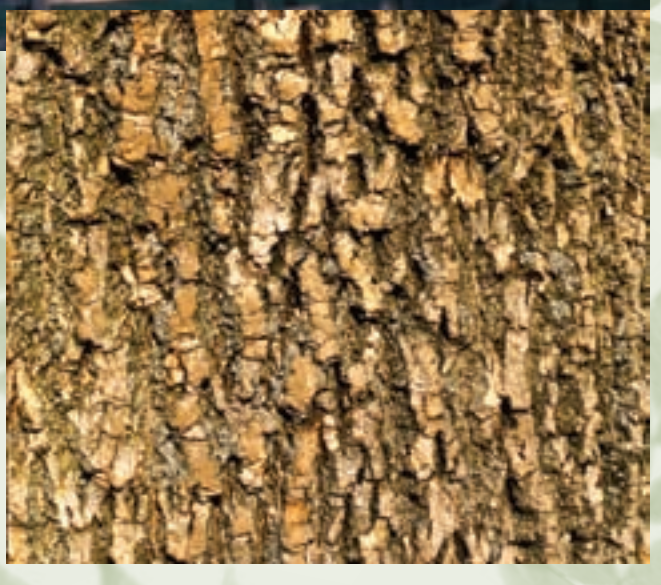
Bulletin 924

ASH REPLACEMENTS FOR URBAN AND WOODLAND PLANTINGS

White Ash Tree

White Ash Leaf



White Ash Bark

THE OHIO STATE UNIVERSITY EXTENSION

ASH REPLACEMENTS FOR URBAN AND WOODLAND PLANTINGS

Authors

T. Davis Sydnor
Professor, Urban Forestry
School of Natural Resources
The Ohio State University
2021 Coffey Road
Columbus, OH 43210

Kathy Smith
Extension Associate
School of Natural Resources
The Ohio State University
2021 Coffey Road
Columbus, OH 43210

Randall Heiligmann
Ohio State University Extension State Forestry Specialist
School of Natural Resources
The Ohio State University
2021 Coffey Road
Columbus, OH 43210


For-sale publication

All photos property of The Ohio State University except where noted: VPI-Virginia Polytechnical Institute Department of Forestry, Paul Wray, Iowa State University, **www.forestryimages.org**, Sally S. Weeks and George R. Parker, Trees of Indiana, CD, Purdue University. Appreciation is expressed to the United States Department of Agriculture Forest Service and the Renewable Resources Extension Act for assistance provided.

Additional copies of this handbook can be purchased from Media Distribution, Communications and Technology, The Ohio State University, 385 Kottman Hall, 2021 Coffey Road, Columbus, OH 43210-1044. Phone: 614-292-1607. Fax: 614-292-1248. E-mail: pubs@ag.osu.edu. Visa and MasterCard accepted.

Keith L. Smith, Associate Vice President for Agricultural Administration and Director, Ohio State University Extension

TDD No. 800-589-8292 (Ohio only) or 614-292-1868

7/05—3.5M—215625

The Emerald Ash Borer Threat

Emerald Ash Borer (EAB) is a non-native insect that is currently attacking ash trees in Michigan, Ohio, and Indiana. First identified in southeastern Michigan in 2002, emerald ash borer has already killed more than 10 million ash trees in the cities and forests of that state. It has now spread into northwestern Ohio and northeastern Indiana. Unless some means is found to eradicate it, emerald ash borer has the potential to kill literally all of the ash in this part of the country.

Emerald ash borer is a selective pest; it attacks only ash trees, members of the genus *Fraxinus*. However, it attacks all of our native ashes — black, blue, green, pumpkin, and white.[1] To learn more about emerald ash borer (including how to identify the insect and its damage), to learn to identify ash trees, or to obtain a diagnostic check list to help determine if your trees or woodland are infested with emerald ash borer, go to Ohio State University Extension's Emerald Ash Borer web site at: **http://ashalert.osu.edu**.

Ashes are important tree species in the natural forests of Ohio and have been planted extensively throughout the state for reforestation. Over the state as a whole, ash species occupy about 12 percent of the total forest land,[2] with stands varying from those containing no ash to stands composed entirely of ash. More than three million ash trees, both native and exotic species, also make up a significant portion of Ohio's urban forests, including street and landscape plantings.

Because of the potentially devastating impact emerald ash borer may have, rural and urban Ohio landowners are becoming increasingly concerned about the risk it poses to their ash trees and woodlands, and what they can do to address that risk. This publication identifies tree species that can be used to replace existing ash, when appropriate, or used in future plantings if ash species are not available or are inappropriate for planting. Recommendations for developing management strategies for existing woodlands or reforestation

plantings are found in another publication.[3]

Selecting the Tree Species to Plant

The first key to a successful tree planting is to select a species that will achieve the objectives of the planting and that will grow well on the site. The first question that needs to be answered is: What is the purpose of this planting? Trees are obviously planted for a wide variety of purposes including reforestation, erosion control, land reclamation, wildlife habitat enhancement, aesthetics (including shape, fall color, bark features, fruit characteristics, and more), shade, visual or sound barriers, and other reasons. Because tree species vary in characteristics, such as size, shape, leaf character, growth rate, and wood value, some tree species are better suited for specific purposes than others.

The second question that must be answered is: Of the tree species that will achieve the purposes of the planting, which will grow well on the planting site? Planting site characteristics that can affect tree growth vary widely in Ohio. These characteristics include soil pH, soil drainage, soil texture (sandy to clayey), soil compaction, available sunlight, and more. Tree species differ markedly in their abilities to grow in these varying site conditions. When selecting the species to plant, it is imperative that species tolerate the characteristics and conditions of the planting site.

In developing this guide for selecting tree species to use to replace ash, it was assumed that, if not for emerald ash borer, one or more of the ash species would be suitable for the planting. Tree species included in this guide, therefore, are generally of the same size as ash and grow well on sites suitable for one or more of the native ash species. You will not, for example, find tree species in this guide that grow to a maximum height of 25 feet and which would be suitable for planting under utility power lines, as ash would not be an appropriate tree for such a planting.


Weeks & Parker

Characteristics of Ohio's Native Ashes

The native habitats and site tolerances of Ohio's native ash species are not identical, and an understanding of those characteristics can be very helpful in selecting replacement species. Four ash species are fairly common in Ohio; one is rare. White ash *(Fraxinus americana)* and green ash *(F. pennsylvanica)* are found throughout Ohio, blue ash *(F. quadrangulata)* primarily in western Ohio, and black ash *(F. nigra)* throughout much of northern and western Ohio, but rare in the southeastern counties. The fifth species, pumpkin ash *(F. profunda),* is rare in Ohio, with a number of trees having been found in western Ohio.[4]

White ash is the most site-demanding ash species native to Ohio. It requires moist, well-drained soils (mesic environments) to thrive, and is the most drought sensitive of the native ashes. It is a common pioneer invader of old fields but will establish under a forest canopy, although it does not thrive in shaded conditions as it matures. For this reason it is classified as intermediate in shade tolerance when young, but moderately intolerant when older. In a woodland interior, it is commonly displaced over time by more shade-tolerant species (such as sugar maple).

White ash's growth rate is rapid when young but slows with age, with mature trees commonly reaching 70 to 80 feet in height. It is the tallest of the native ashes. Growth habit is an upright oval when small, becoming broader spreading with age, and retaining a more regular outline than green or black ash. White ash fruit (samaras) and foliage have some value as wildlife food. Although the wood-using industry doesn't normally differentiate among the ashes, white ash, along with blue ash, commonly produce logs with the highest timber value.

Two naturally occurring varieties of white ash are often recognized, white ash and Biltmore ash. A number of named cultivars are produced by the nursery industry and are generally budded on green ash seedlings. Named cultivars are generally selected for appearance and/or fall color. White ash's value as a street tree, however, has been limited by its sensitivity to drought.

Green ash is found most commonly along streams, at the edge of swamps, and in woodlands growing on poorly drained soils. However, green ash tolerates a wide variety of site conditions, and for that reason it has been widely planted in both urban and rural environments. Its tolerances of acid and alkaline soils have also allowed it to be used extensively in stripmine reclamation. In Ohio, on a comparable site, green ash would be somewhat less tolerant of shade than white ash.

Green ash's growth rate is rapid when young and slows with age, resulting in a tree 60- to 80-feet tall with a broad, irregular outline. Growth habit is an upright oval as a young plant, becoming broader than tall at maturity. Female trees can produce large amounts of fruit (samaras). This fruit along with the foliage has some wildlife value. Green ash commonly produces logs of lower quality than white or blue ash.

Two naturally occurring varieties of green ash are recognized by some taxonomists, green ash and red ash. A number of green ash cultivars are available in the nursery industry and were generally selected for appearance as young plants and lack of fruiting.

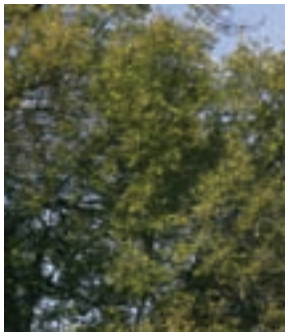
The rarely seen **pumpkin ash** is very similar to green ash in appearance and habitat. It is distinguished from green ash by having much larger fruit and dense hair on the twigs and lower leaf surface. Some taxonomists argue that pumpkin ash is not a separate species, but a variant of green ash. However, it is so uncommon in Ohio that it is only of very limited local interest.


Weeks & Parker

Black ash is most commonly found growing on wetter sites (hydric environments), along streams, in woodlands on poorly drained soils, in bogs, and in areas that are seasonally flooded. Black ash does not establish and grow well in the shade and is considered less shade tolerant than green ash.

Growth is slower than other ashes primarily due to the poor soil drainage conditions that characterize its most common natural sites. It commonly achieves a height of no more than 40 to 70 feet. Growth habit is often irregular, making it less useful for timber and aesthetics.

Though it commonly has low-quality wood for timber purposes, its wood is often split, beaten, and separated along annual rings for use in making baskets. The fruit (samaras) and foliage have some wildlife value. Only one cultivar of black ash has been selected by the nursery industry, and it is rarely seen in commerce. Black ash does not commonly thrive in most urban environments, particularly those that are hot and dry.



Blue ash is more adapted to drier sites (more xeric) than other native Ohio ash, often being found on upland ridges, and is particularly well adapted to alkaline or chalky soils. On a comparable site, blue ash would exhibit shade tolerance similar to white ash.

Blue ash exhibits a rapid growth rate when young that slows with age, resulting in a tree similar in height to white ash (70 to 80 feet). Growth habit is upright oval becoming rounded with age.

Blue ash does not fruit as readily as green ash but its fruit (samaras) and foliage have some wildlife value. Among the ashes, blue ash, along with white ash, commonly produce logs with the highest timber value.

Although more drought resistant than white ash, blue ash has not been popular in the nursery industry as it has poorer fall color than either green or white ash. One cultivar has been selected for use in the Great Plains because of its enhanced drought tolerance but is rarely seen in the industry today.

Planting Situations

As the previous discussion suggests, ash trees play a vital role in our rural and urban forests, and their loss will have a profound impact. In many situations, planting alternative species is one method to mitigate that impact. The remainder of this bulletin contains recommendations for tree species that can be used to replace ash species in urban and woodland plantings. The recommendations include information on the site requirements and tolerances of the species, ornamental features, wildlife and woodland value, flood tolerance, tolerance to wounding, commercial availability, and the situations where the species would be an appropriate replacement for ash. Four situations are recognized:

- **Riparian or Buffer Plantings** — Areas adjacent to streams and other bodies of water where tolerance of wet soil conditions for at least part of the year and/or flooding are important. Green and black ash would be the ash commonly found on these sites. Species selected for planting on these sites should be tolerant of wet soils and/or periodic flooding. Riparian areas are commonly natural areas in Ohio. It is, therefore, recommended that species selected for planting in these areas be species native to Ohio. Tree species that provide wildlife values are desirable in these areas.

- **Woodland Reforestation** — Depending on the site, white and green ash have been the ash species commonly used for reforestation plantings. Green ash, in particular, has been used extensively because of its tolerance of a wide range of site conditions. Replacements for ash in these plantings should generally be large trees, at least 50 feet at maturity, be native species, have wildlife value, and be well suited to existing site conditions. Reforestation plantings are typically relatively large plantings, often several acres, so planting stock of the desired species needs to be available in bare-root stock in order for the planting to be economically feasible.

- **Yard Environment** — Both green and white ash have been used extensively in residential landscape plantings. To fulfill the same function as these ash species, replacements should be relatively large trees. The desirability of the tree providing wildlife value may depend on where in the yard the tree is to be planted, and the specific characteristic. Tree species that produce numerous large seeds, such as black walnut, may be inappropriate for certain plantings.

- **Tree Lawn (or Sidewalk Cut)** — Green ash has commonly been planted in tree lawns, the area located between the street and the sidewalk. Trees selected to replace ash in this situation should be adapted to growing in relatively severe environmental conditions often characterized by limited soil moisture, disturbed and/or compacted soils, high levels of air pollution from automobiles, salt (winter street applications), and limited or restricted overhead room due to the presence of utility lines.

Commonly, more than one species will satisfy the requirements for a specific planting. To identify the specific species or group of species that should be selected, landowners must carefully evaluate the individual tree characteristics (size, shape, leaf character, fruit or seed type, fall color, flower character, and more) and determine which species or group of species best matches the objectives of the planting. Table 1 provides a quick reference for identifying species suitable for each of the four planting situations, and serves as a quick reference for locating species by scientific name. Table 1 is followed by detailed information on the 35 species, arranged alphabetically by common name.

Table 1. Appropriateness of Recommended Ash Replacement Species for Plantings Along Stream Edges (Riparian Zones), in Woodlands, as an Ornamental in an Open Lawn Area, or in a Tree Lawn (Sidewalk Cut). The page numbers in the last column indicate the location of information for that species.

Scientific Name	Common Name	Stream Edge	Wood-land	Open Lawn	Tree Lawn	Page Number
Acer nigrum	Black Maple	X	X	X		24-25
Acer rubrum	Red Maple	X	X	X		50-51
Acer saccharinum	Silver Maple	X	X	X	X	62-63
Acer saccharum	Sugar Maple		X	X		64-65
Acer x freemanii	Freeman Maple	X	X	X	X	40-41
Aesculus octandra	Yellow Buckeye		X	X		80-81
Betula nigra	River Birch	X	X	X		54-55
Carya cordiformis	Bitternut Hickory	X	X	X		20-21
Carya ovata	Shagbark Hickory		X	X		58-59
Catalpa speciosa	Northern Catalpa		X	X	X	44-45
Celtis occidentalis	Common Hackberry	X	X	X	X	34-35
Fagus grandifolia	American Beech		X	X		12-13
Gleditsia triacanthos inermis	Thornless Honeylocust	X	X	X	X	72-73
Gymnocladus dioica	Kentucky Coffeetree		X	X	X	42-43
Juglans nigra	Black Walnut		X	X		26-27
Liquidambar styraciflua	Sweetgum	X	X	X	X	68-69
Liriodendron tulipifera	Tuliptree or Yellow-Poplar		X	X		74-75
Maclura pomifera	Osage-Orange	X	X	X	X	46-47
Magnolia acuminata	Cucumbertree or Cucumber Magnolia		X	X		36-37
Nyssa sylvatica	Blackgum or Black Tupelo		X	X		28-29
Platanus occidentalis	Sycamore	X	X	X	X	70-71
Populus deltoides	Eastern Cottonwood	X	X	X	X	38-39
Prunus serotina	Wild Black Cherry		X	X		78-79
Quercus alba	White Oak		X	X		76-77
Quercus bicolor	Swamp White Oak	X	X	X	X	66-67
Quercus coccinea	Scarlet Oak		X	X		56-57
Quercus macrocarpa	Bur Oak		X	X	X	30-31
Quercus muehlenbergii	Chinkapin Oak		X	X	X	32-33
Quercus palustris	Pin Oak	X	X	X	X	48-49
Quercus rubra	Red Oak		X	X	X	52-53
Quercus shumardii	Shumard Oak		X	X	X	60-61
Robinia pseudoacacia	Black Locust		X	X		22-23
Taxodium distichum	Bald Cypress	X	X	X	X	16-17
Tilia americana	Basswood or American Linden	X	X	X		18-19
Ulmus americana	American Elm	X	X	X	X	14-15

Characteristics of Tree Species to Consider for Ash Replacement in Ohio[5]

Plants Listed Alphabetically By Common Name

Definitions of Terms Used in the Following Tables

A. Flood Tolerance — Tolerance to flooding is a critical characteristic for many of these species. The terms and definitions listed here are used to express relative flood tolerance.

1. **Very flood tolerant** — Able to survive deep, prolonged flooding for more than one year.

2. **Flood tolerant** — Able to survive deep flooding for one growing season, with significant mortality occurring if flooding is repeated the following year.

3. **Intermediately flood tolerant** — Able to survive flooding or saturated soils for 30 consecutive days during the growing season.

4. **Flood intolerant** — Unable to survive more than a few days of flooding during the growing season without significant mortality.

B. Shade Tolerance — The shade tolerance of trees relates to their ability to establish and grow in the shade of over-topping vegetation. The terms and definitions listed here are used to express relative shade tolerance.

1. **Very shade tolerant** — Trees in this category will survive with 1 to 3% of full sunlight and can survive under a closed canopy of densely foliaged trees.

2. **Shade tolerant** — These trees can survive with 3 to 10% of full light or under a closed canopy with some gaps. Many forest understory trees are in this category.

3. **Intermediate shade tolerance** — Trees in this category require 10 to 30% of full sun. Woodland edge trees are often in this category.

4. **Shade intolerant** — These trees require 30 to 60% of full sun to develop properly. Pioneer invader trees are often in this category.

5. **Very shade intolerant** — Very shade intolerant trees require at least 60% of full sun to survive and grow.

American Beech (*Fagus grandifolia*)

Site Selection and General Comments	· Grows well in soil textures from sandy to clay loam. · Tolerant of acid to neutral soil pH. · Less tolerant of droughty conditions than many other species such as white oak. · Very shade tolerant. · Excess soil deposited on top of root system is poorly tolerated. · Growth rate is generally slower than the ashes under comparable conditions.
Ornamental Features	· Dark green foliage is medium textured. Fall color ranges from sepia to yellow. · European beech is preferred for ornamental use. · Rarely used in urban plantings due to purported sensitivity to urban stress. · Bark is a smooth dove grey and more attractive than European beech.
Wildlife Value	· Major den or nesting site for wildlife. · Fruit (beech nuts) is a major source of food for many mammals and birds. · Foliage is excellent browse for mammals.
Woodland Value	· In woodlands is likely to have defects, making the timber value low. · High-quality beech wood is used for furniture and specialty products such as cutting blocks and can be more valuable than ash when markets exist.
Flood Tolerance	· Will grow on poorly drained soils not subject to prolonged flooding.
Wound Tolerance	· Likely to develop cavities in response to wounding.
Where It Replaces Ash	· Woodlands and, to a lesser extent, as a rural landscape ornamental.
Commercial Availability	· Availability is limited. European beech is normally used in landscape settings. · Bare-rooted seedlings are not commonly available for reforestation planting.

American Beech

American Elm (*Ulmus americana*)

Site Selection and General Comments	· Grows well on medium to heavy textured soils (loams to clays); somewhat poorer on droughty, coarse-textured soils. · Tolerant of soil pHs from low 5s to close to 8.0. · Can survive on very infertile soils. · Intermediate in shade tolerance. · Height and diameter growth rate faster than the ashes in open site. · Quite sensitive to Dutch elm disease. · Disease-resistant clones are available. · Disease-resistant selections must be asexually propagated, making them expensive for natural reforestation or buffer plantings. · Few trees are as tolerant of the urban environment as American elm.
Ornamental Features	· Medium textured foliage is dark green. Fall color ranges from sepia to yellow. · Four cultivars have been selected for disease resistance. · Growth habit is distinctly vase shaped. · This tree species has much historical significance in this country.
Wildlife Value	· Foliage is good browse for mammals.
Woodland Value	· Wood valuable where markets exist.
Flood Tolerance	· Intermediate.
Wound Tolerance	· Tolerant of wounding. This characteristic was one reason for its popularity before Dutch elm disease became a problem.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Four disease-resistant cultivars — Valley Forge, Princeton, New Harmony, and Jefferson — are increasingly available in the nursery trade for landscape-sized trees. · Disease-sensitive seedlings are rarely used for reforestation.

American Elm

Bald Cypress (*Taxodium distichum*)

Site Selection and General Comments	· Will grow in soil textures from coarse sand to heavy clay. · Tolerates acid (4.5) to moderately alkaline (7.5) soil pH. · Tolerates excessively wet soils. · Drought tolerant once established. · Intolerant of deicing salt. · Intermediate to intolerant of shade. · Deciduous conifer. · May produce "knees" in excessively wet sites. · Fruit is a one inch in diameter globose cone.
Ornamental Features	· Very fine textured, medium green foliage is unusual except for deciduous conifers. · Reddish brown to ash gray, thin, fibrous bark, viewed by many as attractive. · Conical overall shape. · Russet fall color. · Drops all of its needles in the fall.
Wildlife Value	· Relatively low, but seeds are eaten by a variety of wildlife. · May provide nesting sites for birds.
Woodland Value	· Specialized market.
Flood Tolerance	· Very flood tolerant.
Wound Tolerance	· Good.
Where It Replaces Ash	· Useful in yard areas, tree lawns, and riparian zones.
Commercial Availability	· Available in ornamental nursery trade for landscape-sized trees. · Bare-rooted seedlings available for riparian planting.

Wray

Bald Cypress

Basswood or American Linden (*Tilia americana*)

Site Selection and General Comments	· Tolerates soil textures from sandy to clay. · Tolerant of strongly acid (~4.5) to somewhat alkaline (7.5+) soils. · Shade tolerant. · Excess soil deposited on top of the root system is poorly tolerated. · Adapts better to environmental change than more commonly planted exotic lindens. · Growth rate is generally equal to or faster than the ashes. · Insect problems are numerous but generally cosmetic.
Ornamental Features	· Bold textured foliage is commonly lighter green on the underside. Fall color is poor (yellow to chartreuse). · The European lindens are more commonly planted for ornamental use but are actually less adaptable.
Wildlife Value	· A major den or nesting site for wildlife. · Fruit is a major source of food for many mammals and birds and is more consistently borne than the oaks. · Foliage is excellent browse for many animals.
Woodland Value	· The flowers may be used in honey production. · High-quality basswood wood is used for specialty products and can be valuable where markets exist. · Wood has very low density and is highly desired by wood carvers.
Flood Tolerance	· Intolerant.
Wound Tolerance	· This tree is less tolerant of wounding than ashes and is likely to develop cavities in response to wounding.
Where It Replaces Ash	· Useful in yard areas and woodlands.
Commercial Availability	· One cultivar, Redmond, is commonly grown in the nursery trade and was selected for habit and adaptability. · Seedlings are available for reforestation.

Basswood or American Linden

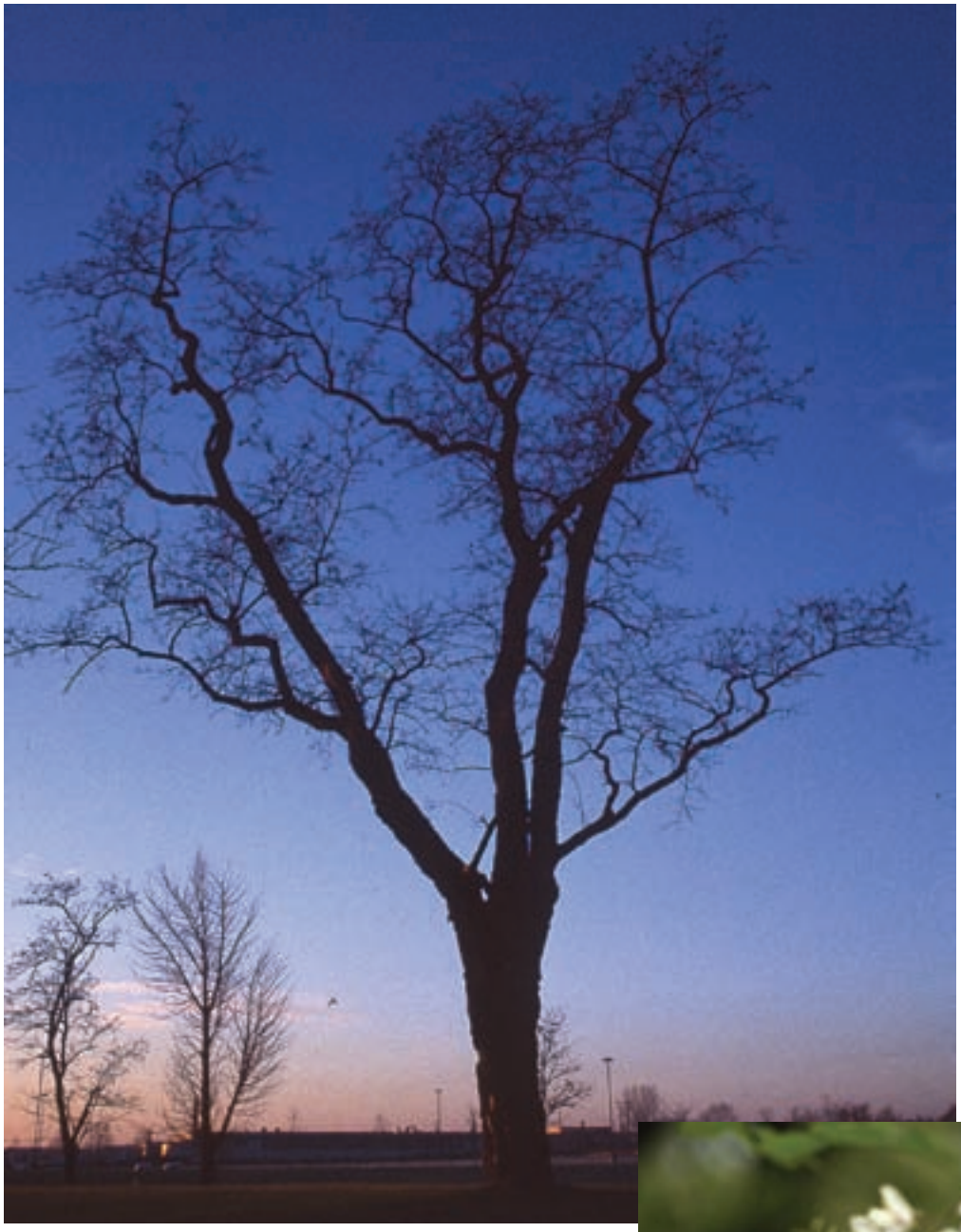
Bitternut Hickory (*Carya cordiformis*)

Site Selection and General Comments	· Grows on soil textures from sandy to clay loam. · Commonly found in soils with pH from slightly acid (6.3) to slightly alkaline (7.5). · Often moderately tolerant of shade when young, becoming intolerant with age. · Grows well on wet or dry sites; tolerant of poor drainage; more tolerant of drought than ash. · Grows well on relatively infertile sites. · High tolerance for environmental change and often remains when new homes are built in woodlands. · Fastest-growing hickory native to Ohio. · Growth rate of young trees slower than ashes and most other hardwoods but similar to beech and sugar maple. · Insect and disease problems are relatively minor.
Ornamental Features	· Pinnately compound leaves are medium textured and medium green in color. Fall color ranges from yellow to gold and is consistently showy. · Growth habit is upright oval when young, becoming rounded with age when growing in the open. · Fruit can be a litter concern during mast years (every 3 to 5 years).
Wildlife Value	· Fruit is bitter as the name suggests and thus is not a major food source for mammals or birds. · Foliage is uncommon browse for mammals such as deer. · Good seed crops occur at 3- to 5-year intervals.
Woodland Value	· Wood is sold as "hickory" and is used for a variety of products including handles, trim, cabinets, and flooring. · Hickory is the premier, high heat content, slow-burning firewood.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Tolerant of wounding.
Where It Replaces Ash	· Useful in yard areas and woodlands.
Commercial Availability	· Uncommonly found in the nursery trade for landscape-sized trees. · Seedlings are hard to find for reforestation.

Bitternut Hickory

Black Locust (*Robinia pseudoacacia*)

Site Selection and General Comments	· Grows reasonably well in all soil textures as long as adequate soil moisture is available. · Tolerates pH range from very acid (~4.5) to very alkaline (~8.2). · Does not tolerate excessive drought. · Will grow on sites with low fertility. · Very intolerant of shade. · Very tolerant of rapid environmental changes such as deforestation. · Growth rate somewhat slower than ash on good quality site, better than ash on wet or infertile sites. · Often found as a pioneer invader and is shaded out as woodlands mature. · Susceptible to black locust borer (potential problem) and black locust leaf miner (cosmetic concern).
Ornamental Features	· Pinnately compound leaves are dark green and fine textured. Fall color is chartreuse and not showy. · Nursery selections are available in Europe. · Flowers are white and quite showy and fragrant. · Growth habit is upright oval becoming irregular with age.
Wildlife Value	· Excellent for cavity-nesting birds such as downy woodpecker and common flicker. · Foliage is excellent browse for wildlife. · Flowers are a source of nectar for some birds and many insects.
Woodland Value	· Flowers may be used in honey production. · One of the most decay resistant of North American hardwoods and thus excellent for fence posts and railroad ties. · Highly favored for land reclamation, because of its high tolerance for extreme soil pH, its ability to grow on infertile soils, and its ability to fix nitrogen.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Very tolerant of wounding. · Wood is quite resistant to decay.
Where It Replaces Ash	· Useful in yard areas and woodlands.
Commercial Availability	· Named cultivars are available in the nursery trade for unusual habits and foliage color. · Seedlings are readily available for site restoration and reforestation.



Wray

Black Locust

Black Maple (*Acer nigrum*)

Site Selection and General Comments	· Grows on variety of soil textures from sandy to clayey, as long as soil is not excessively wet. · Acid soils are preferred but the tree will tolerate neutral soils as well. Not recommended for alkaline soils. · More tolerant of drought than sugar maple, but will not thrive in droughty conditions. · Excess soil on top of the root system is poorly tolerated. · Very shade tolerant. · Considered by some to be a variety or ecotype of sugar maple. · Adapted as a climax forest tree, but seems to adapt to more stressful conditions than sugar maple. · Grows slowly when young and faster later; slower growing than the ashes.
Ornamental Features	· Deep green foliage often appears wilted and is bold textured. Fall color is yellow. · Growth habit is upright oval, spreading with age. · Named cultivars are available in the nursery trade and have been selected for habit, environmental tolerance, and faster growth rate.
Wildlife Value	· Foliage is excellent browse for mammals. · Samaras are valued for food.
Woodland Value	· Excellent source of sap for maple syrup. · The wood is sold as hard maple and valued for furniture and cabinets; thus it is more valuable than ash.
Flood Tolerance	· Intolerant.
Wound Tolerance	· More tolerant of wounding than red or silver maple.
Where It Replaces Ash	· Useful in yard areas and woodlands and better adapted to urban sites than sugar maple.
Commercial Availability	· Several named cultivars are available in the nursery trade for landscape-sized trees. · Seedlings are commonly available for reforestation.

VPI

VPI

Black Maple

Black Walnut (*Juglans nigra*)

Site Selection and General Comments	· Thrives in deep, moist, medium-textured (loamy), fertile soils with good drainage. Will grow well on coarser-textured soils with adequate moisture or finer-textured soils with adequate drainage. · Tolerates soil pH from low 5s to high 7s. · Does not tolerate poor soil drainage. · This tree is intolerant of shade. · On suitable site growth rate is much faster than the ashes. · In the northern limits of its natural range, including Ohio, Nectria canker can be a serious problem (especially in plantations). Only northern seed sources should be planted, and plantings should be monitored and infected trees destroyed immediately. · Produces a compound, juglone, which acts to inhibit or kill some but not all competing vegetation.
Ornamental Features	· Pinnately compound leaves are yellow-green and fine textured. Fall color is commonly a bland yellow, and trees are often defoliated early by a variety of leaf spot diseases. · Growth habit is upright oval becoming rounded with age. · Fruit is a litter concern in urban areas. · Typically walnut is the last tree to leaf out in the spring and the first to lose its leaves in the fall.
Wildlife Value	· Fruit is excellent food source for mammals. · Good seed crops produced twice in 5 years.
Woodland Value	· One of the most valuable timber species. · Wood is commonly used for veneer, furniture, cabinetry, and wood trim. · Cultivars have been selected for wood quality and growth rate but have not been shown to be superior to good seed sources in Ohio. · Produces a nut which is edible to humans.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Tolerant of wounding. · Cold sensitive seedlings are susceptible to Nectria canker.
Where It Replaces Ash	· Useful in yard areas and woodlands.
Commercial Availability	· Named cultivars selected for wood quality or growth rate have limited availability. · Seedlings are readily available for reforestation.

Wray

Black Walnut

Blackgum or Black Tupelo (*Nyssa sylvatica*)

Site Selection and General Comments	· Grows well in soils ranging from sandy to loamy textures. · Requires acid soils for best development; grows well in soils with pH between 4.5 and 6.0. · Requires moderate fertility. · Adapted to periodic flooding. · Classified as shade tolerant. · Growth rate is much slower than the ashes under open conditions, but tupelo is more tolerant of shaded forest conditions.
Ornamental Features	· Shiny deep green foliage is attractive and dark green. Fall color ranges from scarlet to yellow and is consistently outstanding. · Bark is a smooth dove grey for many years, becoming plated with age.
Wildlife Value	· Fruit is a major source of food for many mammals and birds. · Foliage and twigs are excellent browse for mammals. · Ranks as one of the more dependable den tree species.
Woodland Value	· Wood has generally been of low value with limited markets.
Flood Tolerance	· Intermediate flood tolerance.
Wound Tolerance	· Somewhat tolerant of wounding.
Where It Replaces Ash	· Useful in yard areas and woodland edges in acid soil regions.
Commercial Availability	· Seedlings are grown in containers and increasingly available in the nursery trade for landscape-sized trees. · Availability of seedlings for reforestation has been limited.

Blackgum or Black Tupelo

Bur Oak (*Quercus macrocarpa*)

Site Selection and General Comments	· Grows on soils with textures from sandy to clayey. · Tolerates soil pH from acid (low 4s) to alkaline (high 7s to low 8s). · Tolerates periodic flooding of short duration. Will not tolerate permanent flooded conditions. · Intermediate in shade tolerance. · Growth rate of bur oak is similar or superior to ash species on comparable sites. · This tree is well adapted to the urban environment.
Ornamental Features	· Unique leaf shape is bold textured. Foliage is deep green in color. · Fall color ranges from orangey to russet. · Growth habit is generally upright oval when young, becoming broad spreading with age. · This oak has the largest fruit (nearly the size of a golf ball) and can be a litter problem in yard situations.
Wildlife Value	· Trees fruit every several years and are then major sources of food for wildlife. · Major den and nesting sites. · Trees bear seed up to an age of 400 years. · Good seed crops every 2 to 3 years.
Woodland Value	· Bur oak is one of the more valuable timber species in Ohio and is sold as white oak.
Flood Tolerance	· Intermediately flood tolerant.
Wound Tolerance	· More tolerant of wounding than ashes.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Cultivars are not available, but seedlings are available in the nursery trade for landscape-sized trees. · Seedlings are available for reforestation.

Wray

Wray

Bur Oak

Chinkapin Oak (*Quercus muehlenbergii*)

Site Selection and General Comments	· Best suited to medium-textured soils. · An alkaline soil indicator; grows best in soils with pH from 6.5 to 8.0. · Highly tolerant of drought. · Shade intolerant. · Growth rate of young trees relatively much slower than the ashes in open situations. · More tolerant of environmental change than red oak and often remains when new homes are built in woodlands. · Insect and disease problems are relatively minor except when gypsy moth defoliation is combined with other problems such as drought.
Ornamental Features	· Foliage is finer textured than most oaks and is deep green in color. Fall color ranges from sepia to russet, not consistently showy. · Growth habit is upright oval when young, becoming rounded with age. · Produces a small acorn which is less of a litter concern than most other oak species.
Wildlife Value	· Fruit is heavily utilized by wildlife.
Woodland Value	· Wood is sold as white oak.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Tolerant of wounding.
Where It Replaces Ash	· Useful in yard areas, tree lawns, and woodlands.
Commercial Availability	· Seedlings are available in the nursery trade for landscape-sized trees, depending on seed availability. · Seedlings are rarely available for reforestation.

Chinkapin Oak

Common Hackberry (*Celtis occidentalis*)

Site Selection and General Comments	· Adapted to soil textures from sandy to clayey. · Tolerates moderately acid (6.0) to alkaline (7.8) soils. · Drought tolerance is very high, better than the ashes. · Shade tolerance intermediate to tolerant. · Highly tolerant of urban environment. · Grows as fast as ash species on comparable sites. · Insect and disease problems are generally cosmetic. · A common, well-adaptable urban tree, not because it is heavily planted but because it survives and reproduces in the urban environment.
Ornamental Features	· Medium green foliage is elm like and medium textured. · Fall color ranges from yellow to green; not very showy. · Growth habit is generally upright oval and irregular. · Some cultivars have been selected for growth habit but are not common in the nursery trade.
Wildlife Value	· Fruit is quite attractive to birds and some mammals. · Fruit tends to be borne annually and may be available later in the year.
Woodland Value	· Wood is less valuable than ash but can be used for furniture and millwork.
Flood Tolerance	· Intermediate to tolerant.
Wound Tolerance	· Quite tolerant of wounding. · Its wounding tolerance allows this plant to reproduce in urban situations.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Named cultivars and seedlings are available but not common in the nursery trade for landscape-sized trees. · Seedlings sometimes available for reforestation.

Common Hackberry

Cucumbertree or Cucumber Magnolia (*Magnolia acuminata*)

Site Selection and General Comments	· Grows on soil textures ranging from sandy to silty clay loam. · Tolerant of acid (5.0) to neutral (7.0) soil pH. · Prefers rich soils of bottomland and north to east slopes that are well drained, moist, and deep. · Intermediate shade tolerance. · Growth rate generally slower than the ash on comparable sites. · Diseases and insect pests are generally cosmetic.
Ornamental Features	· Foliage is medium green and bold textured. Yellow fall foliage color. · Flowers are conspicuous but may not be showy as they are green or yellow. · The tree outline is pyramidal to upright oval.
Wildlife Value	· Seeds are of limited value. · Leaves and twigs may serve as browse. · Good seed crops occur every 4 to 5 years.
Woodland Value	· Wood very similar to yellow-poplar, often sold with yellow poplar. · Wood is used for pallets, crates, furniture, plywood, and special products. · This tree was harvested almost to extinction in Ohio and is still only infrequently seen in natural woodlots.
Flood Tolerance	· Intolerant.
Wound Tolerance	· This tree is intolerant of wounding. · Cavities are common.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Nursery-grown cultivars have showy yellow flowers in June and are increasingly available in the nursery trade for landscape-sized trees. · Seedlings are rarely available for reforestation.

Cucumbertree or Cucumber Magnolia

Eastern Cottonwood (*Populus deltoides*)

Site Selection and General Comments	· Tolerates all soil textures. · Tolerates pH from moderately acid (5.2) to alkaline (7.5). · Moderately tolerant of drought. · Tolerates poorly drained soils. · Tolerates infertile soil conditions. · Very shade intolerant. · Very fast growth rate. · Commonly used in pollution remediation efforts.
Ornamental Features	· Foliage is deep green and medium textured. Fall color commonly yellow-green to yellow, not showy. · Growth habit generally pyramidal when young, becoming upright oval with age. · Male selections can be propagated by hardwood cuttings to eliminate fruiting.
Wildlife Value	· Heavy fruiting on female trees is of limited value to wildlife but a litter concern in urban areas. · Good den trees for some mammals. · Young plants are heavily browsed by mammals.
Woodland Value	· Relatively low-value timber species, used for pallets, chips, and pulping.
Flood Tolerance	· Tolerant.
Wound Tolerance	· Intolerant of wounding.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Numerous named cultivars are available but uncommon in landscape-sized trees. · Seedlings or cuttings are available for reforestation.

Eastern Cottonwood

Freeman Maple (*Acer x freemanii*)

Site Selection and General Comments	· Tolerates soil textures from sandy to clayey. · Tolerates acid (5.2) to alkaline (7.5) soils. · Tolerates urban environment well. · Shade tolerant on good sites to somewhat shade intolerant on poor sites. · Growth rate faster than the ashes. · Open grown trees may develop poor structure. · Insect and disease problems are generally cosmetic. · Freeman maple is a naturally occurring cross between red and silver maple that has recently become a commonly planted, well adapted, urban tree.
Ornamental Features	· Foliage is medium green with lighter undersides. Texture is medium due to lobing. · Fall color ranges from yellow to scarlet and varies by cultivar. · Growth habit is upright to upright oval and varies by cultivar. · Commercial cultivars have been selected for fall color and/or habit of growth.
Wildlife Value	· Foliage and samaras have wildlife value.
Woodland Value	· Relatively low-value timber species with wood being sold as soft maple.
Flood Tolerance	· Intermediate flood tolerance.
Wound Tolerance	· Moderately tolerant of wounding, more so than red maple.
Where It Replaces Ash	· Useful in yard areas, tree lawns, and could be used in riparian zones and woodlands.
Commercial Availability	· Numerous named cultivars are readily available in the nursery trade for landscape-sized trees. · Cuttings, not seedlings, could be used for reforestation but at increased cost.

Freeman Maple

Kentucky Coffeetree (*Gymnocladus dioica*)

Site Selection and General Comments	· Tolerated soil textures range from fine sands to silty clay loams. · Grows well in pH range from 6.5 to 7.5. · Tolerates drought. · Shade intolerant. · Growth rate is moderate and similar to ashes under urban situations. · Adapts readily to urban situations, including deicing salt.
Ornamental Features	· Foliage is pinnately compound, dark green, and fine textured. Fall color ranges from green to yellow, not showy. · Increasingly used in urban plantings. · Branch structure is quite gaunt and interesting during the winter months. · Very young trees are not very attractive while older trees are quite handsome.
Wildlife Value	· Fruit and foliage are excellent for mammals. · Fruit is a litter concern in urban areas.
Woodland Value	· Kentucky coffeetree is so uncommon in its native range, including Ohio, that a market for the wood has not been developed. · During the U.S. colonial period, the seeds were roasted and used as a coffee substitute.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Resistant to and tolerant to wounding.
Where It Replaces Ash	· Useful in yard areas, tree lawns, and woodlands.
Commercial Availability	· Seedlings are used in the nursery trade for landscape-sized trees. · Seedlings are uncommon for reforestation.

Kentucky Coffeetree

Northern Catalpa (*Catalpa speciosa*)

Site Selection and General Comments	· Grows on fine sandy to silty clay loam textured soils. · Tolerates soil pH from low 6s to high 7s. · Growth rate similar to ash. · Shade intolerant. · Drought tolerance is very high. · Insect and disease problems are generally cosmetic. · A well-adapted urban tree often found in inner-city locations, having survived with minimal care for long periods of time. · Catalpa worms (catalpa sphinx moth larva) cause cosmetic damage and make excellent fish bait.
Ornamental Features	· White flowers have spotted throats, are quite showy, and are borne in foot-high panicles in late May or early June. · Bold textured foliage is medium green and somewhat tropical looking. · Fall color ranges from yellow to green, not showy. · Growth habit is generally upright oval.
Wildlife Value	· Wildlife value is limited.
Woodland Value	· Wood is durable and decay resistant, making it desirable for fence posts in contact with the soil. · The value of lumber is generally less than ash.
Flood Tolerance	· Intermediate flood tolerance.
Wound Tolerance	· Very tolerant of wounding.
Where It Replaces Ash	· Useful in yard areas, tree lawns, and woodland edges.
Commercial Availability	· Named cultivars and seedlings are available in the nursery trade for landscape-sized trees. · Seedlings are sometimes available for reforestation.

Northern Catalpa

Osage-Orange (*Maclura pomifera*)

Site Selection and General Comments	· Grows on sandy to silty clay loam soils or finer. · Tolerates acid (low 5s) to alkaline (high 7s or low 8s) soils. · Extremely drought tolerant. · Shade intolerant. · Open-grown trees may develop irregular growth patterns. · A well-adaptable urban tree that is infrequently planted today. · Insect and disease problems are generally cosmetic. · This tree is credited with allowing the settlement of the prairie as the tree was used as a living hedge or fence. · The thorns are said to have led to the development of barbed wire fences to retain livestock.
Ornamental Features	· Medium textured foliage is dark green, glossy, and showy. · Fall color ranges from yellow to gold and is quite showy. · Growth habit is generally rounded to spreading and may be irregular. · Some cultivars have been selected for lack of fruit and thorns and should be considered for urban situations.
Wildlife Value	· Fruit is large and looks somewhat like a green orange but has limited wildlife value and is borne only on female trees. Fruit is eaten by deer and squirrels. · Thorny branches produce excellent nesting and cover sites for birds and other animals. · Foliage is good forage when quite young.
Woodland Value	· Produces the most decay resistant wood (heartwood) of any plant native to the United States and thus is used for posts. · Osage-orange wood is preferred for bows and billy-clubs because it is dense, quite strong, and rarely breaks. · Thorns are assets and liabilities.
Flood Tolerance	· Intermediately flood tolerant.
Wound Tolerance	· Exceptional wound tolerance and decay resistance would be useful in urban and rural situations.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodland edges.
Commercial Availability	· Wichita and White Shield are thornless male cultivars and are now commercially available. · Seedlings or cuttings can be used for windbreaks.

Osage-Orange

Pin Oak (*Quercus palustris*)

Site Selection and General Comments	· Grows well in moderately coarse (sandy loam) to fine textured (clay) soils. · Native seed sources of pin oak tolerate a range of soil pHs from acid (4.5 to 5.0) to somewhat alkaline (7.5), especially in soils with 3 to 4% organic matter. Non-native seed sources will not generally tolerate soil pH higher than 6.5. · Shade intolerant. · Growth rate is slower than the ashes when young but is faster as it reaches maturity. · This tree is urban adapted in Ohio when selected from local seed sources. · Insect and disease problems are generally cosmetic except for gypsy moth and oak wilt but should not limit the plant's use at present.
Ornamental Features	· The bold textured foliage is deep green. Fall color ranges from russet to scarlet and is often showy. · Growth habit is generally pyramidal when young, becoming rounded with age. · Some young trees retain the dead foliage during the winter. · Lower branches sweep downward, making this a good tree for screening but requiring extra pruning along roadways and walks.
Wildlife Value	· This has some of the smallest fruits of the oaks (1/2-inch diameter). · Like other oaks, this tree is a major source of food, dens, and nesting, especially during mast (heavy fruiting) years. · Important food for mallards and wood ducks as well as turkeys, woodpeckers, and blue jays.
Woodland Value	· Pin oak tends to have many defects (knots) in the wood, but still has some timber value.
Flood Tolerance	· Tolerant.
Wound Tolerance	· Pin oak is quite tolerant of wounding. · Oak frequency can be increased in natural areas by controlled use of fire.
Where It Replaces Ash	· This adaptable tree is useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Easily transplanted, seedlings are readily available in the nursery trade for landscape-sized trees. · Seedlings are also readily available for reforestation. · Local seed sources are needed both for urban and natural plantings.

Pin Oak

Red Maple (*Acer rubrum*)

Site Selection and General Comments	· Tolerates soil textures from sandy to clayey. · Performs best on acid soils (pH < 7.0). · Poor choice for droughty site. · Tolerates wet sites well. · Generally considered shade tolerant. · Rapid early growth rate slows with age. · Open-grown trees may develop poor branch structure. · Insect and disease problems are generally cosmetic. · Urban trees are often subject to micronutrient deficiencies due to high soil pH.
Ornamental Features	· Medium-textured foliage is dark green above and lighter on the underside. Fall color ranges from yellow to scarlet. · Many cultivars have been selected for fall color. · Habit is generally upright oval with some upright cultivars. · Adaptable to lawn conditions where wounding is limited; does not tolerate wounding well.
Wildlife Value	· Foliage and samaras have wildlife food value for mammals but limited value for birds.
Woodland Value	· Wood is sold as soft maple. · Suitable for syrup production with a shorter tapping season than sugar and black maple.
Flood Tolerance	· Tolerant.
Wound Tolerance	· Very intolerant of wounding. · Often removed from natural areas by controlled use of fire.
Where It Replaces Ash	· In yard areas, riparian zones, and woodlands.
Commercial Availability	· Numerous named cultivars are available in the nursery trade for landscape-sized trees. · Seedlings are also readily available for reforestation.

VPI

Red Maple

Red Oak (*Quercus rubra*)

Site Selection and General Comments	· Grows well on loamy to silty clay loam soils, but will grow on loamy sands with adequate soil moisture. · Grows well in soils with strongly acid pH (low 4s) to neutral (7+). · More drought sensitive than other oaks. · Intermediate shade tolerance. · Less tolerant of environmental change than most oaks, yet often remains when new homes are built in woodlands. · Insect and disease problems are relatively minor except when gypsy moth defoliation is combined with other problems such as drought. · Oak wilt is a concern in Ohio for red oaks.
Ornamental Features	· Deep green foliage is bold textured and glossy. Fall color ranges from sepia to red. · Growth habit is upright oval when young, becoming rounded with age. · Fruit can be a litter concern since this is the largest-seeded red oak in Ohio.
Wildlife Value	· Fruit is a major food source for wildlife in mast years but oak does not fruit consistently. · Acorns are bitter and not as desirable to wildlife as white oak acorns. · Foliage is excellent browse for mammals. · Seed takes 2 years to mature.
Woodland Value	· Wood is sold as red oak and is quite valuable. · Used for a variety of uses including furniture, trim, and flooring.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Tolerant of wounding. · Prescribed burning favors oak regeneration in natural areas.
Where It Replaces Ash	· Useful in yard areas, tree lawns, and woodlands.
Commercial Availability	· Seedlings are readily available in the nursery trade for landscape-sized trees. · Seedlings are also available for reforestation.

Wray

Wray

Red Oak

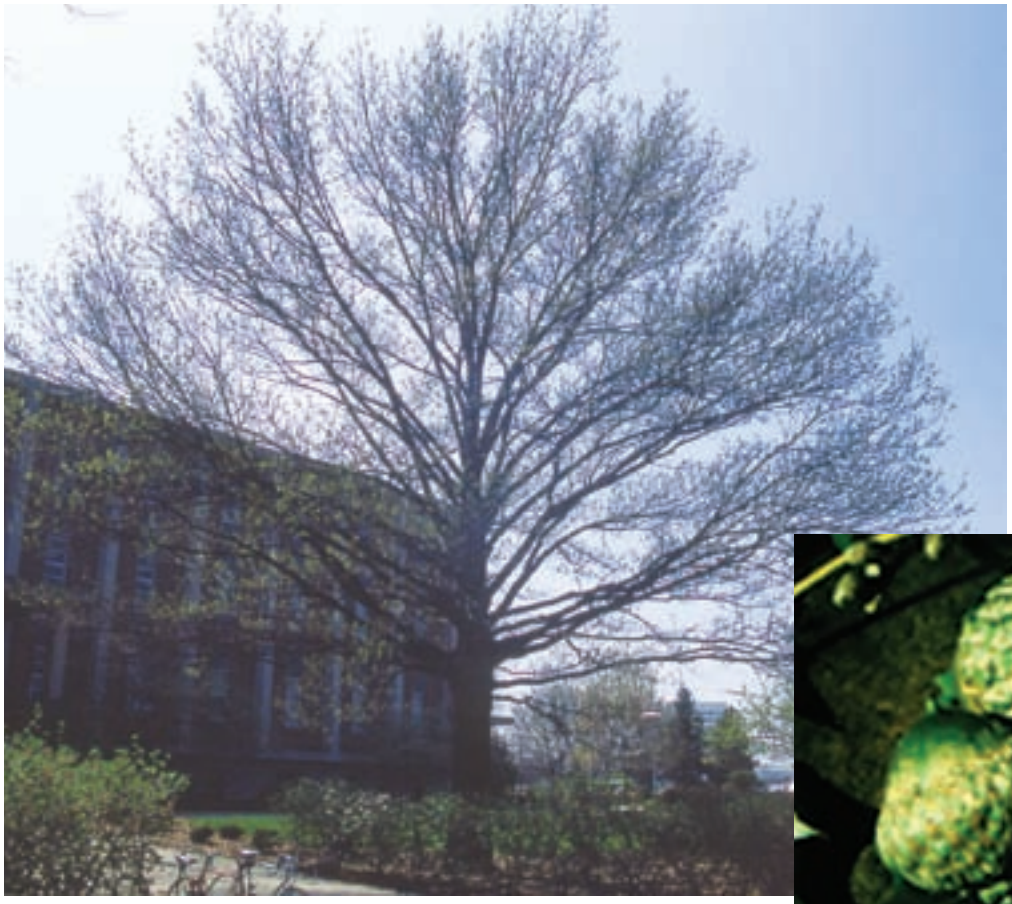
River Birch (*Betula nigra*)

Site Selection and General Comments	· Grows well on a wide range of soil textures from sandy to clayey, as long as there is adequate soil moisture. · Grows best on acid soils with pH between 4.0 and 6.5. · Extremely drought sensitive. · Shade intolerant. · Excess soil on the root system is tolerated. · Iron and manganese chlorosis is a concern under urban conditions (a function of high pH). · Growth rate is much faster than the ashes under open conditions.
Ornamental Features	· Medium to fine textured foliage is deep green above. Fall color ranges from green to yellow; not showy. · The intermediate bark is shed in papery sheets and is a major ornamental feature. Intermediate bark color ranges from light grey to cinnamon brown. · Mature bark is dark, oak-like, and quite different than younger bark. · This tree is commonly used in urban plantings and often grown with multiple stems.
Wildlife Value	· Valuable as mast source. · Foliage is browsed by deer.
Woodland Value	· Timber may be sold for local specialty products such as cutting blocks but is more likely to be used for chips or pulp.
Flood Tolerance	· Intermediate flood tolerance.
Wound Tolerance	· This tree has a good wound response and rapidly closes wounds when growing well.
Where It Replaces Ash	· Useful in yard areas and riparian zones.
Commercial Availability	· Named cultivars are readily available in the nursery trade for landscape-sized trees. · Smaller seedlings are often available for reforestation.

River Birch

Scarlet Oak (*Quercus coccinea*)

Site Selection and General Comments	· Grows well in sandy loam to clay loam. · Grows well on soils with acid (5.0) to neutral (7.0) pH. · Relatively drought tolerant. · Shade intolerant. · Scarlet oak is less tolerant of environmental change than white oak yet often remains when new homes are built in woodlands. · This tree is tolerant of wounding. · Insect and disease problems are relatively minor except when gypsy moth defoliation is combined with other problems such as drought. · Oak wilt is a concern in Ohio.
Ornamental Features	· Dark green foliage is deeply lobed yielding medium texture. Fall color ranges from sepia to red and is more consistently showy than most other Ohio red oaks. · Growth habit is upright oval when young, becoming rounded with age. · Foliage is deeply cut and finer textured than most other oaks. · Purported to be more difficult to transplant in landscape sizes than other red oaks. · Acorns can be a litter concern but are smaller than many other oaks.
Wildlife Value	· Fruit is a major food source in mast years, but oak does not fruit consistently. · Foliage is excellent browse for mammals. · Acorn takes 2 years to mature.
Woodland Value	· Wood is sold as red oak and used for a variety of uses including furniture, trim, and flooring.
Flood Tolerance	· Intermediately flood tolerant.
Wound Tolerance	· More tolerant of wounding than maples. · Often favored in natural areas by use of controlled fire.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Seedlings are available in the nursery trade for landscape-sized trees. · Seedlings are somewhat available for reforestation.



Scarlet Oak

Shagbark Hickory (*Carya ovata*)

Site Selection and General Comments	· Grows on a wide range of soil textures from sandy loams to clay. · Grows well in soils with acid (5.0) to neutral (7+) pH. · Intermediate shade tolerance. · Medium drought tolerance. · Shagbark hickory is more tolerant of environmental change than many other hardwoods, including ash, and often remains when new homes are built in woodlands. · Growth rate of young trees is much slower than the ashes and most other hardwoods. · Insect and disease problems are relatively minor. · Fruit can be used as a substitute for the closely related pecan in recipes.
Ornamental Features	· Medium green foliage is pinnately compound and medium textured. Fall color ranges from yellow to gold and can be quite showy. · Habit is upright oval when young, retaining that form with age unless open grown. · Bark is showy and peels in large longitudinal plates that make the tree easy to identify. · Fruit can be a litter concern.
Wildlife Value	· Fruit is a major food source for many mammals including chipmunks and squirrels. · Foliage is poor browse for mammals such as deer. · Bark provides nurseries for many tree-dwelling bats, including the endangered Indiana brown bat.
Woodland Value	· Wood is sold as "hickory" and used for a variety of products including handles, trim, cabinets, and flooring. · Hickory is a dense, slow burning firewood.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Tolerates wounding quite well.
Where It Replaces Ash	· Useful in yard areas, tree lawns, and woodlands but much slower growing.
Commercial Availability	· Slow growth limits this plant's availability in the nursery trade for landscape-sized trees. · Bare-rooted seedlings for reforestation are also uncommon.

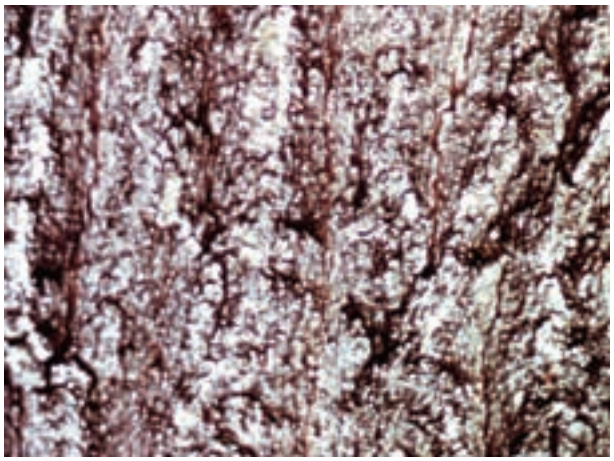
Wray

Wray

Shagbark Hickory

Shumard Oak (*Quercus shumardii*)

Site Selection and General Comments	· Grows well on soils with textures from sandy loam to clay loam. · Tolerates soils with acid (5.0) to slightly alkaline (7.5) soils. · Shade intolerant. · A lowland tree that grows on moist, well-drained soils associated with large and small streams. · More drought tolerant than red oak and the ashes. · More tolerant of environmental change than red oak and often remains when new homes are built in woodlands. · Growth rate of young oaks is slow, but faster once established. · Insect and disease problems are relatively minor except when gypsy moth defoliation is combined with other problems such as drought. · Oak wilt is a concern in Ohio for all red oaks including Shumard.
Ornamental Features	· Deep green foliage is bold textured, deeply lobed, and glossy. Fall color ranges from russet to red and is more consistently showy than most other oaks. · Habit is upright oval when young, becoming rounded with age. · Fruit can be a litter concern as this is a large-seeded red oak.
Wildlife Value	· Fruit is a major food source in mast years, but tree fruits heavily only once every two to three years. · Foliage is excellent browse for mammals.
Woodland Value	· Wood is sold as red oak and used for a variety of products including furniture, trim, and flooring.
Flood Tolerance	· Intermediate.
Wound Tolerance	· Tolerant of wounding, and its presence in natural woodland is enhanced by prescribed burning.
Where It Replaces Ash	· This adaptable tree is useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· This is a favored oak in the nursery trade for landscape-sized trees. · Bare-rooted seedlings are of limited availability for reforestation.



Shumard Oak

Silver Maple (*Acer saccharinum*)

Site Selection and General Comments	· Grows on soil textures from sandy to clayey. · Grows well in soils with pH <7.2. · Shade tolerant on all but most severe sites. · Rapid growth rate. · Open-grown trees may develop poor structure. · Insect and disease problems are generally cosmetic.
Ornamental Features	· Medium textured foliage is medium green with light undersides. · Fall color ranges from yellow to green. · Growth habit is generally upright oval. · Some cultivars were selected for cut-leafed foliage.
Wildlife Value	· Foliage and samaras have some value to birds and some small mammals.
Woodland Value	· Wood is sold as soft maple.
Flood Tolerance	· Intermediately flood tolerant.
Wound Tolerance	· More tolerant of wounding than red maple. · Often removed from natural areas by controlled use of fire.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· A number of named cultivars are readily available in the nursery trade for landscape-sized trees. · Seedlings are commonly available for reforestation.

Silver Maple

Sugar Maple (*Acer saccharum*)

Site Selection and General Comments	· Grows well on soils with textures from fine sand to silt loam, as long as available soil moisture is adequate. · Tolerates acid (<4.0) to slightly alkaline (7.2) soil pH. · Very drought sensitive. · Does not thrive in wet soils. · Very shade tolerant. · Excess soil on top of the root system is poorly tolerated. · Grows slowly when young and faster later, but is slower growing than ashes. · Does not adapt well to situations more stressful than an open lawn. · Sugar maple produces heavy shade and shades out competing trees, shrubs, and lawns.
Ornamental Features	· Medium green foliage is medium to bold textured. Fall color ranges from yellow to orange or red; some named cultivars have been selected for fall color. · Growth habit is upright oval becoming spreading with age. · Named cultivars have also been selected for upright growth habit.
Wildlife Value	· Foliage is excellent browse. · Samaras are valued for food.
Woodland Value	· Primary source of sap for production of maple syrup. · Some cultivars have been selected for high sugar content but are not commonly planted. · Wood is sold as hard maple and valued for furniture and cabinets; thus, it is more valuable than ash.
Flood Tolerance	· Intolerant.
Wound Tolerance	· More tolerant of wounding than red maple. · May be removed from natural areas by controlled use of fire.
Where It Replaces Ash	· A site-demanding tree that is useful in yard areas and woodlands.
Commercial Availability	· Numerous named cultivars are readily available in the nursery trade for landscape-sized trees. · Seedlings readily available for reforestation.

Sugar Maple

Swamp White Oak (*Quercus bicolor*)

Site Selection and General Comments	· Will survive and grow on wide range of soil textures ranging from sandy to clayey. · Tolerates acid soils (4.5) to neutral or slightly alkaline (7.2). · Intermediate in shade tolerance. · Historically, swamp white and pin oaks have displaced ash in many riparian borders over time. · Swamp white oak is urban adapted.
Ornamental Features	· The glossy, dark green, bold textured foliage has light undersides. · Fall color ranges from russet to scarlet. · Growth habit is generally upright oval when young, becoming spreading with age.
Wildlife Value	· Valuable source of food, dens, and nesting sites. · Fruit is a moderate-sized acorn (half the size of a pecan). · Good seed crops occur every 3 to 5 years.
Woodland Value	· Wood is valuable and sold as white oak.
Flood Tolerance	· Intermediately flood tolerant.
Wound Tolerance	· Quite tolerant of wounding. · Controlled use of fire is often used in natural areas to increase the frequency of this species.
Where It Replaces Ash	· This adaptable tree is useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Larger seedlings available in the nursery trade for landscape-sized trees. · Seedlings commonly available for reforestation.

Wray

Swamp White Oak

Sweetgum (*Liquidambar styraciflua*)

Site Selection and General Comments	· Tolerates wide range of soil textures from sandy to clayey. · Tolerates very acid (low 4s) to slightly alkaline (7.2) soils. · Shade intolerant. · Growth habit generally conical or conifer-like when young. · Cold-hardy seed sources or cultivars are required in Ohio.
Ornamental Features	· Leaves are shiny, star shaped, and deep green. Foliage is medium textured. · Corky bark ridges on the twigs add winter interest. · Fall color is outstanding and ranges from yellow to pink and wine, often variegated. · Moraine and Gold Dust are cold-hardy cultivars available in the nursery trade.
Wildlife Value	· Seed is very attractive to birds, but the fruit is a litter problem in urban areas.
Woodland Value	· Uncommon in native stands in Ohio. · Used for lumber, veneer, and railroad ties.
Flood Tolerance	· Tolerant.
Wound Tolerance	· Tolerant of wounding except when cold sensitive seedlings or cultivars are used.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Numerous named cultivars, including Moraine and Gold Dust, are available in the nursery trade for landscape-sized trees. · Cold-hardy seedlings are also available for reforestation.

Sweetgum

Sycamore (*Platanus occidentalis*)

Site Selection and General Comments	· Tolerates broad range of soil textures from sandy to clayey. · Tolerates very acid (mid 4s) to quite alkaline (8.0+) soils. · Very tolerant of wet soils, but tolerates only short-term flooding during growing season. · Moderately tolerant of drought and often drops leaves during drought periods. · Intermediate in shade tolerance. · Growth is very rapid; among the fastest growing of trees. · Sycamore is better adapted to urban areas than the closely related London planetree which is more commonly planted.
Ornamental Features	· Medium green foliage is bold textured. Fall color normally yellow-green to brown, not showy. · Mottled bark ranges from white to grey and is quite showy; more vivid in winter. · Sensitive to cosmetic diseases but resistant to serious diseases that attack London planetree. · Growth habit is generally upright oval, becoming rounded with age.
Wildlife Value	· A common den tree for wildlife. · Seed is not considered as a source of food for wildlife.
Woodland Value	· Wood is used for pallets, chips, and pulping but is less valuable than ash.
Flood Tolerance	· Tolerant.
Wound Tolerance	· Relatively tolerant of wounding. · May be removed from natural areas by controlled use of fire.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Cultivars are not available, but seedlings are available in the nursery trade for landscape-sized trees. · Seedlings are commonly available for reforestation.

Sycamore

Thornless Honeylocust (*Gleditsia triacanthos inermis*)

Site Selection and General Comments	· Grows on wide range of soil textures from fine sands to clays. · Grows well in moderately acid (5.5) to alkaline (8.0+) soils. · Drought resistant. · Tolerant of deicing salt. · Tolerant of wet soils. · Shade intolerant. · Excess soil on top of root system is tolerated. · Adapts to restricted root spaces but will be stunted. · Casts light shade which is less stressful to grass growing beneath. · Native trees are dangerously armed (thorns) and are thus not used in urban situations. · A number of insect and disease problems exist but most are cosmetic in Ohio.
Ornamental Features	· Pinnately compound leaves are deep green and finely textured. Fall color ranges from green to yellow and is occasionally showy. · Cultivars commonly used in urban plantings. · Numerous cultivars produced in ornamental nursery trade. · Selections have been made for foliage color and habit of growth. · Cultivar Skyline has shown some insect resistance.
Wildlife Value	· Major nesting site for wildlife. · Fruit is a source of food for many birds and mammals along with domestic livestock. · Foliage is excellent browse for mammals.
Woodland Value	· High quality honeylocust wood has many desirable properties but is too uncommon in woodland to have a developed market.
Flood Tolerance	· Tolerant.
Wound Tolerance	· Tolerant of wounding. · Decay resistance is high.
Where It Replaces Ash	· Useful in yard areas, tree lawns, riparian zones, and woodlands.
Commercial Availability	· Numerous named cultivars readily available in the nursery trade for landscape-sized trees. · Seedlings rarely available or used for reforestation.

Wray

Thornless Honeylocust

Tuliptree or Yellow-Poplar (*Liriodendron tulipifera*)

Site Selection and General Comments	· Prefers deep, moist, well-drained soils with textures between fine sand and silt loam. · Prefers acid soils with pH between 4.5 and 7.0. · Low drought resistance. · Low tolerance for excessive soil moisture. · Shade intolerant. · Diseases and insect pests are generally cosmetic.
Ornamental Features	· Foliage is deep green, glossy, and bold textured. Fall color is yellow. · Flowers are quite showy but rarely seen as they are hidden by the foliage. · Tree outline is pyramidal to upright oval when young. · Tops will often be blown out during storms in open situations resulting in a more rounded outline.
Wildlife Value	· Fruit is of limited value to some birds. · Leaves and twigs are browsed by mammals. · Natural cavities are important for denning birds and mammals.
Woodland Value	· Yellow-poplar wood is of moderate value and markets exist.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Trees have rather poor wound responses and often have natural cavities.
Where It Replaces Ash	· Useful in woodlands and to a lesser extent yard areas.
Commercial Availability	· Seedlings available in the nursery trade for landscape use. · Seedlings readily available for reforestation.

Tuliptree or Yellow-Poplar

White Oak (*Quercus alba*)

Site Selection and General Comments	· Grows on wide range of soil textures from sandy to clayey. · Grows on soils with acid (4.5) to moderately alkaline (7.5) pH. · Moderate drought tolerance. · Intermediate shade tolerance. · Tolerates environmental change and often remains when new homes are built in woodlands. · Insect and disease problems are relatively minor except when gypsy moth defoliation is combined with other problems such as drought.
Ornamental Features	· Medium green foliage is deeply lobed and medium textured. Fall color ranges from sepia to red and purple. · Purported to be more difficult to transplant in landscape sizes than the red oaks. · Growth habit is upright oval when young, becoming distinctly spreading with age. · Fruit can be a litter concern.
Wildlife Value	· Acorn is an important food source for a wide variety of wildlife, but mast production is somewhat irregular. · Den tree for mammals and birds. · White oak acorns are more palatable than red oak acorns. · Foliage is excellent browse for mammals.
Woodland Value	· White oak wood is valuable and established markets exist.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Wound tolerant. · Often favored in natural areas by controlled use of fire.
Where It Replaces Ash	· Useful in yard areas, tree lawns, and woodlands.
Commercial Availability	· Seedlings are normally available in small numbers; available in the nursery trade for landscape-sized trees. · Seedlings are also available for reforestation.

Wray

White Oak

Wild Black Cherry (*Prunus serotina*)

Site Selection and General Comments	· Grows well on soils with sandy loam to silty clay loam textures. · Tolerates acid (5.0) to moderately alkaline (7.5) soil pH. · Intermediate in drought tolerance. · Intolerant of excessive soil moisture. · Shade intolerant. · Relatively rapid growth rate; would equal or exceed ash on a good site. · Very intolerant of rapid environmental change. · Leaves, twigs, and bark contain cyanide in bound form. · Wilted foliage can pose hazard to livestock; seeds and other plant parts can pose hazard to humans, particularly children.
Ornamental Features	· Deep green, glossy foliage is medium textured. Fall color ranges from yellow to orange; can be quite showy. · One cultivar has been selected for fruiting and fall color (Rum Sparkle) but is uncommon in the nursery trade. · Flowering is conspicuous but not as showy as flowering cherries. · Growth habit is upright oval, becoming rounded with age.
Wildlife Value	· Fruit is highly sought by wildlife. · Cherry fruit is a dependable source of food for wildlife. · Foliage is excellent browse for deer and small mammals, but wilted foliage is toxic to domestic stock such as horses and cattle.
Woodland Value	· One of the most valuable of North American hardwoods; used for fine furniture, cabinets, and paneling. · Cherry fruit (flesh only) can be used for wine, rum, and jelly.
Flood Tolerance	· Intolerant.
Wound Tolerance	· Intolerant of wounding.
Where It Replaces Ash	· Useful in yard areas and woodlands.
Commercial Availability	· A named cultivar was available in the nursery trade but is uncommon now. · Seedlings commonly available for reforestation.

Wild Black Cherry

Yellow Buckeye (*Aesculus octandra*)

Site Selection and General Comments	· Grows best on loamy sand to silt loam soil textures. · Tolerates acid (5.0) to neutral (7.0) soil pH. · Drought and heat sensitive. · Shade tolerant. · Propagation is commonly seen under woodland conditions when the tree is present. · This tree has a weaker wound response than the ashes and is likely to develop cavities in response to wounding. · Yellow buckeye and Ohio buckeye, Aesculus glabra, have similar site and other characteristics, and often interbreed.
Ornamental Features	· Medium textured leaves are unusually palmately compound, medium green, and glossy. Fall color ranges from yellow to an unusual soft orange. · Bark is a mottled and plated dove grey and provides some winter interest. · Rarely used in urban plantings due to its slow growth rate in nursery production. · Yellow buckeye is better adapted and a larger tree, more suited for landscape use than the closely related Ohio buckeye.
Wildlife Value	· Fruit contains a toxin and thus is not often eaten by wildlife. · The toxin aesculin is also present in twigs and foliage.
Woodland Value	· Yellow buckeye has low-density wood which occasionally has a market with local craftsmen; otherwise suitable for chips and pulp.
Flood Tolerance	· Intermediately flood tolerant.
Wound Tolerance	· Relatively intolerant of wounding. · Trees often develop cavities.
Where It Replaces Ash	· Useful in yard areas and woodlands.
Commercial Availability	· Slow growth limits this plant's availability in the nursery trade for landscape-sized trees. · Seedlings for reforestation are uncommon.

Yellow Buckeye

Footnotes

[1] Note that mountain ash is not a true ash and is not affected by emerald ash borer.

[2] *Forest Statistics for Ohio.* 1991. USDA-NEFES Res. Bull. NE-128.

[3] *Management Options for Minimizing Emerald Ash Borer Impact on Ohio Woodlands.* Ohio State University Extension Fact Sheet F-59-05.

[4] For identification information, consult Ohio State University Extension Bulletin 899, *Leaf Identification Key to Eighty-Eight Ohio Trees,* or Ohio State University Extension Bulletin 700, *Ohio Trees.* Both are available from your OSU Extension county office or online at: **http://ohioline.osu.edu**.

[5] Species characteristics were compiled from a variety of sources including personal experience; *Native Trees, Shrubs, and Vines for Urban and Rural America,* Gary L. Hightshoe, 1988, Van Nostrand Reinhold, New York, 819 pp; *Silvics of North America,* Volumes 1 and 2, USDA Forest Service Agriculture Handbook 654; USDA Forest Service Fire Effects Information web site at: **http://www.fs.fed.us/database/feis/plants/index.html**; and the National Plant Data Center web site at: **http://plants.usda.gov/intellect.html**.

Weeks & Parker

Black Ash Tree

Blue Ash Tree

Blue Ash Bark

Weeks & Parker

Black Ash Leaf

Weeks & Parker

Black Ash Bark