEWOOD (*Carpinus caroliniana*)



## OTHER FEATURES OF MUSCLEWOOD (*Carpinus caroliniana*)



Left: stipules and bud scales.

Right: Trichomes in the axils of the secondary veins and the midrib may serve as shelter for mites. The mites feed on spores of fungi that cause damage to the leaves of the host plant. The mites get a source of food and the musclewood is protected from

# REPRODUCTIVE FEATURES OF MUSCLEWOOD (*Carpinus caroliniana*) IN THE PRESERVE



This and other species of Betulaceae have unisexual flowers segregated into male and female catkins. The catkins appear before the leaves are flushed. The male and female flowers are on the same tree in separate catkins (= monoecious). The fruits are subtended by lobed bracts.

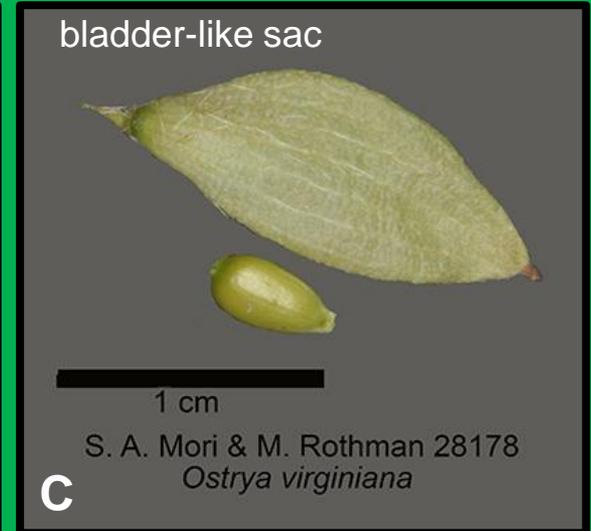
# BARK AND FRUIT FEATURES OF THE HOP-HORNBEAM (*Ostrya virginiana*) IN THE PRESERVE



A. Small tree with rough, thin bark that peels in irregular plates.



B. Inflorescence.



C. The fruit is a nutlet which is enclosed by a bladder-like sac derived from bracts.

These features make it easy to identify this common species

## OTHER FEATURES OF THE HOP-HORNBEAM (*Ostrya virginiana*) IN THE PRESERVE



Stipules and trichome domatia are common in the Betulaceae but have not been used by us to help define species.

# SUMMARY OF BETULACEAE IN THE PRESERVE

1. We have inventoried four genera and five species belonging to the Betulaceae in the Preserve. The only genus missing is *Corylus*.
2. We have photographed many of the characters of the species of Betulaceae. However, we do not have images of all characters. For example, we assume that all species of *Betula* have stipules but we have not seen them probably because they are caducous (i.e., they drop soon after the leaves are flushed).
3. The flowers are difficult to photograph because isolating single flowers without damaging them takes skill and patience.
4. Terminology is poorly defined, e.g., what is the difference between a bract and a scale. We have used scale for a relatively small bracteole that subtends the flowers and then the fruits derived from them of *Betula* and *Alnus*. On the other hand, we use bract for the larger leaf-like structures that subtend or surround the flowers and fruits of *Carpinus* and *Ostrya*.