

RESILIENT TREE SPECIES MANUAL



ABOUT THIS MANUAL

What is a resilient tree species?

Resilient tree species are **native to the Chesapeake Bay region and will thrive in a changing environment.**

Resilient species are likely to withstand new pests and diseases and increasing rainfall and temperatures.

How is resiliency determined?

Each tree species in this manual was determined to be resilient through a review process involving the Maryland Department of Natural Resources (MDNR) and the USDA Forest Service's Climate Change Atlas's Modification Factors (MODFACs).

The USDA's MODFACs system ranks the responses of regional tree species to 9 biological components, such as shade tolerance and seedling establishment, and 12 disturbance components, such as insect pests and drought.

Cross-referencing MDNR's Recommended Tree List with the MODFACs results, we considered factors such as climate and the likelihood of colonization in suitable habitats. With input from local experts and based on available data, we adjusted the scores of each species to create WSA's Resilient Tree Species list.

WSA's Resilient Tree Species list

Our list consists of 26 trees, including 8 understory and 18 canopy species adapted to live in Anne Arundel County. These species will tolerate our shifting climate and thrive in our environment for the next 50 to 100 years.



TABLE OF CONTENTS

Understory trees

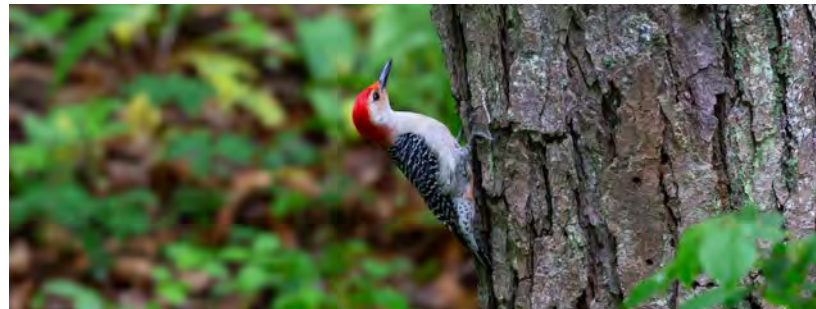
- Serviceberry.....4
- Allegheny Serviceberry.....5
- Flowering Dogwood.....6
- Green Hawthorn..... 7
- American Witch Hazel..... 8
- American Holly..... 9
- Sweetbay Magnolia.....10
- Staghorn Sumac..... 11

Canopy trees

- Red Maple.....13
- River Birch.....14
- Hackberry..... 15
- Persimmon.....16
- Eastern Red Cedar.....17
- American Sweetgum..... 18
- Tulip Poplar..... 19
- Black Gum..... 20
- Loblolly Pine..... 21
- American Sycamore..... 22
- White Oak..... 23
- Swamp White Oak..... 24
- Willow Oak..... 25
- Chestnut Oak..... 26
- Northern Red Oak..... 27
- Black Locust..... 28
- Bald Cypress..... 29
- American Linden..... 30



A diverse mix of understory and canopy trees can transform a sunny lawn into a thriving habitat for local wildlife.



UNDERSTORY TREES

What is an understory tree?

Species considered understory trees are smaller in size and able to grow in shaded conditions underneath canopy trees.

However, do not discount them as ONLY understory trees, especially if they are desirable for the landowner. Each of these species can be planted in open, full sun sites if they fit the other site criteria.

Before planting, consider:

- Mature tree height/spread
- Critical root zones of existing trees
- Spacing underneath the canopy
- Land use practices for the future



SERVICEBERRY

Amelanchier canadensis

Conditions & Characteristics

Mature Height

25'-30'

Mature Spread

15'-20'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist to wet conditions

Soil Type

Clay, loam, sand

Seasonality

Red to gold in fall, blooms April-May



Notes

- In the spring the showy flowers bloom a beautiful white color
- Once ripened the fruits are edible and taste similar to blueberries
- Can grow to have multi-stemmed or single-stemmed trunk



Fruit



Flower



Fall Color



Bark

ALLEGHENY SERVICEBERRY

Amelanchier laevis

Conditions & Characteristics

Mature Height

15'-40'

Mature Spread

15'-40'

Sun Requirements

Full sun to full shade

Moisture Requirements

Moist to wet conditions

Soil Type

Loam, sand

Seasonality

Red to orange in fall, blooms April



Notes

- Similar to *amelanchier canadensis* but grows larger with a wider spread crown
- Once ripened the fruits are edible and taste similar to blueberries
- Typically grows to have a multi-stemmed trunk



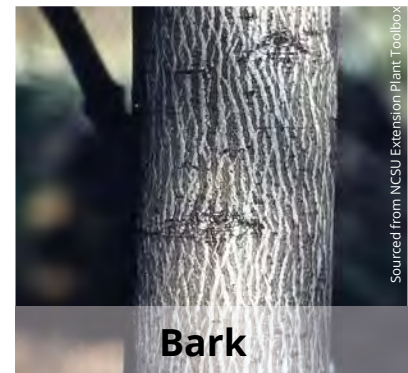
Fruit



Flower



Fall Color



Bark

FLOWERING DOGWOOD

Cornus florida 'Appalachian Spring'

Conditions & Characteristics

Mature Height

15'-40'

Mature Spread

15'-40'

Sun Requirements

Full sun to part shade

Moisture Requirements

Dry to moist conditions

Soil Type

Loam, sand

Seasonality

Red to purple in fall, blooms April-May



Notes

- Beautiful white flowers in the spring make this tree a highly sought after ornamental
- Showy fruit (inedible) provides high wildlife value in the late summer through fall
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)
- Can be planted in an area with clay soils if the drainage is decent



Fruit



Flower



Fall Color



Bark

GREEN HAWTHORN

Crataegus viridis

Conditions & Characteristics

Mature Height

20'-35'

Mature Spread

20'-35'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist to wet conditions

Soil Type

Clay, loam

Seasonality

Purple to scarlet in fall, blooms May



Notes

- Drought and urban pollution tolerant tree
- Fruits ripen in September and persist through winter, supporting wildlife
- The bark of this tree peels off as it matures, highlighting a lighter orange inner bark
- Although the fruits (often called haws) are considered edible, they are best left for birds



Fruit



Flower



Fall Color



Bark

AMERICAN WITCH HAZEL

Hamamelis virginiana

Conditions & Characteristics

Mature Height

15'-20'

Mature Spread

15'-20'

Sun Requirements

Full sun to part shade

Moisture Requirements

Dry to moist

Soil Type

Clay, loam, sand

Seasonality

Yellow in fall, blooms October-December



Notes

- Yellow flowers bloom through fall and into winter, providing seasonal variety in a yard
- Different parts of witch-hazel are used in natural medicinal practices
- Can tolerate heavy clay soils
- The woody fruit forms over a long period, extending through winter



Fruit



Flower



Fall Color



Bark

AMERICAN HOLLY

Ilex opaca

Conditions & Characteristics

Mature Height

15'-30'

Mature Spread

15'-20'

Sun Requirements

Full sun to full shade

Moisture Requirements

Moist

Soil Type

Clay, loam

Seasonality

Evergreen, blooms May-June



Notes

- This evergreen species has bright red berries and a spiked leaf structure
- Since leaves are present year-round, it is often used by birds as cover
- The fruit is inedible for humans but is a source of food for wildlife during the winter
- The leaves are very tough, making them resistant to many types of leaf-eating insects



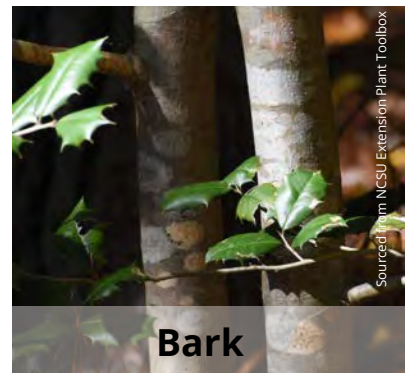
Fruit



Flower



Flower



Bark

SWEETBAY MAGNOLIA

Magnolia virginiana

Conditions & Characteristics

Mature Height

15'-35'

Mature Spread

15'-35'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist to wet

Soil Type

Clay, loam, sand

Seasonality

Semi-evergreen, blooms May-June



Notes

- Very fragrant flowers that bloom a beautiful white-cream color
- This tree is moderately salt and flood-tolerant
- As a semi-evergreen, it periodically sheds old leaves as new ones begin to grow in
- Great species for areas with high deer pressure as it is considered deer-resistant



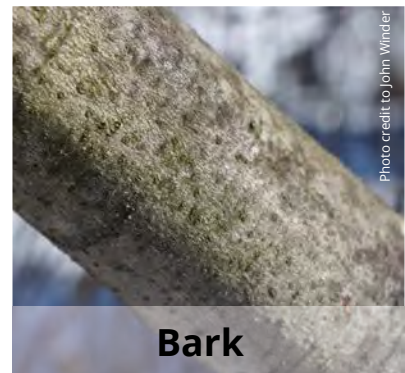
Fruit



Flower



Flower Bud



Bark

STAGHORN SUMAC

Rhus typhina

Conditions & Characteristics

Mature Height

15'-30'

Mature Spread

20'-30'

Sun Requirements

Full sun to part shade

Moisture Requirements

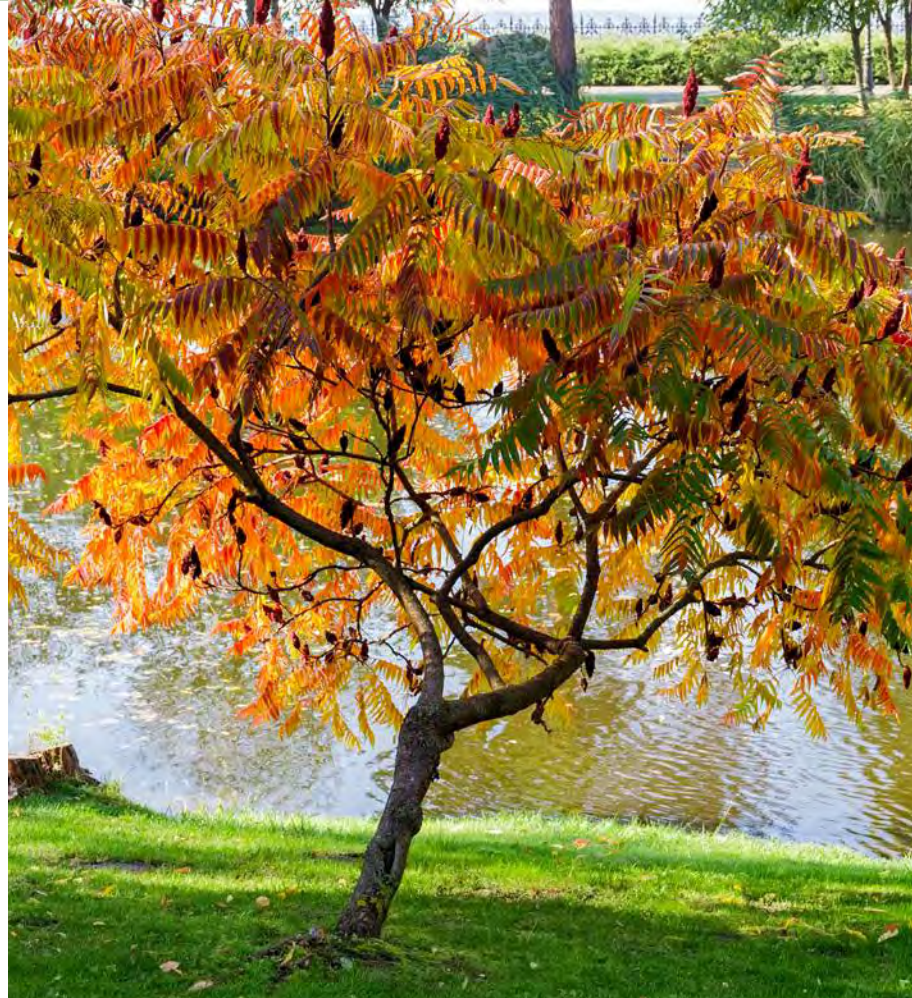
Dry to moist

Soil Type

Clay, loam, sand

Seasonality

Orange to red in fall, blooms June-July



Notes

- High wildlife value from fruit which is highly sought after by songbirds
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)
- Tends to be aggressive in colonizing areas through lateral root shoots
- Can tolerate both brought and urban conditions



Fruit



Flower

Photo credit to David Taylor



Fall Color



Unique Stem

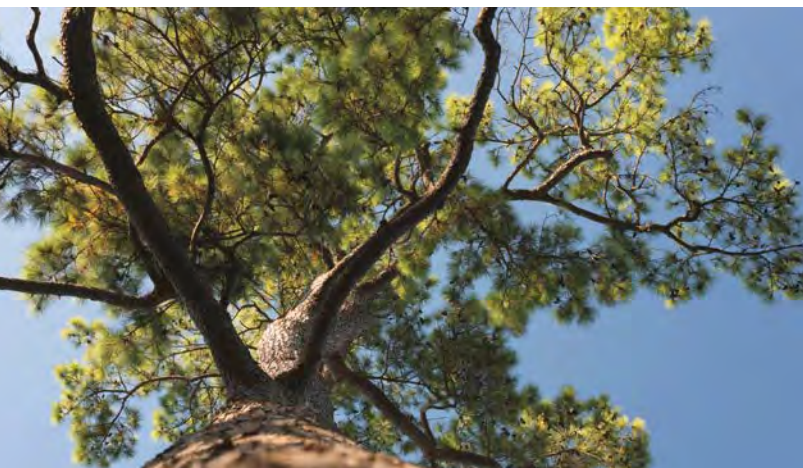
CANOPY TREES

What is a canopy tree?

Species considered canopy trees prefer sunny sites and grow to a larger mature size compared to understory trees. They can often be planted in existing canopy areas and may end up growing into the existing canopy if site conditions are favorable.

Before planting, consider:

- Sun conditions of the site
- Locations of current canopy trees (if any are present)
- Mature tree height/spread
- Locations of powerlines
- Land use practices for the future



RED MAPLE

Acer rubrum

Conditions & Characteristics

Mature Height

40'-70' (up to 120')

Mature Spread

30'-50'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist to wet

Soil Type

Clay, loam, sand

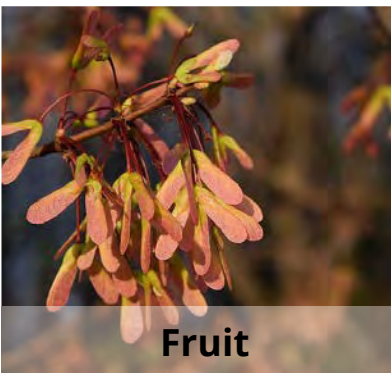
Seasonality

Red, orange, yellow color in fall,
blooms March-April



Notes

- One of the earliest blooming trees in spring, sprouting numerous small red flowers
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)
- An excellent choice for a full sun site that would benefit from a large shade tree
- While it prefers moist conditions, it can tolerate a wide range of soils and urban pollution



Fruit



Flower



Fall Color



Bark

RIVER BIRCH

Betula nigra

Conditions & Characteristics

Mature Height

40'-70'

Mature Spread

40'-60'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist to wet

Soil Type

Clay, loam

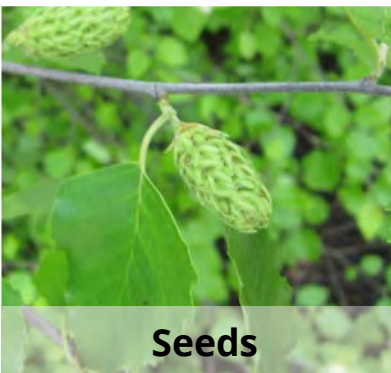
Seasonality

Various yellow colors in fall, leaf blooms in April-May



Notes

- Has unique peeling bark which is characteristic of the birch family
- Can tolerate dry soils but thrives in moist and wet conditions including floodplains
- Excellent tree for creating shade or screening areas
- Fall foliage is a pleasant yellow color that typically falls off of the tree fairly quickly



Seeds



Buds



Fall Color



Bark

HACKBERRY

Celtis occidentalis

Conditions & Characteristics

Mature Height

40'-60' (up to 100')

Mature Spread

40'-60'

Sun Requirements

Full sun to full shade

Moisture Requirements

Dry, moist or wet

Soil Type

Clay, loam, sand

Seasonality

Yellow color in fall, blooms in April-May



Notes

- A very hardy tree that can tolerate windy conditions, drought, shade, and flooding
- The tree itself serves as a host plant for many different species of butterflies
- The hackberry fruit is also sought after by many bird species, giving it high wildlife value
- One of the most versatile trees on this list and a welcome addition to any planting plan



PERSIMMON

Diospyros virginiana

Conditions & Characteristics

Mature Height

35'-50'

Mature Spread

25'-35'

Sun Requirements

Full sun to part shade

Moisture Requirements

Dry to moist

Soil Type

Clay, loam, sand

Seasonality

Yellow or purple color in fall, blooms

May-June



Notes

- Edible fruit ripens September through November
- Flowers and fruit generate high wildlife value
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)
- A resilient tree that can tolerate dry, clay soils and urban conditions



Fruit



Flower



Fall Color



Bark

EASTERN RED CEDAR

Juniperus virginiana

Conditions & Characteristics

Mature Height

30'-65'

Mature Spread

8'-25'

Sun Requirements

Full sun

Moisture Requirements

Dry to moist

Soil Type

Clay, loam, sand

Seasonality

Evergreen, nonblooming



Notes

- Fruits mature in late winter through early spring and provide food for various birds
- Provides year-round cover and nesting habitat for birds and small mammals
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)
- Tolerates a wide range of soils, heat, wind conditions but requires full sun to grow well



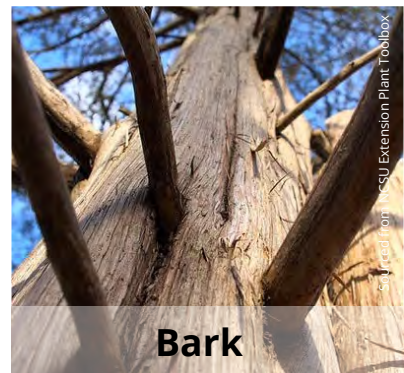
Fruit



Cones



Wildlife



Bark

AMERICAN SWEETGUM

Liquidambar styraciflua

Conditions & Characteristics

Mature Height

60'-80' (up to 120')

Mature Spread

40'-60'

Sun Requirements

Full sun

Moisture Requirements

Moist to wet

Soil Type

Clay, loam, sand

Seasonality

Variety of colors in fall, blooms April-May



Notes

- Leaves of sweetgum are fragrant and can vary greatly in color during the fall from red to purple to yellow to orange
- Fruit can be a nuisance for homeowners once it falls, but provides food for wildlife
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)



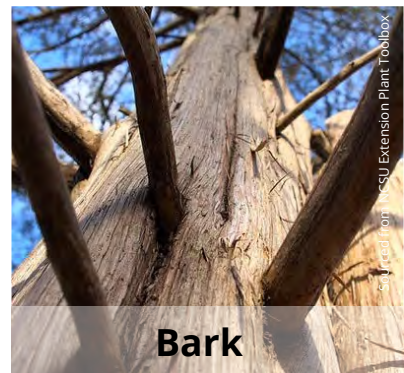
Fruit



Flower



Fall Color



Bark

TULIP POPLAR

Liriodendron tulipifera

Conditions & Characteristics

Mature Height

60'-100'

Mature Spread

30'-50'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist

Soil Type

Loam, sand

Seasonality

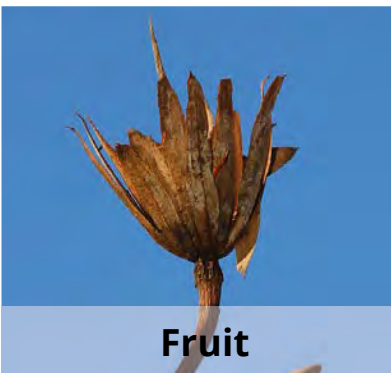
Vibrant yellow color in fall, blooms

May-June



Notes

- A fast-growing tree when in favorable conditions but can also tolerate wet and clay soils
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)
- This tree gets its name from its beautiful tulip-like flowers that bloom in late spring
- Due to their fast growth, these trees are susceptible to limb loss during heavy winds or snows, be mindful of how close they are planted to structures



Fruit



Flower



Fall Color



Bark

BLACK GUM

Nyssa sylvatica

Conditions & Characteristics

Mature Height

30'-80' (up to 90')

Mature Spread

30'-50'

Sun Requirements

Full sun to part shade

Moisture Requirements

Dry, moist, or wet

Soil Type

Clay, loam, sand

Seasonality

Red to scarlet color in fall, blooms

May - June



Notes

- Tolerates both clay soils and poorly drained soils, excellent tree for problem areas
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)
- Flowers are an excellent source of nectar for bees
- Fruits are highly sought after by birds and other wildlife



Fruit



Flower



Fall Color



Bark

LOBLOLLY PINE

Pinus taeda

Conditions & Characteristics

Mature Height

60'-90'

Mature Spread

20'-40'

Sun Requirements

Full sun

Moisture Requirements

Dry, moist, or wet

Soil Type

Clay, loam, sand

Seasonality

Evergreen, nonblooming



Notes

- Evergreen pine has the most rapid growth rate of all pine species
- High wildlife value year-round because of the tree's seeds and cover
- Not tolerant of shade so only plant in full sun areas away from other canopy trees that may outcompete it as they mature



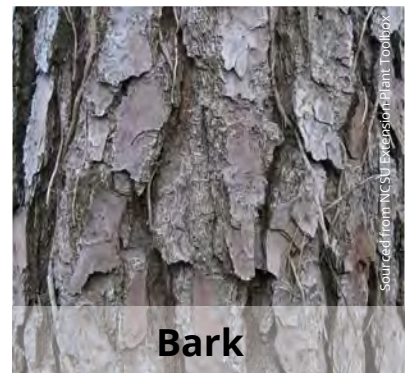
Male Cone



Female Cone



Wildlife



Bark

AMERICAN SYCAMORE

Platanus occidentalis

Conditions & Characteristics

Mature Height

75'-100' (up to 150')

Mature Spread

75'-100'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist to wet

Soil Type

Loam, sand

Seasonality

Yellow-orange color in fall, blooms

April-June



Notes

- One of the largest trees on this list; mind its mature size when picking location
- The outer bark will shed to reveal a showy, ornamental inner bark
- Tolerant of urban pollution and various soil types
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)



Fruit



Flower



Fall Color



Bark

WHITE OAK

Quercus alba

Conditions & Characteristics

Mature Height

50'-100' (up to 150')

Mature Spread

50'-80'

Sun Requirements

Full sun to part shade

Moisture Requirements

Dry to moist

Soil Type

Loam, sand

Seasonality

Red/brown color in fall, blooms May



Notes

- The white oak is the state tree of Maryland
- Tolerates a wide range of soils and considerable drought
- Mind its large mature size when considering planting locations
- Very high wildlife value tree species



Acorn



Flower



Fall Color



Bark

SWAMP WHITE OAK

Quercus bicolor

Conditions & Characteristics

Mature Height

60'-80' (up to 100')

Mature Spread

50'-75'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist to wet

Soil Type

Clay, loam, sand

Seasonality

Yellow to reddish color in fall, blooms

April



Notes

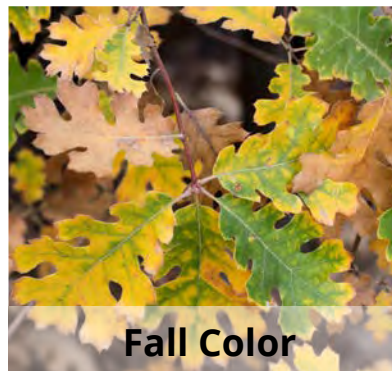
- Prefers wetter sites than the *Quercus alba* species
- Generally considered a durable and long-lived tree, it can be susceptible to various pests and diseases
- Very high wildlife value tree species



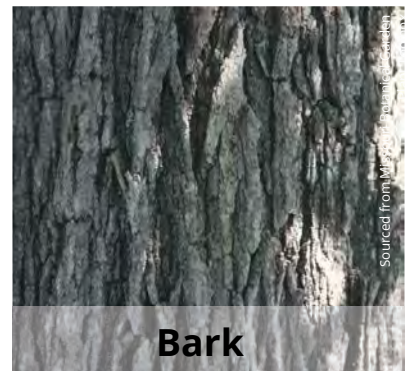
Acorn



Flower



Fall Color



Bark

WILLOW OAK

Quercus phellos

Conditions & Characteristics

Mature Height

40'-75' (up to 100')

Mature Spread

25'-50'

Sun Requirements

Full sun

Moisture Requirements

Moist to wet

Soil Type

Clay, loam

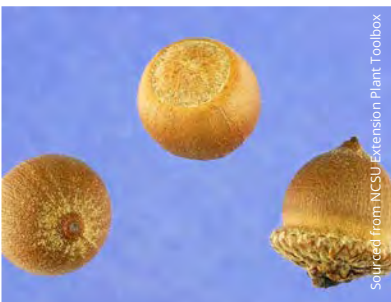
Seasonality

Red in fall, blooms April



Notes

- Can tolerate light shade but will grow best in full sun
- Considered a more disease and pest resistant oak species
- Tolerant of urban pollution, making it a common tree in commercial areas
- Very high wildlife value tree species



Sourced from NCSU Extension Plant Toolbox

Acorn



Photo credit to Katja Schulz

Flower



Sourced from NCSU Extension Plant Toolbox

Fall Color



Sourced from NCSU Extension Plant Toolbox

Bark

CHESTNUT OAK

Quercus prinus/montana

Conditions & Characteristics

Mature Height

40'-80'

Mature Spread

50'-70'

Sun Requirements

Full sun to full shade

Moisture Requirements

Dry to moist

Soil Type

Loam, sand

Seasonality

Yellow to green color in fall, blooms

April



Notes

- Tolerates drought and a variety of conditions including poorly drained soils
- Although it is considered a low maintenance, long-lived tree, keep in mind that it is susceptible to a variety of diseases including chestnut blight
- Very high wildlife value tree species



Sourced from NCSU Extension Plant Toolbox

Acorn



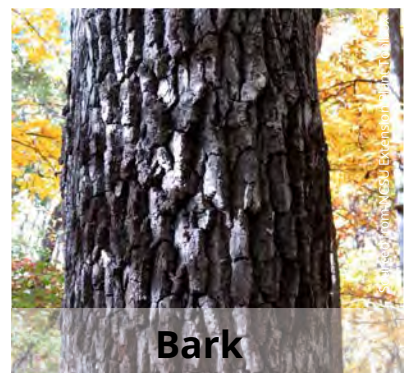
Sourced from Virginia Tech Dendrology Fact Sheet

Flower



Sourced from Missouri Botanical Garden Plant Toolbox

Fall Color



Sourced from NCSU Extension Plant Toolbox

Bark

NORTHERN RED OAK

Quercus rubra

Conditions & Characteristics

Mature Height

50'-75' (up to 90')

Mature Spread

50'-75'

Sun Requirements

Full sun to part shade

Moisture Requirements

Dry to moist

Soil Type

Clay, loam

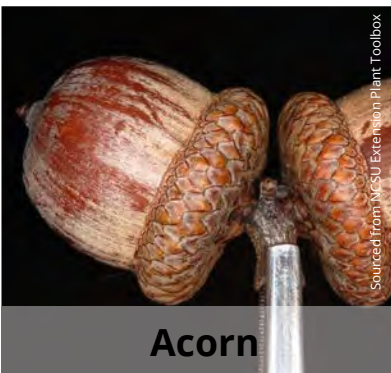
Seasonality

Bright red color in fall, blooms May



Notes

- A hardy and long-lived tree that can withstand drought conditions and urban pollution
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)
- Gets its name from the striking red color produced by its leaves in the fall season
- Very high wildlife value tree species



Acorn



Flower



Fall Color



Bark

BLACK LOCUST

Robinia pseudoacacia

Conditions & Characteristics

Mature Height

30'-60'

Mature Spread

20'-35'

Sun Requirements

Full sun to part shade

Moisture Requirements

Dry to moist

Soil Type

Clay, loam, sand

Seasonality

Yellow color in fall, blooms May-June



Notes

- Pollinators love the pea-shaped flowers
- This species has been found to be excellent at nitrogen fixation
- Tolerates clay soils and drought conditions
- Can withstand juglone (chemical exuded by black walnut trees to reduce competition)



Fruit



Flower



Fall Color



Bark

BALD CYPRESS

Taxodium distichum

Conditions & Characteristics

Mature Height

50'-100' (up to 125')

Mature Spread

20'-35'

Sun Requirements

Full sun to part shade

Moisture Requirements

Moist to wet

Soil Type

Clay, loam, sand

Seasonality

Deciduous conifer, blooms March-April



Notes

- A deciduous conifer tree species that sheds its needle-like leaves every season
- Can tolerate both drought and flooding conditions
- This species will often grow parts of its roots above ground, nicknamed "knees"
- It is considered one of the longest living tree species in the world



Fruit



Flower



Fall Color



Bark

AMERICAN LINDEN

Tilia americana

Conditions & Characteristics

Mature Height

50'-80' (up to 100')

Mature Spread

50'-75'

Sun Requirements

Full sun to full shade

Moisture Requirements

Moist

Soil Type

Loam, sand

Seasonality

Yellow orange color in fall, blooms

June-July



Notes

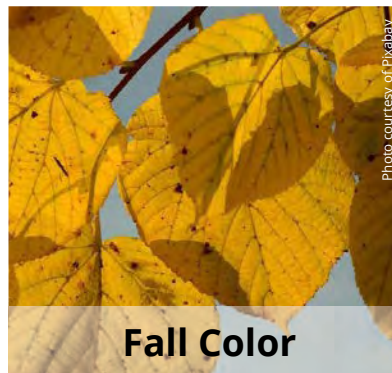
- Tolerates clay soils and drought conditions
- Fragrant yellow flowers are an important source of nectar for bees
- It is a host plant for two species of butterflies
- Fruit provides food for birds and squirrels



Fruit



Flower



Fall Color



Bark