GREENING GUIDE

Greening Practices for Native Ecosystems

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INTRODUCTION

Open spaces throughout the US are disappearing quickly due to urban sprawl and land degradation. This includes prairieland, which saw a decline in tall grass prairies of 99% and a 68% decline in mixed-grass prairies from the historic average for North America (Ohio State University). With this loss has come great changes and threats to the ecosystem at a larger scale. Many of our native species of moths, butterflies, bees and birds depend to a great extent on natural foliage to support their lives. In addition, with the decline of the use of native plants in yards and gardens, we have seen a decline in other species that use these plants for food and shelter.

Historically, the Chestnut blight that wiped out most of the American Chestnut (Castanea dentata) by 1940 caused a breakdown of the American Woodlands of the eastern United States to the southern United States. With the loss of the chestnut, we also saw the extinction of the Carrier pigeon (Ectopistes migratorius) that depended on the nuts as the main food source. Additionally, we also saw other trees within the forest became the keystone species to replace the chestnut, such as the Red Oak. The loss of the species has completely changed the landscape of the United States. We are now on the edge of losing many of our native prairie plant species to develop. However, lawn and vacant properties can be safe havens for preserving biodiversity of native plants.

History of Lawn and Gardens in the United States

In the early 1930s, American lawns and gardens took influences from exotic English gardens that used many foreign plants to emphasize wealth. By the 1940s, the war effort for World War II was under way, and part of giving back to the community was to have a Victory Garden to supplement the family's food needs. By the 1950s, there was a transition into restricting nature by the use of chemical pesticides. This is when we first saw manicured lawns become a staple in the United States landscape.

By the 1970s, Americans had become very aware that the chemical pesticides that they were using on their lawns and gardens came with health consequences. During this time, there was a push for environmental awareness and for health in urban areas. Community gardens that were organically grown became a huge movement. By the 1980s, gardens and lawns became an extension of the home, bringing back into fashion a very manicured lawn. By the 1990s and early 2000s, it became very apparent that the

lawn of a home was a status symbol. If a homeowner had a beautifully manicured lawn, they were seen as affluent because of all the upkeep and money that was directed into lawn maintenance. However, since the real estate crash of 2008 when many people lost their homes to foreclosure, there has been a turn in living more within one's means. We now see this reflected in homeowners across America looking for alternatives to over-managed lawns. One of those alternatives is using native plants to support regional ecosystems.

Why Use Native Plants?

Native plants are adapted to the local climate and soil conditions where they naturally occur. These important plant species provide nectar, pollen, seeds and homes that are used by native butterflies, insects, birds and other animals. Native plants do not require fertilizers or pesticides. Native plants require less water than grass/cut lawns and help prevent soil erosion overall. The deep root systems of many native Midwestern plants increase the soil's capacity to absorb stormwater. Native plants can significantly reduce water runoff, helping to stop flooding. Native plants also help to reduce air pollution, especially in urban areas. Most importantly, native plantscapes do not require mowing. Excessive carbon from the burning of fossil fuels contributes to global warming. Native plants sequester carbon from the air as they grow, acting as a carbon sink. Native plants promote biodiversity and stewardship of Ohio's heritage. Native plants are beautiful and increase scenic values, helping to beautify a landscape (U.S. FOREST SERVICE 2019).

Soils and Geographic Region

Miamian is the state soil of Ohio. Miamian soils are the most widely spread soils in Ohio and is on more than 750,000 acres within the State. They are productive soil with corn, soybeans and winter wheat the primary crops. Soils in the Miamian series consists of very deep, well-drained soils. Miamian soils typically have a very dark grayish brown to brown silt loam, with the A horizon being 5 to 10 inches thick. They commonly have a brown or yellowish subsoil layer. The B horizon, 8 to 35 inches thick, has a higher clay content than the A horizon. Below the subsoil, soils in the Miamian series have a brown to light olive-brown C horizon that is slightly or moderately alkaline and has a lower clay content than the B horizon (USDA 2019).

The Mahoning Valley is found in region six according to USDA, which has Alfisols soil type. These soils are found in cool to hot humid areas, and in the semiarid tropics; they are formed mostly under forest vegetation, but also under grass savanna. Extensive areas of Alfisols are found in the Mississippi and Ohio River valleys in the USA, through Central and Northern Europe into Russia, and in the South-central region of South America (USDA 2019).

A part of the Appalachian Plateau is a series of plateaus located on the western side of the Appalachian Mountains. During the last glaciation, parts of Ohio were covered by the Wisconsin glacier. The glaciated lies to the north and west of the unglaciated, and forms an arc into southeastern Ohio lying between the glacial till plains and the Allegheny Plateau. The Glacial till plains are a till plain landform in Northern Ohio, located near the shore of Lake Erie and created by the retreat of the Wisconsin glaciation. Since glacial till is highly fertile soil, agriculture on the glacial till plains is very productive (USDA 2019).

How to Use This Guide

The plant selector (see next page) can be used for picking the proper placement for each plant. This will serve as a reference for site, condition and layout of the plants. Each plant has a number associated with it that will be displayed in the plant recommendation list above the common name and scientific name. The number will appear next to the attributes that the plant can give to a site within the chart below. The list of 92 species to landscape with comes from the advice and information of Ohio State University, Cleveland Natural History Museum, Carnegie Museum of Natural History, Native Plant Society of Northeastern Ohio, Missouri Botanical Gardens, Sustainable Agriculture Research & Education, and Youngstown State University (as seen in references and acknowledgments).

DESIGN PLANT SELECTOR

Soil:

	Sun Perennials	Shade Perennials	Cover	Grasses/ Ferns	Shrubs	Small Trees	Large Trees	Evergreens
Acid	3, 4, 19					57	66, 68	79
Alkaline	5, 17	21, 24						
Clay	1, 2, 8, 12, 17, 18, 19	27		38, 41	47, 49, 51, 52, 54	56, 58, 60	61, 67, 71, 72, 73	
Dry	2, 3, 6, 9, 11	23, 25, 26, 27, 29	31	35, 36	52, 53	59	69, 67, 70	80, 75, 77
Wet	10, 12, 13, 14, 18, 20	28	33	37, 41, 42	43, 44, 45, 46, 47, 48, 51, 54		61, 62, 65, 72, 73, 74	
Rocky	3, 4, 6, 9		31		49, 52, 53	59		80, 75, 76, 77
Well Drained	1, 5, 7, 15, 16	21, 22, 24, 30	32, 34	36, 39, 40	50	55	63, 64	78

DESIGN PLANT SELECTOR

Sunlight:

	Sun Perennials	Shade Perennials	Cover	Grasses/ Ferns	Shrubs	Small Trees	Large Trees	Evergreens
Full Shade Sites		21, 22, 24, 26, 27, 28	31, 32, 33, 34					80, 76
Full Sun Sites	1, 2, 4, 6, 7, 8, 9, 12, 15, 17			35, 36	43, 46, 49, 50, 51, 52	55, 56, 57, 58, 59	61, 63, 64, 65, 66, 67, 68, 69, 70, 71 72, 73, 74	75, 77, 79
Part Shade Sites	3, 5, 10, 11, 13, 14, 18, 19, 20	23, 25, 29, 30		37, 38, 39, 40, 41, 42	44, 45, 47, 48, 54	60	61, 62, 63, 65, 71, 73, 74	78, 79

Position:

	Sun Perennials	Shade Perennials	Cover	Grasses/ Ferns	Shrubs	Small Trees	Large Trees	Evergreens
Open Spaces	4, 7, 13, 15, 16, 19	23, 24, 25		36			63, 64, 69	
Rock Gardens	4			35, 36, 41, 42				76,77
Air-Polluted						55, 56	66,68, 69,70, 73	
Base of Hedges	5	21, 24, 27	32, 34					
Hedges					43,44, 45, 47, 48, 49, 50, 51, 52, 54	60		76, 78, 80
Ground-cover		26, 27, 27, 30	31, 32, 33, 34	38, 39, 40				
Rain Gardens	1, 2, 10, 12, 13, 14,	28	33	37	43,44, 45, 46, 47, 51,	60, 67	61, 62, 65, 67,	

	17, 18, 19, 20				54		70, 73, 74	
Stormwater Retention						56, 60	61, 62, 63, 64, 65, 66,67, 68, 69, 70, 71, 72, 73, 74	
Banks/ Slopes	3, 6, 9							76,78
By Sidewalks and Paths	9	23, 27, 30	32, 34			56	66, 65,64,68, 69, 70,72	80
By Houses and Buildings	4, 5	24, 27	32, 34			56	64,65, 66	
By Roadways	6, 8, 12, 18					56, 57	64, 65, 68, 69, 70	
Pollinator Gardens	1, 2, 3, 4, 6, 7, 8, 9, 12, 14, 15, 16, 18, 19, 20	21, 22, 23, 25, 27			44, 46, 47, 50, 51	55,,57, 58	61, 62, 63, 65, 71, 72, 73	
Bird Gardens	2, 3, 10, 11, 12, 17, 18, 19	27		37	43, 45, 46, 48, 50, 51, 53, 54, 57, 58	55, 57, 58, 59, 60	65, 69, 70, 73	76, 77
Native Gardens	1, 2, 3, 4, 6, 8, 9, 10, 11, 14, 17, 20	21, 23, 27, 28, 29, 30	32, 33, 34	41, 42		59, 60		
Reforest-ation					48	55, 56, 57, 58, 59, 59, 60	62, 64, 65, 66, 67, 69, 70, 74	75, 76, 78
Natural Barriers	7, 13, 19				43, 44, 45, 47, 48, 50, 53	60	63	75,76, 77, 78, 79, 80

Size & Shape:

	Sun Perennials	Shade Perennials	Cover	Grasses/ Ferns	Shrubs	Small Trees	Large Trees	Evergreens
Solid Hedging								80, 75, 77, 78
Wide Spreading (Trees only)							63, 65, 66, 67, 68, 70, 71, 72, 73	79
Tall (60ft & Up) Trees							62, 63, 64, 66, 69, 67, 68, 72	75, 76, 79
Medium (21ft to 59ft) Trees							61, 65, 70, 71, 73, 74	
Small (20ft & under) Trees						55, 56, 57, 59, 60		77, 78
Tall (6 to 12ft) Plants	3, 7, 12, 13, 14, 19			35, 37, 41	43, 44, 46, 47, 48, 49, 53, 54			
Medium (3 to 5ft) Plants	1, 2, 6, 8, 10, 11, 15, 16, 17, 18, 20	21, 22, 29		36, 42	45, 50, 51, 52			
Low (2ft to .5in) Plants	4, 5, 9	23, 24, 25, 26, 27, 28, 30	31, 32, 33, 34	38, 39, 40				

Seasonal Features:

	Sun Perennials	Shade Perennials	Cover	Grasses/ Ferns	Shrubs	Small Trees	Large Trees	Evergreens
Spring Blooms	2, 11, 15	23, 24, 25, 26, 27, 28	32, 33,		43, 45, 47, 48, 51, 52	55, 56, 57, 58	61, 62, 63, 64 65, 66,	

							67, 68, 69, 70, 71, 74	
Summer Blooms	4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 17, 18, 19	29, 30	34	37	44, 46, 49, 50, 54	59	72, 73	78
Autumn Blooms	1, 3, 5, 13, 20	21, 30		35, 36, 37		60		
Winter Blooms				35, 36, 37				
Long Flowering Season	5	23, 30		35, 36, 37				

Agricultural Cover Crops:

	Clovers	Vetch	Wheats
Nitrogen Source	81, 83, 84	87, 92	
Soil Builder	81, 83, 85		90
Erosion Prevention	81, 82, 84, 85, 86	87	88, 89, 91
Ground Cover	81, 83		
Suppress Weeds	82, 83, 84, 85	87, 92	88, 89, 90
Living Mulch	86, 85	87	88, 89, 91

SUN PERENNIALS

1. Aster, New England

Symphyotrichum novae-angliae

Description

Part of the Aster family (Asteraceae), New England Aster is a rhizomatous perennial with clusters of erect stems, .5 to 2 meters tall, and densely spreading pubescent leaves (Radford, Ahles & Bell 1968). The leaves are lanceolate to elliptic lanceolate, two to nine centimeters long, and one to two centimeters wide. The disc flowers are yellow, perfect (having both male and female organs), and are pollinated by bees, butterflies, flies, beetles and moths(Missouri Botanical Garden 2019).

This plant is commonly found in moist prairies, meadows, roadsides and streams (Johnsgard 2007). It requires well-drained soil and prefers sandy, loamy and clay soils over others. This species can grow on nutritionally poor soil but prefers rich soil. New England aster grows well in a sunny location and can succeed in partial shade(Missouri Botanical Garden 2019).

Establishment/Management

This aster variety prefers full to partial sun. Propagate by seed or division when growing New England asters. Although a bit more difficult to grow from seed. Surface sow in the spring season in an area of rich, moist soil as these plants tend to wilt in poorly drained clay. The New England aster will germinate in 21 to 45 days at a soil temperature of 65-75º F (Missouri Botanical Garden 2019). These late summer through early fall bloomers spread 2 to 4 feet with a height of 1 to 6 feet. When planting make sure to provide good air circulation, keeping in mind the large spreading area (Grant 2018). Divisions of Aster novae-angliae species should be done in the spring every three years to maintain vigor (Heuser 1997).

Pests and Potential Problems

Some susceptibility to powdery mildew. Aster wilt can also be an occasional problem, particularly if the plants are grown in poorly drained clay soils. Taller plants may require staking or other support (Missouri botanical garden 2019). Serious diseases are root rot, wilt, and foot rot, all of which can result in the death of the plant. Avoid rots by planting asters only in well-draining soil. (Baessler 2018).

Attributes	Variables
Height:	3 to 6 feet
Bloom Time:	August to September
Bloom Description:	Deep Pink or Purple
Water:	Medium
Suggested Usage	Native Garden, Rain Garden or Pollinator Garden
Sun:	Full Sun
Soil:	Clay Soil and Well-Drained Soil
Biodiversity:	Butterflies
Stormwater Retention:	Low

2. Foxglove /Beardtongue

Penstemon digitalis

Description

Penstemon digitalis, or Foxglove Penstemon, is a glabrous 3 to 5 foot tall herbaceous plant with opposite, shiny green, simple leaves on slender, purple stems. The leaves are up to 5 inches long. The stems average anywhere from 2 to 3 feet tall. The flowering panicle to almost a third of the plant's height and has pairs of branches which repeat with two flowers many times. The pedicels are almost one fourth of an inch long and produce 1.25 inch-long two-lipped tubular flowers over dark green foliage (Missouri Botanical Garden 2019).

Like other Penstemon species, it is used in roadside planting because it is easily grown and can tolerate pollution. Will attracts honeybees, bumble bees, mason bees and large leaf-cutting bees so is a good plant for pollinator gardens. Other pollinators such as hummingbirds, sphinx moths and butterflies also enjoy the nectar from the flowers. Caterpillars of several moth species feed on the foliage making Foxglove Penstemons a vital part of the larger ecosystem (Missouri Botanical Garden 2019)..

Establishment/Management

Indigenous to dry prairies, savannas, edges and floodplain or upland forests, it also thrives in disturbed fields and along railroad . In cultivation, Foxgloves are easy to grow in full or partial sun,

preferring well-drained, acid, loamy and sandy soils. However, it is adaptable and will tolerate clay and high pH as well. Caring for foxglove plants will include keeping the soil moist. Do not allow the soil to dry out or to get too wet, this will inhibit growth of plant. Foxgloves may be grown from seed, and they will start producing blossoms in the second year (Missouri Botanical Garden 2019). Leave flower heads on plants at the end of the season, foxglove reseed themselves abundantly. If flowers are allowed to drop seeds, thin the seedlings next year to about 18 inches apart, allowing growing foxgloves room to develop. If you want additional foxglove plants next year, leave the last flowers of the season to dry on the stalk and drop seeds for new growth (Badgett 2019).

Pests and Potential Problems

No serious insect or disease problems. However, root rot can occur in wet, poorly drained soils.

Attributes	Variables
Height:	3 to 5 feet
Bloom Time:	April to June
Bloom Description:	White
Water:	Dry to Medium
Suggested Usage	Native Garden, Rain Garden or Pollinator Garden
Sun:	Full Sun
Soil:	Clay and Dry Soil
Biodiversity:	Birds, Butterflies
Stormwater Retention:	Low

3. Jerusalem Artichoke

Helianthus tuberosus

Description

Will thrive in sunny areas. Due to tall size and invasive tendencies, this plant is best suited in naturalized areas where it can spread to form colonies. It is generally considered to be an inappropriate selection for borders of properties. Butterflies love the flowers of Helianthus tuberosus making it a great

choice for pollinator gardens. Some songbirds love to eat seeds from the seed heads of the plant. Some people use the tubers as a healthy food alternative to potatoes (Missouri Botanical Garden 2019).

Establishment/Management

Jerusalem Artichoke is normally propagated by tubers. The plant is easy to grow and can spread rapidly; however, vegetatively-propagated perennials, due to their lack of genetic diversity, are more vulnerable to pests and diseases when grown in the ground than seed-propagated plants are(Missouri Botanical Garden 2019).

Propagation by seed: H. tuberosus seed is mostly traded amongst plant breeders working on new varieties of this plant for food and industrial purposes. Scarification/or stratification may be required, but few studies have been done on Jerusalem artichoke seed and little information is available. This is unfortunate, because seed propagation would reduce the chances of a disease wiping out entire stands of this plant, and although Jerusalem Artichoke seed isn't cheap, seed propagation would still be cheaper than tubers or bedding plants (Amkha Seed, n.d.).

Best grown in alkaline, medium moisture, well-drained soils in full sunlight for plant to reach full potential. However, Helianthus tuberosus can tolerate poor soil conditions as well. Prefers moist soils with good drainage, but some plants do well in the drier soils found in limestone glades. Plants may spread by self-seeding over an area. Will need to cut back plants after flowering to keep plants healthy. Easily grown in hardiness Zones 4 to 8 (Missouri Botanical Garden 2019).

Pests and Potential Problems

Rust, leaf fungal spots and powdery mildew are somewhat common. Caterpillars and beetles often chew on the foliage. May need staking, particularly if grown in exposed locations (Missouri botanical garden 2019).

Attributes	Variables
Height:	6 to 10 feet
Bloom Time:	August to September
Bloom Description:	Yellow
Water:	Dry to Medium
Suggested Usage	Native Gardens, Bird Gardens and Pollinator Gardens

Sun:	Full Sun to Part Shade
Soil:	Dry Soil, Shallow-Rocky Soil
Biodiversity:	Birds, Butterflies
Stormwater Retention:	Low

4. Limestone Calamint

Clinopodium arkansanum

Description

Clinopodium arkansanum is a rhizomatous perennial of the mint family that typically forms a dense, low-growing foliage with upright leafy flowering stems rising to around 12" in height (Missouri Botanical Garden 2019). It typically occurs in limestone bluffs, bald knobs, wet meadows and stream gravel bars. Runners clad with oval to elliptic leaves creep along the ground. Flowering shoots clad with small, opposite, linear leaves, rise 8-12" tall bearing tiny two-lipped white to purple flowers on stalks from the leaf axils. Main flowering occurs June to July with some blooming continuing into fall. The leaves are extremely fragrant when crushed. Additional common names for this plant include wild savory, Ozark calamint and Arkansas mint (Hilty 2018).

Establishment/Management:

Best grown in slightly alkaline, medium moisture, well-drained soils. Grows well in full sunlight but will tolerate light shade. Generally, prefers moist soils with good drainage, but some plants do well in the drier soils found in limestone glades. Plants may spread by self-seeding over an area. Easily grown from seed and will do well in rock gardens, open woodlands and native plant areas.

Pests and Potential Problems:

No serious insect or disease problems for Limestone Calamint.

Attributes	Variables
Height:	.5 to 1 foot
Bloom Time:	June to July

Bloom Description:	White to Light Purple
Water:	Medium
Suggested Usage	Rock Gardens, Border Fronts, Open Woodlands and Naturalize
Sun:	Full Sun
Soil:	Shallow-Rocky Soil
Biodiversity:	Butterflies, Bees
Stormwater Retention:	Low

5. Germander

Teucrium canadense

Description

American germander or Canada germander is a woody-based, rhizomatous, herbaceous perennial of the mint family. Each plant typically consists of a single, hollow, hairy, square stem that stands 18-36" tall with opposite leaves. Topped in summer by a spike of purplish-pink flowers. It is native to moist woods, thickets and marshes in eastern and central North America. In Ohio it is typically found in prairies, wet meadows, low woodlands, fields and along streams. Additional common names include wood sage and wild basil. Blooms in long narrow upright clusters from mid-June to September (Missouri Botanical Garden 2019). Flowers do lack fragrance.

Establishment/Management

Easily grown in moist, fertile, well-drained soil but will tolerate some poorly drained soils; avoid dry soils. Grows in full sun and can tolerates part shade. Can be aggressive in optimum growing conditions where it often spreads easily by rhizomes and self-seeding to form colonies. Easily grown from seed, propagate by seeds, cuttings and division (Missouri Botanical Garden 2019).

Pests and Potential Problems

No serious insect or disease problems but susceptible to mildew, leaf spot, rust and mites can happen.

Attributes	Variables
Height:	1.5 to 3 feet
Bloom Time:	June to September
Bloom Description:	Purplish-Pink
Water:	Medium
Suggested Usage	Herb or Naturalize
Sun:	Full Sun to Part Shade
Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	Low

6. Common Milkweed

Asclepias syriaca

Description

Common milkweed is a rough, weedy Ohio native perennial which commonly occurs in fields, open woods and along roadsides throughout the state. It typically grows 3-4' tall and has an upright stem with thick, broad reddish-veined, light green leaves (Missouri Botanical Garden 2019). Pinkish-purple fragrant flowers appear mostly in the upper leaf over a long bloom period from late spring well into summer. Stems and leaves exude a milky sap when cut or bruised. Flowers give way to prominent, warty seed pods which will split open releasing their numerous silky-tailed seeds for dispersal by the wind. Flowers are a nectar source for many butterflies and leaves are a food source for monarch butterfly larvae (Stevens 2002).

Establishment/Management

The seeds can be stratified for three months, but many gardeners get good results without stratification. Whether stratified or not, seeds can be sown indoors in February or March. Sow 3, 4 or 5 seeds in a seed-starting kit with large cells, or in 4-inch or smaller individual pots (Missouri Botanical Garden 2019). Use fine, sifted seed-starting mix with good drainage. Cover the seeds with a fine layer of seed-starting mix, no more than ¼ inch deep. Set the seed-starting system in a warm, brightly-lit spot (on a

heating pad under grow lights, if possible), and keep the seed-starting mix just barely, but thoroughly, moist by either misting or bottom-watering.

Easily grown in dry to medium, well-drained soils but will grow in poor, dryish soils. Milkweed likes to grow in Full Sun and is drought tolerant. Easily grown from seed and will self-seed in the landscape if seed pods are not removed prior to splitting open. Can spread somewhat rapidly by rhizomes. Often forms extensive colonies in the wild areas. Butterfly gardens, meadows, prairies or large native plant gardens are some good use of Milkweed (Stevens 2002).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	2 to 3 feet
Bloom Time:	June to August
Bloom Description:	Pink, Mauve, White
Water:	Dry to Medium
Suggested Usage	Naturalize
Sun:	Full Sun
Soil:	Dry Soil or Shallow-Rocky Soil
Biodiversity:	Butterflies, Milkweed Beetles
Stormwater Retention:	Low

7. Compass Plant

Silphium laciniatum

Description

A tall and sturdy plant that grows on stiff resinous stems to 9' tall. Features sunflower-like flowers with yellow rays and yellow center disks (Missouri Botanical Garden 2019). Flowers bloom in loose spikes on the upper parts of the plant in summer. Very large, deeply pinnatifid basal leaves are reminiscent of pin oak leaves. Upper leaves are smaller. Basal leaves usually orient themselves on a north-south axis so as to

minimize intense overhead sun exposure, thus giving rise to the common name. Split or broken stems exude a gummy, fragrant-but-bitter resin which was used by Native Americans as a mouth-cleansing chewing gum. Many of the silphiums are commonly called rosinweed (Wynia, 2009).

Establishment/Management

Easily grown in average, medium, well-drained soils in full sun. Tolerates poor soils. Good height for the rear of the border. Also excellent for naturalizing in prairies, cottage gardens, wildflower gardens or native plant gardens (Wynia, 2009).

Pests and Potential Problems

No serious insect or disease problems. Slow to establish and may not flower until the second or third year of being planted.

Attributes	Variables
Height:	5 to 9 feet
Bloom Time:	July to September
Bloom Description:	Yellow
Water:	Medium
Suggested Usage	Border or Wildflower Gardens
Sun:	Full Sun
Soil:	Well-Drained
Biodiversity:	Butterflies
Stormwater Retention:	Low

8. Black-Eyed Susan

Rudbeckia hirta

Description

Black-eyed Susan is an annual, biennial or short-lived perennial forb about 2 to 3 feet tall with yellow flowers and dark brown centers. After germination, the seedling grows into a rosette with long leaves. Sometimes flower stalks will appear in the early summer, but typically black-eyed Susan blooms

from June to September of the second year. After flowering and seed maturation, the plants decline and usually die, but self-sow and spread easily (Missouri Botanical Garden 2019). The seed is very small and black, about 2 mm long to .5 mm in diameter. It is adapted to grow in soils ranging from well-drained to somewhat poorly drained. It will perform well on droughty soils during years with average or above rainfall, but best growth is achieved on sandy, well drained sites (Brakie 2019).

Establishment/Management

Black-eyed Susan is easily established with most critical area seeding techniques. Generally, ½ lb. of seed per acre is sufficient in mixes with conservation grasses, legumes and other forbs (Missouri Botanical Garden 2019). Where the intent is to maximize the impact of the forb component, utilize bunchgrasses rather than aggressively spreading grasses such as reed canary grass or bromegrass. Once established, new seedlings will be produced from the preceding crop; the stand may perpetuate itself indefinitely (Grabowski 2001).

After establishment, if you want to maintain a colorful artificial prairie, competing perennial vegetation should be controlled through the use of mechanical or chemical practices. If competing vegetation is not controlled, one will observe a decrease in the number of black-eyed Susan plants (Brakie 2019). Only necessary if you don't want shrubs or longer-lived perennials like aster, goldenrod, coneflower and penstemon to replace black-eyed Susans over time.

Pests and Potential Problems

There are no major insect or disease pests of black-eyed Susan. Stands can be reduced by powdery mildew.

Attributes	Variables
Height:	2 to 3 feet
Bloom Time:	June to September
Bloom Description:	Yellow to Orange-Yellow Rays and Dark Brown Centers
Water:	Medium
Suggested Usage	Annual, Naturalize
Sun:	Full Sun
Soil Tolerate:	Clay Soil

Biodiversity:	Butterflies
Stormwater Retention:	Low

9. Butterfly-Weed

Asclepias tuberosa

Description

Asclepias tuberosa is part of the Milkweed family and is a perennial herb with a deep, woody taproot. The species name, tuberosa, means full of knobs, referring to the enlarged root system. Butterfly milkweed stems are hairy, 2 to 3 feet tall and grow in many clumps (Missouri Botanical Garden 2019). The leaves are alternate, simple, lance-shaped, shiny green, smooth and velvety beneath. The flowers are rounded to flat-topped groups near the ends of branches. Flowers are orange to red or sometimes yellow, topped by a crown of five erect hoods. Fruits are hairy, spindle shaped pods 8-15 cm long (Missouri Botanical Garden 2019). Milkweeds grow in clumps beside roadways, on farmlands and in other open areas throughout the United States (Stevens 2000). Butterfly milkweed grows on sandy, loamy or rocky limestone soils of prairies, open woodlands, roadsides and disturbed areas similar to other milkweed species.

The cardiac glycoside in milkweed has also been useful as a chemical defense for monarch butterflies. Chemicals from the milkweed plant make the monarch caterpillar's flesh distasteful to most predators. Monarch butterflies are specific to milkweed plants. Milkweeds are the only plants on which the eggs are laid, and the larvae will feed and mature into a chrysalis. Eggs are laid on the underside of young healthy leaves (Bouton 1995).

Establishment/Management

Butterfly milkweed is easily propagated by both seed and cuttings. Both seedlings and cuttings will usually bloom in their second year. Seeds and plants of selected cultivars are available from many nurseries. It is ideal in semi-dry areas where it can spread in a large area. Milkweeds are thought to be poisonous to cows and sheep(Missouri Botanical Garden 2019).

Asclepias tuberosa is easily propagated from seed. Collect seeds after the pods have ripened, but before they split open. The seeds are wind dispersed, so be careful when gathering to put the seeds in a container avoid losing them. Some sources recommend stratification. The seeds can be stratified for three months, but many gardeners get good results without stratification. Whether stratified or not, seeds can be

sown indoors in February or March. Sow 3, 4 or 5 seeds in a seed-starting kit with large cells, or in 4-inch or smaller individual pots. Use fine, sifted seed-starting mix with good drainage (Missouri Botanical Garden 2019). Cover the seeds with a fine layer of seed-starting mix, no more than ¼ inch deep. Set the seed-starting system in a warm, brightly-lit spot (on a heating pad under grow lights, if possible) and keep the seed-starting mix just barely, but thoroughly, moist by either misting or bottom-watering. The method just described produces stocky seedlings for planting out in a formal pattern; if simply starting a prairie landscape, seeds can be directly sown into the ground in the fall (Stevens 2000).

Pests and Potential Problems

There are no major insect pests or diseases for Butterfly-weed.

Attributes	Variables
Height:	1 to 2.5 feet
Bloom Time:	June to August
Bloom Description:	Yellow/Orange
Water:	Dry to Medium
Suggested Usage	Naturalize, Rain Garden
Sun:	Full Sun
Soil Tolerate:	Dry Soil, Shallow-Rocky Soil
Biodiversity:	Butterflies
Stormwater Retention:	Low

10. Cardinal Flower

Lobelia cardinalis

Description

This herbaceous perennial is between 2 to 4 feet tall with unbranched stems. The alternate leaves are toothed and long to a pointed at both ends. The flowers are tubular with the upper portion two-lobed and the lower spreading and divided into threes. The red flowers appear in long terminal racemes and bloom in July to September. The seeds come in a two-celled, many seeded capsules opening at the very top. They are small and numerous. This plant is found in wet soil (Missouri Botanical Garden 2019).

Establishment/Management

Cardinal flower is easy to grow. The capsules can be collected in autumn, usually October. The stalks are cut below the capsules and placed upside down in a per sack. The bag should be opened so that the capsules are exposed to the air for a few days. Shake the bag to release the seeds. Crushing the capsules with a rolling pin and picking out the seeds from the litter can retrieve remaining seeds. Fresh seeds will germinate without cold stratification (Missouri Botanical Garden 2019). Sow seeds in cells filled with seed mix and cover the seeds lightly or if watering from below, simply press the seeds into the surface of the seed starting mix the seeds need light to germinate. Place the flat in on a heating pad under a grow light or in a warm greenhouse to maintain a soil temperature of around 70 degrees Fahrenheit (Bubel, 1998). Keep the flats moist and the seedlings should come up in a few weeks. Transplant them outdoors 4 to 6 weeks after.

Propagation by cuttings: Take two node stem cuttings 4 to 6 inches before the flowers open and remove the lower leaf and half the upper leaf. Treat the cutting with a rooting powder containing Indole-3-butyric acid, then immediately stick the cuttings upright in a sterile, fine-textured growing medium such as a sand and perlite mixture, a vermiculite and sterile, finely milled peat mixture or a commercial mix made for cutting propagation (Missouri Botanical Garden 2019). Cover the flats or pots with a clear plastic ventilated lid or with clear plastic bags with one corner cut off for ventilation. Roots will form in 2 to 3 weeks, but the cuttings need to force a good crown from the lower node to successfully over winter. When well established, clumps of this plant can be divided in the fall or spring by separating the rosettes or basal offshoots from the mother plant and replanting these divisions and watering them immediately (Anderson 2002).

Cardinal flower is adapted for hummingbird and butterfly pollination, while provides a valuable late summer pollen source for native bees.

Pests and Potential Problems

There are no major insect or diseases for cardinal flower.

Attributes	Variables
Height:	2 to 4 feet
Bloom Time:	July to September
Bloom Description:	Scarlet Red, White or Rose
Water:	Medium to Wet
Suggested Usage	Naturalize, Rain Garden
Sun:	Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Hummingbirds, Butterflies
Stormwater Retention:	Medium

11. Columbine (Wild)

Aquilegia canadensis

Description

Columbine is part of the Buttercup Family (Ranunculaceae). Red columbine is a perennial herb that has short-lived fibrous roots and a vertical underground stem or caudex. It is around 12-30 inches tall. The flower is downward facing with all petals prolonged backward into a spur (Missouri Botanical Garden 2019). Sepals are petal-like are typically red. This plant blooms from March to July and sets fruit in mid to late summer during the months of June to August (Skinner 2004).

Establishment/Management

This eastern perennial is propagated by seed. Seed is mature and ready for collection when it turns black in the follicles. Collected seed should be stored in seed bags at temperatures of 41 degrees Fahrenheit and can be stored up to four months (Missouri Botanical Garden 2019). A 3 to 4 weeks of moist stratification may speed up germination time but does not increase germination rate overall. Seeds should be hand sewn into germination trays in greenhouse temperatures of 70 to 75 degrees Fahrenheit (Missouri Botanical Garden 2019).

Germination takes place within 3 to 4 weeks and supplemental lighting is not necessary. Soil in the germination trays must be kept evenly moist during germination. Seedlings can be transplanted into plug cells following a 3 to 4 weeks of root development (Missouri Botanical Garden 2019). Plants should be exposed to lower greenhouse, or frost-free outdoor, temperatures before planting outdoors. Although prefers soils that are well drained, loose, and slightly acidic, it will grow in a medium that is loose and has a mixture of organics. It will not bloom during the first growing season. The general recommendation for wildflower seeding is 11 pounds per acre (Skinner 2004).

Pests and Potential Problems

There are no major insect or diseases for Wild Columbine. A. canadensis is less susceptible to leaf miners than most of the garden cultivars of Columbine, and leaf damage from native insects' peaks after the plant has gone to seed in midsummer, by which time taller plants have risen to hide the damage (Missouri Botanical Garden 2019).

Attributes	Variables
Height:	2 to 3 feet
Bloom Time:	April to May
Bloom Description:	Light Pink/Yellow to Blood Red/Yellow
Water:	Medium
Suggested Usage	Naturalize
Sun:	Full Sun to Part Shade
Soil:	Dry Soil
Biodiversity:	Hummingbirds
Stormwater Retention:	Low

12. Cup-Plant

Silphium perfoliatum

Description

Cup-plant or Silphium perfoliatum is a tall perennial native that grows up to eight feet tall. This species has square stems and leaves that are mostly opposite, toothed, with cuplike shapes. The flower heads are a golden yellow and closely grouped at the end of the stems (Favorite 2001).

Establishment/Management

Seeds are best sown as soon as they are ripe in a greenhouse. If the seeds are collected in the fall, they should be stratified for 12 weeks and then sown at 24 to 32 degrees Fahrenheit for 4 to 8 weeks, and then moved to 68 degrees Fahrenheit for germination (Missouri Botanical Garden 2019). When the plants are large enough to handle, place them into individual pots and plant them out in the summer. Silphium perfoliatum species should be transplanted when they are young (Favorite 2001).

Pests and Potential Problems

There are no major insect or diseases for cup-plant.

Attributes	Variables
Height:	4 to 8 feet
Bloom Time:	July to September
Bloom Description:	Yellow
Water:	Medium to Wet
Suggested Usage	Naturalize, Rain Garden
Sun:	Full Sun
Soil:	Clay Soil, Wet Soil
Biodiversity:	Birds, Butterflies
Stormwater Retention:	Medium

13. Ironweed, Tall

Vernonia gigantea

Description

This perennial plant can grow to be around 5 to 8 feet tall. The central stem is light green or purplish green. The alternate leaves are densely to moderately distributed along the stem, spreading widely in many directions. The top surface of each leaf is dark green and glabrous; the under surface is a lighter shade of green and glabrous, sparsely pubescent or somewhat hairy. The base of each leaf has a short petiole, or it is sessile (Missouri Botanical Garden 2019).

The blooming period occurs from late summer to early fall and lasts about 1 month. There is no noticeable floral scent to the Ironweed flowers. Each disk flower is replaced by a small achene that is gray or brown and bullet-shaped; the apex of each achene has a small tuft of both short and long hair hairs that are pale purple to tawny. These achenes are distributed by the wind. The root system consists of short thick rhizomes with fibrous roots below the plant. Small clumps of plants are produced from the rhizomes. (Missouri Botanical Garden 2019).

Establishment/Management

Stratify Ironweed seeds for two months at 33-38º F. Then, sow seeds in seed-starting mix in flats and place the flats in a warm, bright location. Alternatively, seeds may be sown outdoors in fall, either in a seed bed or scattered in the location where you want the plants to grow (Prairie Moon Nursery Germination Codes & Instructions 2019).

The Ironweed grows best in full sun to light shade, moist conditions and soil containing loam, clay-loam, silt-loam or sandy loam. Plants growing in sunny areas require more moisture than those growing in the shade (Missouri Botanical Garden 2019).

Pests and Potential Problems

There are no major insect or diseases for Ironweed.

Attributes	Variables
Height:	5 to 8 feet
Bloom Time:	August to September

Bloom Description:	Rose Purple
Water:	Medium to Wet
Suggested Usage	Naturalize, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Native insects (Prairie Moon Nursery, n.d.)
Stormwater Retention:	Medium

14. Joe-Pye Weed

Eutrochium fistulosum

Description

Joe-Pye Weed is a native perennial wildflower that grows from 2 to 6 feet tall, with hollow stems and whorled leaves (Missouri Botanical Garden 2019). The flowers are fragrant, purple or pink and occur in round clusters of five to seven flowers per head. Flowers appear in mid- to late summer around July or September. The flowers produce a wind-dispersed small dry seed with hair-like bristles. The fibrous root system sometimes produces rhizomes, which create colonies of the plant. Joe-Pye Weed grows in moist to wet soils in full sun to partial shade (Kirk & Belt 2001).

Establishment/Management

Seeds ripen about a month after flowering and should be collected when the heads dry, split and the fluffy seed begins to float away. If collected earlier, dry the seed heads for two weeks in open paper. If seeds are sown directly, sow in the fall and sow thickly because germination rates are typically low. For container production, a cold-moist pretreatment at 40º F for one to three months will increase germination (Missouri Botanical Garden 2019). After pretreatment, sow seeds in a fine germination mix containing moss. Cover seeds lightly, and place flats on heating mats under grow lights as the seeds require warmth and light to germinate. Use a greenhouse with alternating temperatures with day temperatures 70-85º F, and night temperatures 65-68º F (Missouri Botanical Garden 2019). Seeds will last up to 3 years if stored in a cold place. Joe-Pye Weed can be propagated by division or two-node softwood tip cuttings taken in late

spring. Divide the plants in the fall as they go dormant or in the spring just as shoots first appear (Kirk & Belt 2001).

Pests and Potential Problems

Hollow-stemmed Joe-Pye Weed is not drought-tolerant. The leaves are favored by grasshoppers and flea beetles which can leave them looking unwell by midsummer (Missouri Botanical Garden 2019).

Attributes	Variables
Height:	4 to 7 feet
Bloom Time:	July to September
Bloom Description:	Dusky Rose
Water:	Medium to Wet
Suggested Usage	Naturalize, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Butterflies
Stormwater Retention:	Medium

15. Meadow-Rue

Thalictrum dasycarpum

Description

Meadow Rue is a clump-forming perennial that grows to be 3 to 5 feet tall. It has tiny, purplish white flowers that appear in early summer around late May to July. Individual flowers are not particularly striking, but many blooms can be quite showy. Stems are often purple, mostly dioecious, meaning male and female flowers on separate plants, with the male flowers having showy yellow stamens. Variations of this species are native to Ohio (Missouri Botanical Garden 2019).

Establishment/Management

Meadow-rue will grow in full sun to light shade, wet conditions and soil that is loamy, slightly sandy or slightly rocky. Generally, plants growing in sunlight require more moisture than plants growing in shade.

The size of individual plants can vary significantly depending on environmental conditions. The blooming period occurs from early to mid-summer for about 2 to 3 weeks. The flowers are cross-pollinated by the wind. Afterwards, the female flowers are replaced by spindle-shaped achenes that turn brown at maturity. The root system is fibrous and rhizomatous. Clonal offsets are sometimes produced from the rhizomes (Missouri Botanical Garden 2019).

Seed propagation: Stratify seeds for two months at 33-48 °F. Sow stratified seeds in a flat of seed-starting mix and place the flat under a grow light. Do not use a heating mat; Meadow Rue germinates and grows best at cooler temperatures. Meadow Rue seeds can also be sown outdoors in late fall or early spring (Prairie Moon Nursery Germination Codes & Instructions).

Pests and Potential Problems

No serious insect or disease problems. Powdery mildew and rust are only occasional problems. Taller plants may need staking or other support.

Attributes	Variables
Height:	3 to 5 feet
Bloom Time:	May to June
Bloom Description:	Purple White
Water:	Medium
Suggested Usage	Open Spaces
Sun:	Full Sun to Part Shade
Soil:	Well Drained
Biodiversity:	Butterflies
Stormwater Retention:	Low

16. Mountain Mint

Pycnanthemum virginianum

Description

Pycnanthemum virginianum or Mountain Mint is native to Ohio. Its common name of mountain mint is somewhat misleading since the plant typically occurs in moist soils in swamps and along streams. A straight, many-branched, herbaceous perennial that grows 2 to 3 feet tall and features narrow tapering

leaves with somewhat flat-topped (Missouri Botanical Garden 2019). Clusters of white flowers appear in mid- to late-summer. All parts of the plant emit a strong, mint-like aroma when crushed. Pycnanthemums have been used in teas for many years (Bebeau 2019).

Establishment/Management

Propagation by seed: Mountain Mint seed does not require stratification. In early spring, press seed into the surface of a fine, well-drained seed-starting mix. Do not cover the seed. Water from below or with a fine spray of water from a seedling misting nozzle. Place the flat on a heat mat under grow lights or in a warm greenhouse (Prairie Moon Nursery Germination Codes & Instructions). Easily grown in average, medium, well-drained soil and likes to be in full sun.

This plant can be used for the herb garden, border, naturalized area or meadow. Also, may be grown in open areas near ponds and streams (Bebeau 2019).

Pests and Potential Problems

No serious insect or disease problems affected Mountain Mint.

Attributes	Variables
Height:	2 to 3 feet
Bloom Time:	July to September
Bloom Description:	White
Water:	Medium
Suggested Usage	Open Spaces
Sun:	Full Sun
Soil:	Well Drained
Biodiversity:	Butterflies
Stormwater Retention:	Low

17. Obedient Plant

Physostegia virginiana

Description

Commonly called obedient plant or false dragonhead, is a perennial that is native to North America. It is commonly found in a variety of habitats including open meadows, prairies, stream banks, gravel bars, wooded bases and right of ways (Missouri Botanical Garden 2019). Tubular, two-lipped, snapdragon-like, pink to pale lilac flowers in upright terminal spikes bloom throughout summer from late June to September. Flowers bloom bottom to top on each side. Stems are clad with opposite, narrow-lanceolate, sharply toothed leaves(Missouri Botanical Garden 2019). These plants are noted for being aggressive spreaders in the landscape by both rhizomes and self-seeding (Martin 2006).

Establishment/Management

Seed Propagation: Stratify seeds for two months at 33-38 degrees Fahrenheit. Then, sow seeds in seed-starting mix in flats and place the flats in a warm, bright location. Alternatively, seeds may be sown outdoors in fall, either in a seed bed or scattered in the location where you want the plants to grow (Prairie Moon Nursery Germination Codes & Instructions).

Easily grown in average, moist, acidic, well-drained soils in full sun. Stems tend to flop in rich soils, too much shade or hot summer temperatures. Obedient plant is a taller plant and may need staking. Tolerates wet soils and some part shade as well (Martin 2006).

Pests and Potential Problems

No serious insect or disease problems. Rust is an occasional problem. Watch for aphids and spider mites. Species plants can be an aggressive spreader.

Attributes	Variables
Height:	3 to 4 feet
Bloom Time:	June to September
Bloom Description:	Pink, White
Water:	Medium
Suggested Usage	Naturalize, Rain Garden

Sun:	Full Sun
Soil:	Clay Soil
Biodiversity:	Hummingbirds
Stormwater Retention:	Medium

18. Oswego Tea

Monarda didyma

Description

Oswego Tea is a member of the mint family (Lamiaceae). This aromatic herbaceous perennial plant grows to a height of 2 to 5 feet on branched, hairy, square stems. The leaves are opposite, are around 3 to 6 inches long and dark green (Missouri Botanical Garden 2019). Oswego tea plants produce red flowers concentrated primarily at the end of each stem with a bloom period of at least a month. The flowers bloom from June through September in beautiful clusters of red. The flowers are solitary, terminal and rounded on the end of the branching stems, supported by leafy bracts. The flowers are perfect containing both male and female parts (2008 North American Butterfly Association).

Establishment/Management

Oswego tea grows best in a moist, rich soil with high organic matter but can tolerate almost any well-drained soil. The plant prefers a pH in the 6.0-7.0 range. Although it can tolerate drought, it performs wet soils (Missouri Botanical Garden 2019).

Seed open in the late fall to a brown color with a firm texture. When the seeds are ripe, the seed heads should be clipped from the plants and allowed to air-dry for several days. Once dry, inverting the seed heads and tapping them will dislodge most of the seed. This can also be accomplished by placing the seed heads in a paper bag and shaking to dislodge the seed (Missouri Botanical Garden 2019). Remove the chaff from the seed by running it through a sieve. Stratify the seed for three months in wet sand prior to planting at 34 to 40 degrees Fahrenheit. Seeds can be planted directly into the ground at the desired site from late winter through spring. Planting sites should be sunny with adequate soil moisture and reduce weed competition. Once seedlings emerge, apply water during extended dry periods to aid in survivability (Randall & Vandevender 2015).

Germinate seeds indoors by sowing in flats or trays. The soil should be moist before seeding. Cover the seed with a thin 1/8" layer of soil to keep the seed moist. Seed should germinate in 1 to 2 weeks. Add water to the flats when the soil surface is dry to the touch (Missouri Botanical Garden 2019). Apply a starter fertilizer when the seedlings are 2 to 3 weeks old. Transplant seedlings into larger containers after 6 to 8 weeks. Space plants transplanted to the field 18 to 24 inches apart. This allows for sufficient air flow, reducing the chances of powdery mildew infection. Scarlet beebalm is a low maintenance plant but benefits from care (Randall & Vandevender 2015).

Pests and Potential Problems

Powdery mildew is a common disease problem associated with Monarda species (Hawke, 1998). Outbreaks are often caused by poor air circulation because of too much foliage and inadequate soil moisture.

Attributes	Variables
Height:	2 to 4 feet
Bloom Time:	July to August
Bloom Description:	Red
Water:	Medium to Wet
Suggested Usage	Herb, Naturalize, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Clay and Wet Soil
Biodiversity:	Hummingbirds, Butterflies
Stormwater Retention:	Medium

19. Queen of the Prairie

Filipendula rubra

Description

Commonly called queen of the prairie, this plant is a USA native perennial which ranges from Pennsylvania to Georgia and west to Iowa. It is a 6 to 8 feet tall, upright, clump forming perennial and has fragrant, pale pink flowers in early to mid-summer (Missouri Botanical Garden 2019). Deeply cut, compound, bright green leaves having 7-9 lance-shaped leaflets each, with a large, 7-9 lobed (Missouri Botanical Garden 2019). A good foliage plant that is valued for both its leaves and its flowers (Hilty 2018).

Establishment/Management

Seed Propagation: Stratify Filipendula seed at 33-38 degrees Fahrenheit for three months. Then, sow seeds in seed-starting mix in flats and place the flats in a warm, bright location. Germination may be slow and erratic. This plant is usually propagated by rhizome divisions (Prairie Moon Nursery Germination Codes & Instructions) (Prairie Moon Nursery, n.d.).

This plant's preference is full or partial sun, and wet to moist conditions. The soil should be high in organic content and can contain a little sand. The cooler climate of the Great Lakes region is preferred. The inflorescence occurs on a long naked stalk, having many pink buds and flowers. Each flower is about 1/3" across, consisting of 5 pink petals and numerous long white stamens with pink anthers. The overall appearance of the inflorescence resembles wind-tossed fluff or foam. The flowers bloom from the bottom up and have no fragrance. The blooming period occurs from early to mid-summer and lasts about three weeks. Afterward, straight reddish fruit develops on the plant. Queen-of-the-Prairie is rhizomatous and tends to form colonies under moist conditions (Hilty 2018).

Pests and Potential Problems

No serious insect or disease problems. Occasionally, the leaves become spotted from foliar disease, otherwise it is not subject to any special problems. Though quite tall, this sturdy plant usually does not need staking (Hilty 2018).

Attributes	Variables
Height:	6 to 8 feet
Bloom Time:	June to August

Bloom Description:	Pale Pink
Water:	Medium to Wet
Suggested Usage	Naturalize, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Clay Soil
Biodiversity:	Butterflies, Bees and Birds
Stormwater Retention:	Medium

20. Turtlehead

Chelone glabra

Description

Chelone glabra, commonly called turtlehead is a clump-forming, leafy-stemmed, Ohio native perennial which typically grows 2 to 3 feet tall and grows in moist woods, swampy areas and along streams (Missouri Botanical Garden 2019). Hooded, snapdragon-like, white flowers with a little pink appear in groups from late summer into autumn. Flowers purportedly resemble turtle heads as they grow. Coarsely-toothed, dark green leaves go along this tall plant stem (McGhan 2019).

Establishment/Management

Sow seeds outdoors in late fall or early spring, either in the plants' intended permanent locations, or in a prepared seedbed (Prairie Moon Nursery Germination Codes & Instructions).

Best grown in moist to wet, rich, humusy soils in part shade. Appreciates a good composted leaf mulch, in sunny areas. Consider pinching back the stem ends in spring to reduce mature plant height, especially if growing plants in strongly shaded areas where they are more likely to need some support. Staking is usually not required, but many need to stalk for tall plants. Turtlehead will slowly spread by rhizomes over an area (McGhan 2019).

Pests and Potential Problems

No serious insect or disease problems. Mildew, particularly if soils are kept on the dry side and/or air circulation is poor. If grown in too much shade, plants may need some support (Missouri Botanical Garden 2019).

Attributes	Variables
Height:	2 to 3 feet
Bloom Time:	August to October
Bloom Description:	White with Pink Tinge
Water:	Medium to Wet
Suggested Usage	Naturalize, Rain Garden
Sun:	Part Shade
Soil:	Wet Soil
Biodiversity:	Butterflies
Stormwater Retention:	Medium

SHADE PERENNIALS:

21. Aster, big leaf

Eurybia macrophylla

Description

Eurybia macrophylla, commonly called large leaved aster, is known for its large leaves. This is a perennial that grows 2 to 4 feet tall (Missouri Botanical Garden 2019). It is native to woods and clearings from Nova Scotia to Illinois, Ohio and North Carolina. Heart-shaped, rough, sharply-toothed, basal leaves are wide in size. Flat topped clusters of flowers with violet to blue sometimes white with a yellow centers. Blooms around August and September. Flowers are attractive to butterflies (Missouri botanical garden 2019).

Establishment/Management

Stratify seeds for 2 months at 33-38 degrees Fahrenheit. Fill a flat or plug tray with good-quality seed-starting mix (Missouri Botanical Garden 2019). Look for mixes that include finely milled sphagnum peat moss, vermiculite, perlite. Avoid mixes containing composted bark, topsoil, or large amounts of sand. Sow seeds and cover the seeds with up to ¼ inch of seed-starting mix (Missouri Botanical Garden 2019). Place the flat or plug tray on a heat mat under a grow light, or in a warm greenhouse. Alternatively, sow seeds outdoors in late fall or early spring, either in the plants' intended permanent locations, or in a prepared seedbed (Prairie Moon Nursery Germination Codes & Instructions).

Best grown in moist, well-drained, sandy loams in part shade. This is a woodland species that will grow in shade, but best flowering and growth is in part shade. Spreads by rhizomes and self-seeding to form colonies. Best grown in open shade gardens, native plant gardens, woodland gardens or slopes (Missouri botanical garden 2019).

Pests and Potential Problems

No known serious insect or disease problems. Powdery mildew may occur.

Attributes	Variables
Height:	2 to 4 feet

Bloom Time:	September to October
Bloom Description:	Violet to Pale Blue Rays with Yellow Centers
Water:	Medium
Suggested Usage	Naturalize
Sun:	Part Shade to Full Shade
Soil:	Most Soils
Biodiversity:	Butterflies
Stormwater Retention:	Low

22. Bugbane

Actaea racemosa

Description

Actaea racemosa, commonly called black cohosh, it is a native perennial which occurs in rocky woodlands. It typically grows to a total height of 4 to 6 feet, but under optimum conditions can reach up to 8 feet tall. Small, numerous, creamy white, fragrant flowers appear in late summer to early fall (Missouri Botanical Garden 2019). The common name of bugbane is in reference to the odoriferous insect repellant properties of this plant (Missouri botanical garden 2019).

Establishment/Management

Cut rhizomes into 3-inch sections. Plant each section two inches deep in a pot of compost and leaf mold or plant each section two inches deep in a prepared planting bed outdoors. Space the rhizome sections or potted plants 18 to 24 inches apart when you plant bugbane plants in their permanent location (Davis, 2019).

In fall, sow freshly harvested seed in a prepared seedbed in a part shaded location. Cover the seeds with ¼ of soil, then cover the entire bed with autumn leaves. Seedlings should emerge in 6 to 18 months(Missouri Botanical Garden 2019). Seed purchased is most likely dormant or nonviable, and germination will be poor (Davis, 2019).

Easily grown in average, medium moisture soils and part shade to full shade. Prefers organically rich, moisture-retentive soils (Missouri Botanical Garden 2019). Best sited in locations sheltered from winds. This is a slow growing plant. Adds height and late summer bloom to a shaded part of the border or shade area. Also effective for use in woodland, cottage gardens and naturalized areas. Grows best in groups. Deep green foliage provides excellent texture and color to the landscape throughout the growing season (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Rust and leaf spot are occasional problems. Foliage generally does not need staking, but taller flower may need some support (Missouri Botanical Garden 2019).

Attributes	Variables
Height:	4 to 6 feet
Bloom Time:	June to July
Bloom Description:	White
Water:	Medium
Suggested Usage	Naturalize
Sun:	Part Shade to Full Shade
Soil:	Well Drained
Biodiversity:	Butterflies and Insects
Stormwater Retention:	Low

23. Cohosh, Giant Blue

Caulophyllum giganteum

Description

This perennial wildflower that will grow to be 1 to 3 feet tall. The central stem is green to pale purple. A non-flowering plant has a single compound leaf, while a flowering plant has two compound leaves (Missouri Botanical Garden 2019). This compound leaf resembles the lower compound leaf, except its three compound leaflets are smaller in size because they have only 3 sub leaflets each (Hilty 2018).

Establishment/Management

The plant preference sunlight during the spring, followed by light shade during the summer. Cohosh likes a location with average moisture and fertile and loamy soil. The soil should also contain abundant organic matter from decaying leaves and other plant materials, as typically occurs underneath trees (Missouri Botanical Garden 2019). The large seeds are difficult to germinate, but once it becomes established Blue Cohosh is long-lived plant. In fall, as soon as the fruits are ripe, sow seeds outdoors in fall. Cover the bed with chicken wire to prevent animals from digging up the seeds and cover the bed with fallen leaves. After the steps above seedlings should appear in 2 to 3 years (Purple Beasties--Caulophyllum, n.d.).

The blooming period occurs from mid to late spring before the leaves have fully developed. The flowers are replaced by berry like seeds (Missouri Botanical Garden 2019). These seeds are green to start, but they later become bright blue at maturity during the summertime. The seed coat is fleshy and contains carbohydrates. The root system is rhizomatous and fibrous (Hilty 2018).

Pests and Potential Problems

No serious insect or disease problem for Cohosh.

Attributes	Variables
Height:	1.5 to 2 feet
Bloom Time:	May to Frost
Bloom Description:	Lavender-Blue
Water:	Medium
Suggested Usage	Open Spaces

Sun:	Full Sun
Soil:	Dry Soils
Biodiversity:	Butterflies
Stormwater Retention:	low

24. Cohosh, Blue

Caulophyllum thalictroides

Description

Commonly called blue cohosh, is an Ohio native perennial which grows to be 1 to 3 feet tall on strong, upright stems (Missouri Botanical Garden 2019). It is valued not for its flowers but for its, blue-green foliage and its clusters of blue seeds. Leaves appear at midstem, emerging a s blue in spring and turning blue/green at maturity. Inconspicuous, brownish green to yellowish green flowers, each with 6 pointed sepals, appear in spring (Missouri Botanical Garden 2019). In summer blue berry like seeds that have an outer seed coating turns fleshy and blue as seeds mature (Missouri botanical garden 2019).

Establishment/Management

Seed propagation - The large seeds are difficult to germinate; sow seeds in a prepared seedbed outdoors in fall as soon as the fruits are ripe, the same way you would treat C. giganteum seed (Purple Beasties--Caulophyllum, n.d.). Once it becomes established at a favorable site, Blue Cohosh is long-lived plant.

Best grown in shady woodland areas in rich, moist, neutral to slightly acidic soils (Missouri Botanical Garden 2019). Needs consistently moist soils that do not dry out. Plants may be grown from seed, but usually will not flower until the third or fourth year. May be divided, but established plants are generally best left undisturbed. Can spread very slowly by rhizomes over time to form colonies (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	1 to 2 feet

Bloom Time:	April
Bloom Description:	Yellow-green
Water:	Medium
Suggested Usage	Open spaces
Sun:	Part Shade to full shade
Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	Low

25. Geranium, Wild

Geranium maculatum

Description

Geranium maculatum is an herbaceous perennial native to deciduous woodlands of eastern North America. Known by many different common names including alum root, alum bloom, cranesbill, spotted cranesbill, wild cranesbill, spotted geranium, wild geranium, wood geranium and other local names (Missouri Botanical Garden 2019). Geranium maculatum usually very abundant in patches in natural woodland openings. These colonies are formed of groups of long-lived clones that have grown from individual plants. Plants have a loose cluster of basal leaves and flowering stems arising from thick, branched horizontal rhizomes (Mahr 2013).

Establishment/Management

Stratify seeds for 3 months at 33-38 degrees Fahrenheit. Fill a flat or plug tray with good-quality seed-starting mix. Look for mixes that include finely milled peat moss. Avoid mixes containing composted bark, topsoil or large amounts of sand. Cover the seeds with up to ¼ inch of seed-starting mix. Place the flat or plug tray on a heat mat under a grow light, or in a warm greenhouse (Prairie Moon Nursery Germination Codes & Instructions). Sow seeds outdoors in late fall or early spring, either in the plants' intended permanent locations, or in a seedbed.

Easily grown in average, medium, well-drained soil in full sun to part shade (Missouri Botanical Garden 2019). Prefers moist soils but tolerates poor soils. Will naturalize in good growing conditions. Foliage may yellow in hot summers if soil dries out. Foliage may decline after flowering in summer climates, at which point it may be lightly cut back and shaped (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Rust and leaf spot may occur. Watch for snails and slugs.

Attributes	Variables
Height:	1.5 to 2 feet
Bloom Time:	April to May
Bloom Description:	Pale Pink, Deep Pink, Lilac
Water:	Medium

Suggested Usage	Open Spaces
Sun:	Full Sun to Part Shade
Soil:	Dry Soil
Biodiversity:	Butterflies
Stormwater Retention:	Low

26. Mayapple

Podophyllum peltatum

Description

Podophyllum peltatum, commonly called mayapple, is a native Ohio wildflower that occurs in both moist and dry woodland areas throughout the state. From a single stem, each plant grows 12-18" tall and features one to two, deeply divided, palmately lobed, umbrella like, pale green leaves (Missouri Botanical Garden 2019). From the crotch on two leafed plants, 6-9-petaled, white flower appears on a short, thin stem in spring. Flowers are showy, but usually hidden by the umbrella shaped leaves. Each flower gives way to an edible greenish fruit called mayapple which turn golden when ripe and may be used to make preserves and jellies (Missouri Botanical Garden 2019). Leaves and roots are poisonous (Hilty 2018).

Establishment/Management

Difficult to grow from seed. Usually planted as bare-root rhizomes and allowed to spread and fill in naturally (Prairie Moon Nursery, n.d.).

Grow in average, medium moisture, well-drained soil in part shade to full shade (Missouri Botanical Garden 2019). Prefers rich and moist soils and often forms large colonies in the wild. Will self-seed under good growing conditions. As with many of the early spring wildflowers, Mayapple goes dormant in summer. Excellent for naturalizing in woodland, wild or native plant gardens. Because plants naturalize freely but go dormant in summer, Mayapple is not considered a good border plant (Hilty 2018).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	1 to 1.5 feet
Bloom Time:	April
Bloom Description:	White
Water:	Medium
Suggested Usage	Open Groundcover
Sun:	Part Shade to Full Shade
Soil:	Dry Soil
Biodiversity:	N/A
Stormwater Retention:	Low

27. Wild Sweet William

Phlox divaricata

Description

Commonly called woodland phlox, is a spreading, native wildflower which forms mats of foliage with stems typically reaching 12-15 inches tall (Missouri Botanical Garden 2019). As the common name suggests, this is a woodland species which occurs in woodlands, fields and along streams. Clusters of slightly fragrant, lilac to rose to blue flowers with five, flat, notched, petal-like lobes that appear at the stem tips in spring. Stems are both hairy and sticky. Lance-shaped to elliptic leaves. Can form large colonies over time as leafy shoots spread along the ground rooting at the nodes (Missouri botanical garden 2019).

Establishment/Management

Stratify seeds for 2 months at 33-38 degrees Fahrenheit. Fill a flat or plug tray with good-quality seed-starting mix. Look for mixes that include finely milled sphagnum peat moss. Cover the seeds with up to ¼ inch of seed-starting mix. Place the flat or plug tray on a heat mat under a grow light, or in a warm greenhouse (Prairie Moon Nursery, n.d)

Cut a piece of stem with two leaf nodes before the flowers open. Remove the leaves from the lower node, and if the leaves are large, cut off half of each leaf at the upper node. Immediately place the cutting in a glass of sterile, room-temperature water. Treat each cutting with a rooting powder containing butyric acid, then immediately stick the cuttings upright in a sterile, fine textured growing medium such as a sand and perlite mixture, a vermiculite and sterile, finely milled peat mixture, or a commercial mix made for cutting propagation. Cover the flats or pots with clear plastic bags with one corner cut off for ventilation(Prairie Moon Nursery, n.d). Best grown in medium moisture, well-drained soil in part shade to full shade. Prefers rich, moist, organic soils and appreciates a light summer mulch which helps retain moisture and keep roots cool (Missouri botanical garden 2019).

Pests and Potential Problems

Powdery mildew can be a serious problem. Cutting back stems after flowering helps combat mildew. Spider mites can also be a problem, particularly in hot, dry conditions. Rabbits will eat this plant (Missouri botanical garden 2019).

Attributes	Variables
Height:	0.75 to 1 foot

Bloom Time:	April to May
Bloom Description:	Rose/Lavender or Violet/Blue
Water:	Medium
Suggested Usage	Ground Cover, Naturalize
Sun:	Part Shade to Full Shade
Soil:	Clay and Dry Soil
Biodiversity:	Hummingbirds, Butterflies
Stormwater Retention:	Low

28. Solomon's Seal

Polygonatum biflorum

Description

Commonly called small Solomon's seal, is an Ohio native wildflower which occurs in rich woodlands throughout the state. Typically grows in a mound to 1 to 3 feet tall on unbranched stems (Missouri botanical garden 2019). Small, bell-shaped, yellow flowers in pairs dangle in the spring from the leaf axils along and underneath of the arching stems. Flowers are followed by blue-black berries in autumn. Starchy, edible rhizomes were formerly used by early Americans as a potato-like food. Common name is usually considered to be in reference to the large, circular seals located on the rhizomes (Missouri botanical garden 2019).

Establishment/Management

Pick berries when they change color, remove the flesh from the seed, and sow the seeds immediately, do not allow the seeds to dry out before sowing (Bubel, 1998). To start seed indoors and get germination the first year after sowing. Avoid mixes containing composted bark, topsoil or large amounts of sand. Cover the seeds with up to ¼ inch of seed-starting mix, store the flat for 2 to 3 months at 33-38 degrees Fahrenheit, then place the flat or plug tray on a heat mat under a grow light, or in a warm greenhouse for 2 to 3 months (Prairie Moon Nursery Germination Codes & Instructions).. Most of the seeds will not germinate for at least two years.

Easily grown in average, medium wet, well-drained soil in part shade to full shade (Missouri botanical garden 2019). Slowly spreads by rhizomes to form colonies in optimum growing conditions. Best in woodland gardens, wild gardens, naturalized areas or native plant gardens. May be used in partially shaded borders or rock gardens (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	1 to 3 feet
Bloom Time:	April to May
Bloom Description:	Greenish White
Water:	Medium to Wet
Suggested Usage	Naturalize, Rain Garden
Sun:	Part Shade to Full Shade
Soil:	Wet Soil
Biodiversity:	N/A
Stormwater Retention:	Medium

29. American Spikenard

Aralia racemosa

Description

Commonly called American spikenard, is a rhizomatous, shrubby looking, soft-stemmed, herbaceous perennial of the Ginseng family that is native to Ohio (Missouri botanical garden 2019). Freely branching, dark maroon to near black stems rise from large roots to 3 up to 5 feet tall bearing very large compound leaves each of which is divided and subdivided into 9-21 coarse oval-rounded leaves. Flowers are followed by dense hanging clusters of inedible berries which mature to dark purple. Berries are very attractive to birds. Thick roots have been used to flavor teas and root beer. Roots was used for a variety of

medicinal purposes including treatment of infections, burns, skin irritations, ulcers and swellings (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium moisture, well-drained soils in full sun to part shade. Perhaps best in part shade. Prefers moist, fertile, humusy loams but tolerates a wide range of soils including rocky and clayey ones (Missouri botanical garden 2019). Best sited in areas sheltered from winds to help protect the large leaves. Easily grown from seed, division or root cuttings, but best started by sowing seed in place in the fall as soon as the seed is ripe, as plants do not appreciate transplanting (Prairie Moon Nursery, n.d.). Plants will slowly spread over time by self-seeding and creeping rhizomes (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Susceptible to leaf spots. Aphids and mealybugs may appear. Watch for spider mites.

Attributes	Variables
Height:	3 to 5 feet
Bloom Time:	June to August
Bloom Description:	White
Water:	Medium
Suggested Usage	Naturalize
Sun:	Full Sun to Part Shade
Soil:	Dry Soils
Biodiversity:	N/A
Stormwater Retention:	Low

30. Violet, Canadian White

Viola canadensis

Description

Commonly called white violet or Canada violet, is a clump forming, stemmed violet. White flowers with yellow centers and purple on the back of the upper petals bloom in spring on short, naked stalks rising from the leaf axils of leafy stems typically growing 9 to 15 inches tall (Missouri botanical garden 2019). Canadian White Violet are dark green, heart-shaped leaves. Genus name comes from the Latin name for the sweet-scented flowers (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium wet, well-drained soil in partial shade. Prefers moist and humusy soils. Does not spread by runners, but freely self-seeds and behaves as a weed in a bed. Performs better in cool summer climates of the northern USA and Canada than in hot summer areas (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Aggressively self-seeds.

Attributes	Variables
Height:	1 to 1.5 feet
Bloom Time:	June to October
Bloom Description:	White, Tinged Purple
Water:	Medium to Wet
Suggested Usage	Ground Cover, Naturalize
Sun:	Full Sun to Part Shade
Soil:	Well Drained
Biodiversity:	N/A
Stormwater Retention:	Low

GROUND COVER

31. Christmas Fern

Polystichum acrostichoides

Description

Commonly called Christmas fern, native fern which occurs in both dry and moist wooded slopes and along rivers. Typically grows in clumps up to 2 feet tall and features leathery, lance-shaped, evergreen fronds (Missouri botanical garden 2019). Stocking shape of the pinnae is how this fern got its name. Sori appear on the undersides of the pinnae only at the ends of the fronds(Missouri botanical garden 2019). Evergreen fronds provide nice winter interest for the landscape.

Establishment/Management

Best grown in organically rich, dry to medium moisture, well-drained soils in partial shade to full shade. Consider planting rhizome at an angle to help combat rot problems which can occur in poorly drained soils (Missouri botanical garden 2019). Although rhizomatous this fern will not spread or naturalize, however clumps will increase in size over time. Dryish or moist soils in woodland gardens, shade gardens or shady areas of borders, wild or native plant gardens. May also be planted in shady areas along walls (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Crown rot in poorly drained soils can be a problem, particularly in winter.

Attributes	Variables
Height:	1 to 2 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Dry to Medium
Suggested Usage	Grow Cover
Sun:	Part Shade to Full Shade
Soil:	Dry Soil, Shallow-Rocky Soil

Biodiversity:	N/A
Stormwater Retention:	Low

32. Foamflower

Tiarella cordifolia

Description

Grows in clump forming perennial which spreads rapidly by runners to form dense clumps of foliage. Sometimes commonly called false miterwort because of its similarity to Miterwort. Semi-glossy, heart-shaped, 3-5 lobed leaves rise directly from the stolons (Missouri botanical garden 2019). Leaves may have reddish variegation along the veins. Foliage is evergreen in mild winters, often turning reddish bronze in autumn and winter. Tiny, white flowers with very long stamens appear in spring for about six weeks. Flower buds are pinkish in hue (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium, well-drained soil in part shade to full shade. Prefers organically rich, moisture-retentive soils. Soil should not be allowed to dry out. Wet soils, particularly in winter, can be fatal, however. Removal of flower spikes after bloom will improve the appearance of the foliage (Missouri botanical garden 2019). Foliage is semi-evergreen where the amount of retained foliage color in winter is in large part dependent upon the severity of the temperatures (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	0.75 to 1 foot
Bloom Time:	May
Bloom Description:	White or Pink
Water:	Medium
Suggested Usage	Ground Cover, Naturalize
Sun:	Part Shade to Full Shade

Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	Low

33. Ginger, Wild

Asarum canadense

Description

Commonly called wild ginger, is an Ohio native spring wildflower which occurs in rich woods and wooded slopes throughout the state. A stemless plant which features two downy, heart-shaped to kidney-shaped, veined, dark green, basal leaves (Missouri botanical garden 2019). Cup-shaped, purplish brown flowers appear in spring on short stems. Flowers are quite attractive however, bloom singly on or near the ground and are usually hidden from view by the foliage (Missouri botanical garden 2019).

Establishment/Management

Fill a flat or plug tray with good-quality seed-starting mix. Look for mixes that include finely milled peat moss. Wild ginger appreciates mixes containing sifted compost or leaf mold (Bubel, 1998). Cover the seeds with up to ¼ inch of seed starting mix. Moisten flat, then place the flat or plug tray on a heat mat under a grow light, or in a warm greenhouse, for 2 to 3 months. Stratify seeds for 2-3 months at 33-38 degrees Fahrenheit. Return the flat to a warm, bright location, and the seeds should germinate (Prairie Moon Nursery Germination Codes & Instructions).

Propagation by division can be dig and divide rhizomes in early spring or mid-fall (Prairie Moon Nursery, n.d.).

Easily grown in average, medium to wet, well-drained soil in part shade to full shade (Missouri botanical garden 2019). Prefers constantly moist, acidic soils in heavy shade. Spreads slowly by rhizomes to form a ground cover for shade areas. Usually grown as a ground cover in shady areas. Woodland, native plant gardens or naturalized areas are all good areas for this plant. May also be used for edging (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Slugs and snails can be occasional problems.

Attributes	Variables
Height:	.5 to 1 foot
Bloom Time:	April to May
Bloom Description:	Purplish Brown
Water:	Medium to Wet
Suggested Usage	Ground Cover, Naturalize, Rain Garden
Sun:	Part Shade to Full Shade
Soil:	Wet Soil
Biodiversity:	N/A
Stormwater Retention:	Medium

34. Wintergreen

Gaultheria procumbens

Description

Commonly called wintergreen, is a rhizomatous, creeping, woody, evergreen groundcover of the heath family that is native to woodlands in Eastern North America (Missouri botanical garden 2019). Leathery, dark green, about 2" long leaves on 3-6" glossy stems arise from the rhizomes. Plants will spread over time to form ground cover (Missouri botanical garden 2019). Nodding, bell-shaped, white flowers bloom in early summer around June to July. Flowers give way to bright red berries that persist through winter. Leaves acquire shades of purple in fall. Leaves and fruit have the smell and taste of wintergreen. Berries are an excellent winter food for some wildlife such as pheasant, squirrels, and deer (Missouri botanical garden 2019).

Establishment/Management

Best grown in rich, moist, acidic, well-drained soils in part shade to full shade. Established plants tolerate dry soils. Plants perform best in climates with cool summers. Space plants 10-14" apart for growth as a ground cover (Missouri botanical garden 2019). Excellent ground cover for shady areas. Woodland gardens, rock gardens, foundations or native plant areas. Plants are an interesting complement to other

acid-loving shrubs such as blueberries (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Aphids and thrips can be troublesome.

Attributes	Variables
Height:	.25 to .5 foot
Bloom Time:	June to July
Bloom Description:	White
Water:	Medium
Suggested Usage	Ground Cover, Naturalize
Sun:	Part Shade to Full Shade
Soil:	Well Drained
Biodiversity:	N/A
Stormwater Retention:	Low

35. Big Bluestem

Andropogon gerardii

Description

Big Bluestem is a native, perennial, warm season grass that occurs from the grass prairie region to the Atlantic Ocean. It is tufted, forms sod, and has short, scaly rhizomes. Big bluestem is tall, reaching a height of 6 to 8 feet on most sites where it is protected from grazing (Missouri botanical garden 2019). It is very leafy at the base, with some leaves going up the stem. The seed heads normally have three spikelets that looks like a 'turkey foot.' Big bluestem is adapted throughout the Midwest and Northeast on well drained soils. It is adapted to a range of other soil limitations such as shallow depth, low pH, or low fertility (USDA 2002).

Establishment/Management

Easily grown in average, dry to medium, well-drained soils in full sun. Tolerant of a wide range of soils and growing conditions. Puts out lots of growth in moist, fertile soils, but is less apt to topple in dryish, infertile soils (Gustafson, Gibson, Nickrent 2004). Self-seeds in optimum growing conditions. This grass develops an extensive root system and is somewhat slow to establish, but once established it is very drought tolerance and is easy to maintain. Cut stems to the ground in late winter before new shoots come in. Best to use in wildflower meadows, prairie or naturalized areas. Extensive root system makes this a good grass for erosion control (Schultz 2009).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	4 to 6 feet
Bloom Time:	September to February
Bloom Description:	Purplish-Red

Water:	Dry to Medium
Suggested Usage	Naturalize
Sun:	Full Sun
Soil:	Dry Soil
Biodiversity:	N/A
Stormwater Retention:	Low

36. Little Bluestem

Schizachyrium scoparium

Description

Schizachyrium scoparium, commonly called little bluestem, is native to prairies, fields, clearings, hills, limestone glades, roadsides and open woods (Missouri botanical garden 2019). It was one of the dominant grasses of the vast tallgrass prairie region which once covered rich and fertile soils in many parts of North America. It typically matures to 2 to 4 feet tall, and features upright clumps of slender, flat, green leaves with each leaf having a tinge of blue at the base (Missouri botanical garden 2019). Purplish-bronze flowers appear in long racemes on branched stems rising above the foliage in August. Flowers are followed by clusters of fluffy, silvery-white seed heads which often persist into winter. Many consider the most outstanding ornamental feature of this grass to be its bronze-orange fall color (Wasowski 2002).

Establishment/Management

Easily grown in average, dry to medium moisture, well-drained soils and likes full sun. Tolerates a wide range of soil conditions including clay. Good drought resistance once established and well tolerate high heat and humidity. Cut to the ground in late winter to early spring (Wasowski 2002).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	2 to 4 feet

Bloom Time:	August to February
Bloom Description:	Purplish Bronze
Water:	Dry to Medium
Suggested Usage	Open Spaces
Sun:	Full Sun
Soil:	Dry and Shallow-Rocky Soil
Biodiversity:	N/A
Stormwater Retention:	Low

37. Switchgrass

Panicum virgatum

Description

Native grass which was an important component of the tallgrass prairie which once covered large areas of the state. It occurs in both wet and dry soils in prairies, woodlands and stream banks and along roadways throughout most of the state. Switchgrass is generally noted for its stiff, columnar form and typically retains its shape throughout the growing season (Missouri botanical garden 2019). It is a clump forming, warm season grass which typically grows to be 3 feet tall. Medium green leaves which turn yellow in autumn, fading to tan in winter. Seeds are a food source for birds in wintertime like the Black-capped Chickadee (Birdsleuth, 2016).

Establishment/Management

Easily grown in average, medium to wet soils in full sun to part shade. Tolerates a wide range of soils, including dry ones, but likes moist, sandy or clay soils. Can tolerates occasional flooding. Generally, performs best in full sun areas. Will grow in part shade but begins to lose its form in too much shade, growing more openly and possibly falling over. Grows primarily in clumps but will slowly spread by creeping rhizomes (Missouri botanical garden 2019). Cut back clumps to the ground in late winter to early spring. This will help with growing in the spring. Plants may self-seed in optimum growing conditions, but cultivars may not come true from seed. Adult food source and larval host for the Delaware Skipper (Anatrytone logan) a small bright orange butterfly that is native to Ohio (www.butterfliesandmoths.org 2019).

Pests and Potential Problems

No serious insect or disease problems. Some susceptibility to rust, particularly in hot and humid summer climates. Japanese beetles, thrips and spider mites may appear (Missouri botanical garden 2019).

Attributes	Variables
Height:	3 to 6 feet
Bloom Time:	July to February
Bloom Description:	Pink-Tinged
Water:	Medium to Wet
Suggested Usage	Naturalize, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Dry Soil and Wet Soil
Biodiversity:	Birds
Stormwater Retention:	Medium

38. Wood Fern

Dryopteris intermedia

Description

Commonly called evergreen wood fern. This plant is a rhizomatous wood fern that is native to moist woodland areas, swamp margins and rocky slopes in Eastern North America. This is an evergreen wood fern that typically grows to 1 to 3 feet tall with upright arching fronds to 40” long (Missouri botanical garden 2019). Frond leaflets are lobed and toothed, oval to narrow triangular, and the finely dissected blade has 10-15 pairs of narrow lance-shaped pinnae (Missouri botanical garden 2019). Fruit dots appear on the leaflet undersides on fertile fronds in early to midsummer. Genus name from Greek “dryas” meaning oak and “pteris” meaning fern in reference to the presence of some species of wood ferns in woodland areas populated with Oak trees (Missouri botanical garden 2019).

Establishment/Management

Easily grown in medium moisture, well-drained soils in part shade to full shade. Prefers fertile, moist, humusy loams that are rich in organic matter. Best with consistent moisture. Soils should not be

allowed to dry out. Site in locations protected from strong winds to prevent damage to the fronds. Tolerant of high humidity but not dry air. Fronds are evergreen in mild winter climates. The old fronds should be cut off in late winter prior to the emergence of the new growth. Propagate by division or spores on the plant (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	1 to 3 feet
Bloom Time:	Non-flowering
Bloom Description:	Non-flowering
Water:	Medium
Suggested Usage	Ground Cover
Sun:	Part Shade to Full Shade
Soil:	Clay Soil
Biodiversity:	N/A
Stormwater Retention:	Low

39. Lady Fern

Athyrium filix-femina

Description

Commonly called lady fern, is a deciduous fern that features lacy cut, erect or ascending, finely divided, green fronds which grow in dense circular clumps to 2 to 3 feet tall (Missouri botanical garden 2019). Each frond has twenty to thirty pairs of elliptic non-opposite pinna with narrow pointed tips. Each pinna is divided into deeply-cut lanceolate to oblong pinnules. This is a circumglobal species which is found in rich moist woods, thickets, fields, meadows and along rivers throughout northern North America, Europe and Asia (Missouri botanical garden 2019).

Establishment/Management

Easily grown in rich, medium moisture, well-drained soil in part shade to full shade. Tolerates drier soils than many other ferns. Will tolerate full sun if soil is kept constantly moist. Shelter from wind to protect fronds from breaking. Divide clumps in spring every few years to reposition crowns at the soil level to replant (Wasowski 2009).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	1 to 3 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Medium
Suggested Usage	Ground Cover
Sun:	Part Shade to Full Shade
Soil:	Well Drained
Biodiversity:	N/A
Stormwater Retention:	Low

40. Marginal Shield Fern

Dryopteris marginalis

Description

Commonly called marginal shield fern, is an evergreen, Ohio native fern which typically forms a non-spreading, vase-shaped clump to 1.5-2 feet tall (Missouri botanical garden 2019). This is a woodland fern which is most often found in shaded areas on rocky ledges. Features grayish green, deeply cut, leathery fronds. Sori are located at the edges or margins of the pinnule undersides, hence the common name (Missouri botanical garden 2019). Rhizome forms an erect crown. Evergreen fronds provide good interest to the winter landscape (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium, well-drained soil in part shade to full shade. Prefers moist, rich, humusy, acidic soils with protection from wind. Grow in shady areas of the woodland, native plant or wild garden. Mixes well with spring wildflowers and excellent as a specimen or in groups (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	1.50 to 2 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Medium
Suggested Usage	Ground Cover
Sun:	Part Shade to Full Shade
Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	Low

41. Ostrich Fern

Matteuccia struthiopteris

Description

Commonly called ostrich fern, is a clump-forming, upright into an arch, rhizomatous, deciduous fern which typically grows 2 to 3 feet tall in cultivation, but may reach 6 feet tall in moist, cool climates in the wild (Missouri botanical garden 2019). The showy parts of this fern are the finely dissected, medium green fronds which, as the common name suggests, exhibit the feathery appearance of long ostrich feather. These fronds usually depreciate as the summer proceeds, looking rather tattered by early fall and finally losing their leaflets later in the fall as the plant goes dormant for the winter (Missouri botanical garden 2019). The sterile fronds form a huge crown around the much less showy fertile fronds which are dark brown. The fertile fronds arise in mid-summer and persist through the wintertime (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium to wet soils in part shade to full shade. Best in rich soils with a lot of moisture. Soil must never be allowed to dry out or plant will die. Spreads by underground rhizomes to form dense colonies and is in best growing conditions. Prefers cool summer climates and is generally intolerant of the hot summers. Avoid windy sites overall. Plant in moist, woodland areas, wild gardens or wet areas near streams or ponds. Plant in conjunction with early spring wildflowers which will be well on the way toward dormancy by the time this fern reaches full size (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	3 to 6 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Medium to wet
Suggested Usage	Naturalize, Rain Garden

Sun:	Part Shade to Full Shade
Soil:	Clay Soil and Wet Soil
Biodiversity:	N/A
Stormwater Retention:	Medium

42. Royal Fern

Osmunda regalis

Description

Commonly called royal fern, is a tall, deciduous, Ohio native fern which usually occurs on moist bluffs, along streams. sometimes growing in the water. Typically grows in clumps to 2 to 3 feet tall. Broad fronds have large, well-separated leaflets which give this fern an almost pea-family appearance (Missouri botanical garden 2019). Fronds typically turn yellow in autumn. Spores are located in brown, tassel-like, fertile clusters at the tips of the fronds (Adelman & Schwartz 2011).

Establishment/Management

Best grown in medium to wet soils in part shade. Prefers moist, rich, acidic soils but adapts to lesser conditions. Also prefers cool summer climates where it tolerates close to Full sun as long as given moisture. Full sun exposure is not recommended for areas with hot summers. Excellent selection for wet areas along ponds, streams, water gardens or bogs. Also grows well in shaded borders, woodland gardens or native plant gardens (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	2 to 3 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Medium to Wet

Suggested Usage	Naturalize, Rain Garden
Sun:	Part Shade to Full Shade
Soil:	Wet Soil
Biodiversity:	N/A
Stormwater Retention:	Medium

SHRUBS

43. Bayberry, Northern

Myrica pensylvanica

Description

Commonly called bayberry, is a branching deciduous shrub with a rounded habit which typically grows 6-10 feet tall. Native to North America narrow, leathery, glossy, grayish-green leaves around 4" long are dotted with resin and aromatic when crushed (Missouri botanical garden 2019). Male and female flowers appear in separate catkins on separate plants. Only the male flowers displaying color a low yellowish green. Flowers on female plants, if pollinated, are followed by attractive clusters of tiny, grayish white fruits in late summer which usually persist through the winter (Missouri botanical garden 2019). The fruits are covered with a waxy substance which is used to make bayberry candles, soaps and sealing wax. Fruits are attractive to birds and it is host to larvae of the Columbia silk moth-Hyalophora Columbia (Opler & Wright 1999).

Establishment/Management

Easily grown in average, well-drained soils in full sun to part shade. Prefers moist, sandy, acidic soils, but tolerates a wide range of soils and growing conditions. Including poor soils, wet soils, drought, and high winds (Missouri botanical garden 2019). Groupings of plants need at least one male plant to facilitate pollination of the female plants and subsequent fruit sets. Shrubs tend to sucker and may form sizable colonies in optimum growing conditions (Burrell 2006).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	5 to 10 feet
Bloom Time:	May
Bloom Description:	Yellowish Green
Water:	Dry to Medium
Suggested Usage	Hedge, Naturalize, Rain Garden

Sun:	Full Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Birds
Stormwater Retention:	Medium

44. Buttonbush

Cephalanthus occidentalis

Description

Buttonbush is a deciduous shrub with an open-rounded habit that typically grows 6 to 12 feet tall (Missouri botanical garden 2019). It is common throughout Ohio most frequently occurring in wet open areas, woods, swamps, river bottomland and along stream/pond. Tiny, 5-lobed, fragrant white flowers appear in dense, spherical flower heads in early to mid-summer. Flower heads are very attractive to bees and butterflies (Missouri botanical garden 2019). Flower heads mature into hard spherical ball-like fruits consisting of multiple tiny two-seeded nutlets (Allain 2014). Fruiting heads usually persist throughout the winter. Ovate to elliptic glossy bright green leaves are in pairs. Leaves emerge late in spring around May. Genus name comes from the Greek words cephalo (head) and anthos (flower) (Missouri botanical garden 2019).

Establishment/Management

Easily grown in moist soils in full sun to part shade. Grows very well in wet soils, including flood conditions and shallow standing water. Adapts to a wide range of soils except dry ones. Pruning is usually not necessary but may be done in early spring to shape. If plants become unmanageable, however, they may be cut back near to the ground in early spring to revitalize. Best used in naturalizing of woodland areas, native plant gardens, pond banks or shrub borders. (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	5 to 12 feet

Bloom Time:	June
Bloom Description:	White
Water:	Medium to Wet
Suggested Usage	Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Butterflies
Stormwater Retention:	Medium

45. Chokeberry, Black

Aronia melanocarpa

Description

Commonly called black chokeberry, is an upright, spreading, somewhat rounded but leggy, deciduous shrub that typically grows 3 to 6 feet tall (Missouri botanical garden 2019). It is native to woods, swamps, bogs and moist thickets but occasionally to dry areas. Although common in many parts of its native range, it is somewhat rare in west part of the state where it is only found in boggy ground. It is noted for its 5-6 flowered clusters of white 5-petaled spring blooming in May, glossy dark green leaves 2-3" long with finely toothed margins, black autumn berries around the size of a blueberry and purple/red fall color (Hardin 1973).

Establishment/Management

Easily grown in average moisture, well-drained soils in full sun to part shade. Plants have a wide range of soil tolerance including boggy soils (Missouri botanical garden 2019). Best fruit production usually occurs in full sun. Remove root suckers to prevent colonial spread. Group or mass in shrub borders, small gardens or woodland areas for best use (Van Dersal 1938). Ability to withstand wet conditions makes it suitable for growing on the margins of ponds or streams. Excellent addition to naturalized areas where its colonial growth habit does not need to be restrained (Morgenson 2005).

Pests and Potential Problems

No serious insect or disease problems. Some susceptibility to leaf spots and fruit blight.

Attributes	Variables
Height:	3 to 6 feet
Bloom Time:	May
Bloom Description:	White
Water:	Medium
Suggested Usage	Hedge, Naturalize, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Birds
Stormwater Retention:	Medium

46. Dogwood, Gray

Cornus racemosa

Description

Commonly called gray dogwood, is a deciduous shrub which is native to Ohio and will occur in moist or rocky ground along streams, ponds, wet meadows, glade and prairie margins. Grows 10-15 feet tall and features white flowers borne in terminal racemes in late spring and grayish-green, elliptic to lance-shaped leaves (Missouri botanical garden 2019). Foliage turns an interesting purplish red in fall. Stems holding the flowers are red and provide interesting contrast to the clusters of small white berries which form after the flowers have dropped (Missouri botanical garden 2019). Red stem color is more easily seen after the fruits are gone, and red color often persists into early winter (USDA 2002).

Establishment/Management

Easily grown in average, medium, well-drained soil in full sun to part shade. Tolerates wide range of soil conditions, including both moist and somewhat dry soils. Tolerant of city air pollution well. Will spread to form groups if root suckers are not removed. Excellent when planted in groups and left alone to spread in naturalized areas or native plant gardens. Also effective in shrub borders, along streams or ponds or near buildings or when planted as a natural barrier (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. The dogwood bud gall occurs on this species but is usually not a significant problem (Missouri botanical garden 2019).

Attributes	Variables
Height:	10 to 15 feet
Bloom Time:	May to June
Bloom Description:	May to June
Water:	Medium
Suggested Usage	Rain Garden
Sun:	Full Sun to Part Shade

Soil:	Wet Soil
Biodiversity:	Birds, Butterflies
Stormwater Retention:	Medium

47. Dogwood, Red Osier

Cornus sericea

Description

Cornus sericea, commonly known as red twig dogwood or red osier dogwood, is an upright-spreading, suckering shrub that typically grows in the absence of pruning to 6 to 9 feet tall. Except for the lower Midwest and deep South, this species is native to much of North America where it is typically found growing in swampy areas, wetland margins or along rivers (Missouri botanical garden 2019). Medium to dark green leaves acquire interesting shades of red to orange eventually fading to purple in autumn (Missouri botanical garden 2019). Reddish stems turn bright red in winter. Tiny, white flowers appear in flat-topped clusters in late spring, additional flowering sometimes continuing into summer. Flowers give way to clusters of whitish drupes in summer. Fruit is quite attractive to birds and is generally considered to have as much if not more ornamental interest than the flowers (Martin, Zim, & Nelson 1951).

Establishment/Management

Best grown in organically rich, fertile, moist soils in full sun to part shade. Tolerant of a range of soils, including swampy conditions. Trim roots and promptly remove root suckers if colonial spread is undesired. Best stem color occurs on young stems (Missouri botanical garden 2019). Although pruning is not required, many gardeners choose to remove 20 to 25% of the oldest stems in early spring of each year to stimulate growth of new stems. As an alternative to annual pruning, some gardeners prune all stems close to the ground (coppice to 8") in early spring every 2 to 3 years to renew (Missouri botanical garden 2019). Any loss of flowers through spring pruning is not terribly significant since the small flowers of this dogwood are rather ordinary. Plants become stressed and more vulnerable to diseases such as canker in hot and humid summer climates (Isaacson, R. T. 1993).

Pests and Potential Problems

Susceptible to leaf and twig blights, canker and leaf spots. Scale, leaf miners and bagworms are occasional insect pests (Missouri botanical garden 2019).

Attributes	Variables
Height:	6 to 9 feet
Bloom Time:	May to June
Bloom Description:	White
Water:	Medium to Wet
Suggested Usage	Hedge, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Clay or Wet Soil
Biodiversity:	Birds and Butterflies
Stormwater Retention:	Medium

48. Nannyberry

Viburnum lentago

Description

Commonly called nannyberry, is a large, upright, multi-stemmed, suckering, deciduous shrub which typically grows to 10 to 18 feet tall with a spread of 6-12 feet (Missouri botanical garden 2019). Non-fragrant white flowers in flat-topped cymes appear in spring. Flowers give way in autumn to blue, berry-like drupes which often persist into winter and are attractive to birds and wildlife. Finely toothed, glossy dark green leaves are abruptly long-pointed. Variable fall color ranges from a greenish yellow to reddish purple. Fruits are edible and may be eaten off the bush when ripe or used in jams and jellies (Davis & Nesom 2002).

Establishment/Management

Easily grown in average, medium, well-drained soil in full sun to part shade. Prune immediately after flowering since flower buds form in summer for the following year (Missouri botanical garden 2019). Remove root suckers to control spread unless naturalization is desired. Good for shrub borders or tall hedge (Davis & Nesom 2002).

Pests and Potential Problems

No serious insect or disease problems. Mildew and leaf spot are occasional problems.

Attributes	Variables
Height:	14 to 16 feet
Bloom Time:	May
Bloom Description:	White
Water:	Medium
Suggested Usage	Hedge
Sun:	Full Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Birds and Butterflies
Stormwater Retention:	Medium

49. Ninebark

Physocarpus opulifolius

Description

Commonly called ninebark, is an upright, spreading, deciduous, native shrub which is closely related to the genus Spiraea (Missouri botanical garden 2019). It typically occurs along streams, rocky banks and in moist thickets. Grows 5-9' tall noted for its exfoliating bark which peels in strips to reveal several layers of reddish to light brown inner bark (USDA, NRCS 1993). Bark provides winter interest but is usually hidden by the foliage during the growing season (Dirr 1997). Features small pink or white, five-petaled flowers appearing in dense, rounded clusters in late spring. Flowers give way to drooping clusters of reddish fruit. Ovate to rounded, usually 3-5 lobed leaves are dull green in summer changing to yellow in fall (Kurz 1997).

Establishment/Management

Easily grown in average, to slightly acidic, dry to medium moisture, well-drained soil in full sun to part shade. Best in full sun but likes some afternoon shade. Tolerates a wide range of soil conditions overall. Prune as needed immediately after bloom and no later than mid-August (Missouri botanical garden 2019). Plants may be cut close to the ground in winter to rejuvenate. Plants often struggle in the hot and humid summer. Effective as a hedge, screen or for erosion control on banks or native plant garden. Able to grow in harsh conditions. (Morgan 1993).

Pests and Potential Problems

No serious insect or disease problems. Fire blight and leaf spots may occur.

Attributes	Variables
Height:	5 to 8 feet
Bloom Time:	May to June
Bloom Description:	White or Pink
Water:	Dry to Medium
Suggested Usage	Hedge

Sun:	Full Sun to Part Shade
Soil:	Clay, Dry or Wet Soil, Shallow-Rocky Soil
Biodiversity:	Bees
Stormwater Retention:	Medium

50. Purple-Flowering Raspberry

Rubus odoratus

Description

Purple Flowering Raspberry is a native of Eastern North America. It is a deciduous, coarse, suckering shrub with cane-like stems which typically grows 3 to 6 feet tall and spreads 6 to 12 feet wide (Missouri botanical garden 2019). One of the best of the ornamental raspberries because of its rose like, fragrant, purple flowers which appear over a long summer bloom period. This shrub has hairy stems and flowers give way to cup-shaped red fruits (raspberries) which are edible but somewhat dry, crumbly and unappetizing (Missouri botanical garden 2019).

Establishment/Management

Grow in average, medium moisture, well-drained soil in full sun to part shade. Has good shade tolerance. Prune immediately after fruiting. Best in a shade gardens, shrub borders, native plant gardens or wild or naturalized areas (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Aggressive, suckering habit needs to be watched.

Attributes	Variables
Height:	3 to 6 feet
Bloom Time:	June to August
Bloom Description:	Rose-Purple
Water:	Medium
Suggested Usage	Hedge
Sun:	Full Sun to Part Shade

Soil:	Well-Drained
Biodiversity:	Birds and Butterflies
Stormwater Retention:	Low

51. Spicebush

Lindera benzoin

Description

Commonly called spicebush, is a native deciduous shrub with a broad, rounded habit which typically grows 6 to 12 feet high in moist locations in bottomlands, woods, ravines, valleys and along streams (Missouri botanical garden 2019). Clusters of tiny, green to yellow flowers bloom along the branches in early spring before the foliage comes out. Dioecious meaning to have male and female flowers on separate plants, with the male flowers being larger and showier than the female ones (Missouri botanical garden 2019). Flowers of female plants give way to bright red which mature in fall and are attractive to birds. Female plants need a male pollinator in order to set fruit. Male plants are very attractive but are largely hidden by the foliage. Thick, oblong-obovate, light green leaves turn an attractive yellow in autumn. Leaves are aromatic when crushed that smells like fruit. The caterpillar of the spicebush swallowtail butterfly feeds on the leaves of this shrub (Carter & Feeny 1999).

Establishment/Management

Easily grown in average, well-drained soils in full sun to part shade. Fall color is best in sunny areas. Tolerates full shade, but habit becomes more open and wide-spreading (Missouri botanical garden 2019). Best used in shrub borders, woodland gardens, moist areas along streams or ponds, native plant gardens or naturalized plantings (Wofford 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	6 to 12 feet
Bloom Time:	March

Bloom Description:	Greenish Yellow
Water:	Medium
Suggested Usage	Hedge, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Clay or Wet Soil
Biodiversity:	Birds, Butterflies
Stormwater Retention:	Medium

52. Sumac, Fragrant

Rhus aromatica

Description

Commonly called fragrant sumac, is a deciduous native shrub which occurs in open woods, glades and thickets throughout the state. A dense, low-growing shrub which spreads by root suckers to form thickets in the wild. Typically grows 2 to 4 feet tall and spreads to 10 feet wide (Missouri botanical garden 2019). Medium green leaves turn to a shade of orange, red and purple in autumn. Leaves and twigs are aromatic when crushed. Although smaller, the leaves resemble in appearance those of the related poison ivy. However fragrant sumac is a non-poisonous plant. Tiny yellow flowers bloom at the tips in early spring before the foliage. Separate male flowers and female flowers appear on the same plant or, more commonly, on different plants. Male catkins form in late summer and persist throughout the winter until eventually blooming in spring (Missouri botanical garden 2019). Female flowers give way in late summer to small clusters of hairy, red berries which may persist into winter (Wasowski 2002). Fruit is attractive to wildlife including the Banded Hairstreak and Red banded Hairstreak butterfly larva (Covell 2005).

Establishment/Management

Easily grown in average, dry to medium, well-drained soil in full sun to part shade. Tolerant of wide range of soils except those that are poorly drained. Good for stabilizing embankments or for hard-to-cover areas with poorer soils or for wild parts of native plant gardens or naturalized areas. May also be used as informal hedges (Wasowski 2002).

Pests and Potential Problems

No serious insect or disease problems. Some susceptibility to leaf spot, rust, scale, aphids and mites. Nipple galls on foliage are generally a cosmetic problem (Missouri botanical garden 2019).

Attributes	Variables
Height:	2 to 6 feet
Bloom Time:	April
Bloom Description:	Yellow
Water:	Dry to Medium
Suggested Usage	Hedge
Sun:	Full Sun to Part Shade
Soil:	Clay or Dry Soil, Shallow-Rocky Soil
Biodiversity:	Birds, Butterflies
Stormwater Retention:	Low

53. Sumac, Shining

Rhus copallinum

Description:

Commonly called dwarf sumac, winged sumac or shining sumac, is a multi-stemmed, deciduous shrub that is native to eastern North America. It is a deciduous shrub or small tree which occurs in dryish soils on hillsides, open woods, glades, fields and along the roadsides. It is a large open shrub which typically grows to 10 feet tall and spreads by root suckers to form large colonies in the wild (Missouri botanical garden 2019). It is very similar to smooth sumac, except leaflets are untoothed and leaf midribs have leafy ridges or wings that give rise to another common name of winged sumac for this plant (Missouri botanical garden 2019). Leaves turn bright red in autumn. Small, yellow flowers bloom in terminal pyramidal panicles in late spring to early summer, with separate male and female flowers usually occurring on separate plants . Pollinated female flowers produce showy fruiting clusters. Each cluster contains many hairy, berry like drupes which ripen in autumn, gradually turning brown as they persist through much of the winter. Fruit is attractive to wildlife such as songbirds (Wasowski 2002).

Establishment/Management

Easily grown in dry to medium, well-drained soils in full sun to part shade. Tolerant of a wide range of soils except for those that are poorly drained. Best for dry, informal, naturalized areas where it can be allowed to spread and form colonies. effective when massed on slopes for erosion control. Naturalize in woodland areas, wood margins or wild areas. Has some nice ornamental features like its flower panicles in spring, shiny dark green summer foliage, fruiting clusters in fall and excellent fall foliage color (Wasowski 2002).

Pests and Potential Problems

No serious insect or disease problems. Some susceptibility to leaf spots, rusts, scale, aphids and mites.

Attributes	Variables
Height:	7 to 15 feet
Bloom Time:	July to August
Bloom Description:	Greenish
Water:	Dry to Medium
Suggested Usage	Outlining
Sun:	Full Sun to Part Shade
Soil:	Dry Soil or Shallow-Rocky Soil
Biodiversity:	Birds
Stormwater Retention:	Low

54. Winterberry

Ilex verticillata

Description

Commonly called winterberry, is a deciduous holly that is native to eastern North America where it typically occurs in swamps, low woods and along streams. This is a slow-growing, deciduous shrub with an upright rounded habit that typically grows 3 to 12 feet tall (Missouri botanical garden 2019). In the wild, it often suckers to form large colonies. Toothed dark green leaves are found on this plant. Fall color is usually

changeable, but in some years, leaves may turn beautiful shades of maroon. White flowers appear in the leaf axils in late spring. Flowers, if properly pollinated, give way to a crop of bright red berries in late summer to fall (Missouri botanical garden 2019). Berries are quite showy and will persist throughout the winter and often into early spring. (Wasowski, S. & A. Wasowski 2009).

Establishment/Management

Easily grown in average, acidic, wet soils in full sun to part shade. Adaptable to both light and heavy soils, but prefers moist, acidic, organic soils. Good tolerance for poorly drained soils including wet boggy or swampy conditions. Winterberries are dioecious meaning this plant has separate male and female plants. Only fertilized female flowers will produce the red berries. Generally, one male winterberry will be sufficient for pollinating 6 to 10 female plants (Missouri botanical garden 2019). Prune to shape in early spring just before new growth. Best if used for native plant areas, bird gardens or hedge. Excellent shrub for moist soils in low spots or along streams and ponds (Wasowski, S. & A. Wasowski 2009).

Pests and Potential Problems

No serious insect or disease problems. Occasional disease problems include leaf spots and powdery mildew. Plants do poorly in neutral to alkaline soils where they are susceptible to chlorosis (yellowing of leaves) and often die (Missouri botanical garden 2019).

Attributes	Variables
Height:	3 to 12 feet
Bloom Time:	June to July
Bloom Description:	Greenish-White
Water:	Medium to Wet
Suggested Usage	Hedge, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Clay or Wet Soil
Biodiversity:	Birds
Stormwater Retention:	Medium

SMALL TREES

55. Hawthorn

Crataegus

Description

Commonly called scarlet hawthorn or Ontario hawthorn, is native to eastern North America. It is a small, dense, broad-rounded tree to 20 to 25 feet tall with horizontal branching armed with thorns (Missouri botanical garden 2019). It is also seen as a large multi-stemmed shrub. Dark green leaves are broadest near the base and sometimes lobed near the top. Leaves are toothed and mostly hairless. Leaves turn orange to purple red in fall. White flowers bloom in May. Flowers emit an unpleasant fragrance. Flowers are followed by rounded fruits that ripen in September-October and typically persist to late fall to early winter. Fruits are technically edible. The fruit is sometimes called a haw (Missouri botanical garden 2019).

Establishment/Management

Grow in average, medium moisture, well-drained soils in full sun. Tolerates a wide range of soils as long as drainage is good. Tolerates light shade and some drought. Tolerates many urban pollutants. Small flowering landscape tree for lawns or open woodland areas (Missouri botanical garden 2019). Thorns are a drawback for pedestrian areas or areas with small children. Plants may be effective when grown as barrier plants on property borders or in hedgerows (Missouri botanical garden 2019).

Pests and Potential Problems

Pests and diseases are a problem with most hawthorns. Plants are susceptible to cedar hawthorn rust and fire blight. Other potential diseases include fungal leaf spots, powdery mildew, cankers, apple scab, leaf blight and twig blight (Missouri botanical garden 2019). Potential insect pests include aphids, borers, caterpillars, lace bugs, leaf miners and scale. Red spider mites may also occur. Use of pesticide sprays may be advisable in areas where this plant suffers from significant diseases and insects. Thorns pose significant risks for young children, and also make culture/pruning more difficult (Missouri botanical garden 2019).

Attributes	Variables
Height:	20 to 25 feet
Spread:	20 to 25 feet

Bloom Time:	May
Bloom Description:	White
Water:	Medium
Suggested Usage	Flowering Tree
Sun:	Full Sun
Soil:	Well-Drained
Biodiversity:	Birds, Butterflies
Stormwater Retention:	High

56. Eastern Hop Hornbeam

Ostrya virginiana

Description

Commonly called American hop hornbeam, is a deciduous, native tree which usually occurs in dry soils on rocky slopes, upland woods throughout the State. A small to medium-sized, understory tree with a generally rounded crown. Typically grows 25 to 40 feet tall with a slightly smaller spread (Missouri botanical garden 2019). Features birch-like, oval to lance-shaped, sharply serrated, dark green leaves. Leaves turn yellow in autumn and often drop early. Flowers are monoecious reddish-brown male flowers and greenish female flowers appear in separate catkins on the same tree (Missouri botanical garden 2019). Flowers are not particularly showy. Female catkins are followed by drooping clusters, seed-bearing pods which, as the common name suggests, somewhat resemble the fruit of hops. Also commonly called ironwood because of its extremely hard and dense wood (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium, well-drained soil in full sun to part shade. Good if used as a lawn tree, street tree or woodland garden (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables

Height:	25 to 40 feet
Spread:	20 to 30 feet
Bloom Time:	April
Bloom Description:	Red-Brown (male) Light Green (female)
Water:	Medium
Suggested Usage	Shade Tree, Street Tree
Sun:	Full Sun to Part Shade
Soil:	Clay Soil
Biodiversity:	N/A
Stormwater Retention:	High

57. Serviceberry, Allegheny

Amelanchier laevis

Description

Commonly called Allegheny Serviceberry, is a small, deciduous, usually multi-trunked understory tree or tall shrub which is native to thickets, open woods, sheltered slopes and wood margins in Eastern North America where it typically grows 15 to 25 feet tall (Missouri botanical garden 2019). Features 5-petaled, slightly fragrant, white flowers in drooping clusters which appear in early spring around April before the leaves. Flowers give way to small, round, edible berries which ripen to a purplish in June and resemble blueberries in size, color and taste. Berries are often used in jams, jellies and pies. Finely-toothed, obovate leaves emerge with a brownish-purple tinge in spring, mature to lustrous dark green in summer and turn red-orange in fall (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium, well-drained soil in full sun to part shade. Tolerant of a wide range of soils but prefers moist, well-drained. Attractive understory tree for lawns, shrub borders, woodland

margins or native plant areas. Shrub forms can be grown as tall hedges or screens. Good plant for bird gardens, birds love the berries of this plant (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Rust, leaf spot, fire blight, powdery mildew and canker are occasional disease problems.

Attributes	Variables
Height:	15 to 40 feet
Spread:	15 to 40 feet
Bloom Time:	April
Bloom Description:	White
Water:	Medium
Suggested Usage	Street Tree, Flowering Tree
Sun:	Full Sun to Part Shade
Soil:	Well-Drained
Biodiversity:	Birds
Stormwater Retention:	High

58. Serviceberry, Common

Amelanchier arborea

Description

Commonly called downy serviceberry, is a deciduous, early-flowering, large shrub or small tree which typically grows 15 to 25 feet tall in cultivation but can reach 40 feet in the wild (Missouri botanical garden 2019). A Ohio native plant that occurs most often in open rocky woods, wooded slopes, and bluffs. Features 5-petaled, slightly fragrant, white flowers in drooping clusters which appear before the leaves emerge in spring. The obovate leaves exhibit good fall color. Flowers give way to small, round green berries which turn red and finally mature to a dark purple in early summer. Edible berries resemble

blueberries in size and color and are often used in jams, jellies and pies. Amelanchiers are commonly called Juneberries (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium, well-drained soil in full sun to part shade. Tolerant of a wide range of soils. Root suckers are common, and if not removed, will result in a shrubby growth habit for the plant (Missouri botanical garden 2019). Best in shrub borders, or in woodland, native plant gardens, especially with shaded backdrops which tend to highlight the form, flowers and fall color of the plant. Also effective along stream banks and ponds (Missouri botanical garden 2019).

Pests and Potential Problems

No serious problems. Rust, leaf spot, fire blight and powdery mildew are occasional disease problems, and sawfly, leaf miner, borers and scale are occasional insect pests.

Attributes	Variables
Height:	15 to 25 feet
Spread:	15 to 25 feet
Bloom Time:	March to April
Bloom Description:	White
Water:	Medium
Suggested Usage	Flowering Tree
Sun:	Full Sun to Part Shade
Soil:	Clay Soil
Biodiversity:	Birds
Stormwater Retention:	High

59. Sumac, Staghorn

Rhus typhina

Description

Commonly called staghorn sumac, is the largest of the North American sumacs. It is native to woodland edges, roadsides, railroad embankments and stream or swamp margins. This is an open, spreading shrub that typically grows 15 to 25 feet tall (Missouri botanical garden 2019). It is named for the brown hairs that cover the young branchlets in somewhat the same way that velvet covers the horns of a male deer. It is also known for its ornamental fruiting clusters and nice fall foliage color. Large, compound, odd-pinnate leaves are bright green above during the growing season. Leaves turn attractive shades of yellow, orange, and red in autumn. Tiny, yellow flowers bloom in terminal cone-shaped panicles in late spring to early summer around June to July, with male and female flower cones primarily occurring on separate plants (Missouri botanical garden 2019). Female flowers produce pyramidal fruiting clusters, with each cluster containing numerous hairy, berry-like drupes which ripen bright red in autumn, gradually turning dark red as they persist through much of the winter (Missouri botanical garden 2019). Fruit is attractive to wildlife.

Establishment/Management

Easily grown in average, dry to medium moisture, well-drained soils in full sun to part shade. Tolerant of a wide range of soils except for those that have poorly drained. Generally tolerant of urban conditions. This is a suckering shrub that will form thickets in the wild via self-seeding and root suckering (Missouri botanical garden 2019). Best for dry, informal, naturalized areas where it can be allowed to spread and form colonies. Effective when massed on slopes for erosion control or in hard-to-cover areas with poorer soils. Naturalize in open woodland areas, wood margins or wild areas (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Some susceptibility to leaf spots, rusts, powdery mildew, blister and cankers.

Attributes	Variables
Height:	15 to 25 feet
Spread:	20 to 30 feet
Bloom Time:	June to July
Bloom Description:	Greenish-Yellow

Water:	Dry to Medium
Suggested Usage	Naturalize
Sun:	Full Sun to Part Shade
Soil:	Dry Soil or Shallow-Rocky Soil
Biodiversity:	Birds
Stormwater Retention:	High

60. Witchhazel

Hamamelis virginiana

Description

Known as common witch hazel, is a fall-blooming, deciduous shrub or small tree that is native to woodlands, forest, and stream banks in eastern North America. It typically grows 15 to 20 tall. Stem-hugging clusters of fragrant bright yellow flowers, each with four crinkly, ribbon-shaped petals, appear along the branches from October to December, usually after leaf drop but sometimes at the time of fall color (Missouri botanical garden 2019). Fertilized flowers will form fruit over a long period going through winter and into the following growing season. Fruits are green seed capsules that become woody with age and mature to light brown. Each seed capsule splits open in fall of the following year, exploding the 1 to 2 black seeds within for up to 30 feet. Oval to obovate, medium to dark green leaves with dentate to wavy margins turn quality shades of yellow in fall (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium moisture, well-drained soils in full sun to part shade. Best flowering in full sun. Prefers moist, acidic, organically rich soils. Tolerates heavy clay soils. Promptly remove suckers to prevent colonial spread. Little pruning is required. Prune in early spring if necessary (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Occasional insect galls or small wasps appear on the foliage. Japanese beetles may chew on the leaves.

Attributes	Variables
Height:	15 to 20 feet
Spread:	15 to 20 feet
Bloom Time:	October to December
Bloom Description:	Yellow Sometimes Tinged with Orange or Red
Water:	Medium
Suggested Usage	Hedge, Naturalize, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Clay Soil
Biodiversity:	Birds
Stormwater Retention:	High

LARGE TREES

61. Birch

Betula alleghaniensis

Description

It is a small to medium sized tree that typically grows 25 to 40 feet tall with an upright, narrow pyramidal shape (Missouri botanical garden 2019). It is noted for its burgundy red to purple foliage and white bark. Foliage acquires orange, red and yellow shades in autumn. Tiny flowers appear in early spring in separate catkins on the same tree. Female flowers are followed by drooping cone-like fruits containing numerous small winged seeds that typically mature in late summer (Ahlgren 1957).

Establishment/Management

Best grown in moist, acidic, sandy or rocky, well-drained loams in full sun to part shade. Best foliage color occurs in full sun, but plants appreciate some afternoon part shade in hot summer areas. This tree needs consistently moist soils. Consider using bark mulches to keep the root zone cool and moist. It needs little pruning, but if necessary, prune during the dormant season. Avoid pruning in winter or spring when the sap is running because it will bleed (Missouri botanical garden 2019). Performs best in cool climates where summer temperatures rarely exceed 75 degrees Fahrenheit and where root zones are generally covered with snow throughout the winter (Missouri botanical garden 2019).

Pests and Potential Problems

This cultivar performs best in cool summer climates. It is not recommended for planting south of USDA Zone 7 (USDA 2002). Weakened birches, including those stressed by summer heat and humidity, become more vulnerable to the bronze birch borer which infects and kills trees (Missouri botanical garden 2019).

Attributes	Variables
Height:	25 to 40 feet
Spread:	15 to 25 feet

Bloom Time:	April to May
Bloom Description:	Yellow-Green
Water:	Medium to Wet
Suggested Usage	Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Clay or Wet Soil
Biodiversity:	Butterfly
Stormwater Retention:	High

62. Ohio Buckeye

Aesculus glabra

Description

Commonly called Ohio buckeye. It is found throughout the State of Ohio where it typically occurs in rich or rocky wooded areas of valleys, ravines, slopes and thickets. This is a low-branched, small to medium sized deciduous tree that typically grows 20 to 40 feet tall with a broad oval-rounded crown (Missouri botanical garden 2019). Bright green compound leaves emerge in spring. Leaves mature to dark green in summer. Fall color is yellow, although foliage may develop shades of orange and red in some years. Yellow flowers appear in clusters in mid-spring. Flowers are followed by the familiar fruit, which is a globular dehiscent capsule consisting of 1 to 2 buckeyes encased by a leathery light brown partitioned husk covered with warty spines (Missouri botanical garden 2019). When ripe, each buckeye turns a shiny dark brown with a light tan eye. Ohio is known as the Buckeye State and has adopted the buckeye as its State Tree. All parts of this tree, particularly the flowers, bark and twigs, emit an unpleasant odor when bruised (Williams 1990).

Establishment/Management

Easily grown in average, medium, well-drained soils in full sun to part shade. Prefers moist, fertile soils. Foliage tends to scorch and generally depreciate in dry conditions. This is a tap rooted tree that once established is very difficult to transplant (Williams 1990).

Pests and Potential Problems

Leaf blotch can be a significant problem. Powdery mildew and anthracnose are also frequent problems. Watch for bagworms, Japanese beetles and borers. Leaf scorch /brown edges may occur in drought conditions or on sites exposed to wind (Missouri botanical garden 2019).

Attributes	Variables
Height:	20 to 40 feet
Spread:	20 to 40 feet
Bloom Time:	April to May
Bloom Description:	Greenish-Yellow
Water:	Medium
Suggested Usage	Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Well-Drained
Biodiversity:	Butterflies
Stormwater Retention:	High

63. Cucumber-Tree

Magnolia acuminata

Description

Commonly known as cucumber tree, is native to eastern North America, reaching its largest size in the southern Appalachian Mountains. This is a deciduous magnolia that produces slightly fragrant, greenish-yellow, tulip-like flowers at the twig tips in late spring, but is named for the green, warty, cucumber-like fruits that follow the flowers. Cone-like fruits mature to a showy red in late summer, releasing individual red coated seeds suspended on slender threads at maturity. Cucumber tree is a straight-trunked tree that typically grows 40 to 70 feet tall (Missouri botanical garden 2019). Trunk diameter of mature trees can reach 3 to 4 feet, with furrowed dark gray-brown bark. Ovate, yellow-green leaves are pointed at the tip, but not classic narrow-tapering acuminate form (Missouri botanical garden 2019). Unlike most magnolias, this tree often produces respectable fall colors of gold.

Establishment/Management

Best grown in moist, organically rich, well-drained soils in full sun to part shade. Generally intolerant of soil extremes like dry or wet. Intolerant of most urban pollutants. May take twelve or more years before first blooms appear. Needs a large space like in a park or open farmland (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	40 to 70 feet
Spread:	20 to 35 feet
Bloom Time:	April to May
Bloom Description:	Greenish yellow
Water:	Medium
Suggested Usage	Shade Tree or Flowering Tree
Sun:	Full Sun to Part Shade
Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	High

64. Maple, Black

Acer nigrum

Description

Commonly called black maple is very similar in appearance to sugar maple. It is a large, deciduous tree with ascending branching, typically growing 60 to 75 feet all with a dense rounded crown (Missouri botanical garden 2019). Black maple is indigenous to the northeast and upper Midwest. It is native to Ohio where it typically occurs in rich woods, ravines, valleys, slopes and along streams. Black maple generally has a darker bark, darker leaves that are mostly 3 lobed, and hairy underneath and leafy stipules at the bases of many of the leaf petioles. Dark green leaves turn beautiful shades of yellow, orange and red in fall. Pale yellowish flowers appear in clusters in spring. Flowers give way to clusters of paired samaras that mature in late summer. Tree sap may be tapped for syrup that is equal in quality to than obtained from sugar maple (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium, well-drained soil in full sun to part shade. Best in moist soils in full sun. Seems to have slightly better tolerance for heat and drought than sugar maple. Mature trees have some tolerance for drought but does not tolerate pollution well (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	60 to 75 feet
Spread:	40 to 60 feet
Bloom Time:	April
Bloom Description:	Yellowish-Green
Water:	Medium
Suggested Usage	Shade Tree, Street Tree

Sun:	Full Sun to Part Shade
Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	High

65. Red Maple

Acer rubrum

Description

Commonly called red maple, is a medium-sized, deciduous tree that is native to Eastern North America. It typically grows 40 to 60 feet tall with a rounded to oval crown (Missouri botanical garden 2019). It grows faster than Norway and sugar maples, but slower than silver maple overall. In northern states, red maple occurs mostly in wet bottomland, river floodplains and wet woods. Emerging new growth leaves, leafstalks, twigs, flowers, fruit and fall color are red or tinged with red. Leaves have three triangular lobes. Lobes have toothed and pointed tips. Leaves are green above and gray green below. Flowers on a given tree are primarily male or female or monoecious and appear in late winter to early spring around March to April before the leaves (Missouri botanical garden 2019). Fruit is a two-winged samara (Tallamy 2009).

Establishment/Management

Easily grown in average, medium wet, well-drained soil in full sun to part shade. Tolerant of a wide range of soils, but prefers moist, slightly acid conditions (Missouri botanical garden 2019). Very cold hardy tree. Plant as a tree for the lawn, street or park. This tree has a shallow, flattened root system that may buckle nearby sidewalks or driveways if planted too close (Tallamy 2009).

Pests and Potential Problems

No serious insect or disease problems. Watch for leafhoppers, borers, scale and caterpillars. Verticillium wilt attacks the vascular system and can be fatal. Canker, fungal leaf spot and root rots may also occur. Wind and ice may break some branches. Leafhoppers can cause substantial damage (Missouri botanical garden 2019).

Attributes	Variables
Height:	40 to 70 feet
Spread:	30 to 50 feet
Bloom Time:	March to April
Bloom Description:	Red
Water:	Medium to Wet
Suggested Usage	Shade Tree, Street Tree, Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Birds, Moths
Stormwater Retention:	High

66. Sugar Maple

Acer saccharum

Description

Commonly known as sugar maple is a deciduous, native tree which will typically grow 40 to 80 feet tall with a dense, rounded crown (Missouri botanical garden 2019). Is one of the main tree of the Eastern hardwood forest and is one of the trees which is most responsible for giving New England its fall color. Medium green leaves turn yellow to an orange in autumn. Is the familiar two-winged samara. Sugar maples are long-lived trees which grow relatively slowly. Native Americans taught the early colonists how to tap these trees to make maple syrup which has now become a multi-billion-dollar industry in the U.S. and Canada(Missouri botanical garden 2019). The sugar maple leaf is the national symbol of Canada.

Establishment/Management

Easily grown in average, medium moisture, well-drained soil in full sun to part shade. Best in fertile, slightly acidic, moist soils in full sun. Grows poorly in compacted, poorly-drained soils. Intolerant of road salt. Generally intolerant of urban pollution. Great tree for the lawn or parks with beautiful fall color. May be used as a street tree as long as it can be located on a street and in a location where road salt, soil compaction and pollution will not be significant problems (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Susceptible to verticillium wilt, anthracnose, cankers, leaf spot and tar spot (Missouri botanical garden 2019). Also susceptible to aphids, borers and scale. Leaf scorch may be a problem in drought conditions. Has been frequently used as a street tree, but is generally intolerant of road salt, soil compaction and pollution (Missouri botanical garden 2019).

Attributes	Variables
Height:	40 to 80 feet
Spread:	30 to 60 feet
Bloom Time:	April
Bloom Description:	Greenish
Water:	Medium
Suggested Usage	Shade Tree
Sun:	Full Sun to Part Shade
Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	High

67. Bur Oak

Quercus macrocarpa

Description

Commonly called Bur Oak, is one of the most majestic of the native North American oaks. It is a medium to large sized deciduous oak of the white oak group that typically grows 60 to 80 feet tall with a broad-spreading, rounded crown (Missouri botanical garden 2019). Acorn cups are covered with a mossy scale or bur near the rim. It is native to a variety of habitats in central and eastern North America. Best growth occurs in bottomland soils, particularly in the Ohio River valley. Insignificant yellowish flowers in separate male and female catkins appear in spring as the leaves emerge (Missouri botanical garden 2019). Fruits are oval acorns, with fringed, burry cups that extend to approximately 1/2 to 3/4 the acorn length (Missouri botanical garden 2019). Acorns are an important source of food for wildlife. Leathery, green leaves with 5-9 rounded lobes are variable in shape, but usually have a pair of deep central sinuses that

extend nearly to the midrib giving the leaf a wasted appearance (Missouri botanical garden 2019). Fall color is a yellow to brown.

Establishment/Management

Easily grown in average, dry to medium, well-drained soils in full sun. Prefers moist well-drained soil but adapts to a wide range of soil conditions. Good drought tolerance. May take up to 35 years for this tree to bear a first crop of acorns. A large shade tree for very large lawns or parks (Missouri botanical garden 2019).

Pests and Potential Problems

Oaks are susceptible to a large number of diseases, including oak wilt, chestnut blight, shoestring root rot, anthracnose, oak leaf blister, cankers, leaf spots and powdery mildew (Missouri botanical garden 2019). Potential insect pests include scale, oak skeletonizer, leaf miner, galls, oak lace bugs, borers, caterpillars and nut weevils. Bur oak is generally considered to be a low-maintenance and long-lived tree (Missouri botanical garden 2019).

Attributes	Variables
Height:	60 to 80 feet
Spread:	60 to 80 feet
Bloom Time:	April
Bloom Description:	Yellowish-Green
Water:	Dry to Medium
Suggested Usage	Shade Tree, Rain Garden
Sun:	Full Sun
Soil:	Clay or Dry Soil
Biodiversity:	N/A
Stormwater Retention:	High

68. Red Oak

Quercus rubra

Description

Commonly called red oak or northern red oak, is a medium-sized, deciduous tree with a rounded to broad-spreading crown. Typically grows at a moderate to fast rate to a height of 50 to 75 feet. Dark, lustrous green leaves grayish-white beneath, with 7-11, toothed lobes which are sharply pointed at the tips (Missouri botanical garden 2019). Leaves turn red in autumn. Insignificant flowers in separate male and female catkins appear in spring. Fruits are acorns with flat, saucer-shaped cups which, mature in early fall (Missouri botanical garden 2019). An abundant crop of acorns may not occur before this tree reaches 40 years old of age. An Ohio native tree which typically occurs on northern- and eastern-facing wooded slopes throughout the State (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, dry to medium moisture, acidic soil in full sun. Prefers fertile, sandy, finely-textured soils with good drainage. Best used as a street tree or lawn tree.

Pests and Potential Problems

Generally, a durable and long-lived tree. Susceptible to oak wilt which is a systemic fungal disease that has no cure (Missouri botanical garden 2019).

Attributes	Variables
Height:	60 to 80 feet
Spread:	40 to 50 feet
Bloom Time:	April to May
Bloom Description:	Green (female) Red (male)
Water:	Dry to Medium
Suggested Usage	Shade Tree, Street Tree
Sun:	Full Sun
Soil:	Acidic Soil

Biodiversity:	Butterfly
Stormwater Retention:	High

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69. Scarlet Oak

Quercus coccinea

Description

Commonly called scarlet oak, is a large tree with a rounded, open habit which eventually matures to 70 feet tall. Leaves are 3-6" long and deeply cut with bristle-tipped, pointed lobes (Missouri botanical garden 2019). Foliage is a glossy green in summer turning to scarlet in fall. Monoecious, with neither male drooping catkins nor female solitary or clustered flowers being showy and fruit is an acorn (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, dry to medium, well-drained soil in full sun. Prefers dry, acidic, sandy soils. A stately shade tree for the lawn, particularly in drier locations, with excellent fall color. Also, a good street tree. Since it is a large tree, it must be planted in a location where it will have sufficient space to grow upward and spread to its mature size (Missouri botanical garden 2019).

Pests and Potential Problems

No serious problems. Scarlet oak is not subject to chlorosis problems as much as the closely related pin oak (Missouri botanical garden 2019).

Attributes	Variables
Height:	50 to 70 feet
Spread	40 to 50 feet
Bloom Time:	April to May
Bloom Description:	Yellowish-Green
Water:	Dry to Medium
Suggested Usage	Shade Tree and Street Tree
Sun:	Full Sun

Soil:	Dry Soil
Biodiversity:	Birds, Mammals
Stormwater Retention:	High

70. Shumard Oak

Quercus shumardii

Description

Commonly called Shumard oak, is a medium-sized, deciduous tree of the red oak group (Missouri botanical garden 2019). Typically grows at a moderately fast rate to a height of 40 to 60 feet. Shiny, dark green leaves with deep, spiny lobes usually 7-9 lobe (Missouri botanical garden 2019). Fall color appears late but is often a red hue. Fruits are acorns which are usually not produced until the tree has reached the age of 25 years of age. Indigenous to Ohio it likes moist locations in bottomlands and lowlands, including sites along streams and lakes, valleys, floodplains and at the edge of swamps. (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, dry to medium moisture, acidic, well-drained soils in full sun. Tolerates a wide range of soil conditions including wet soils. Shade tree, street tree, lawn tree. Does well in a wide range of soils from dry locations to wet ground and low spots (Missouri botanical garden 2019).

Pests and Potential Problems

Generally, a long lived tree, but is susceptible to a large number of potential diseases and insect pests, including anthracnose, canker, leaf spot, rust, blight, galls, caterpillars, borers, leaf miners, oak lace bug and oak mite (Missouri botanical garden 2019). Yellowing of the leaves while the veins remain green, often occurs when soils are not properly acidic. Can be difficult to transplant and establish (Missouri botanical garden 2019).

Attributes	Variables
Height:	40 to 60 feet
Spread:	30 to 40 feet
Bloom Time:	April
Bloom Description:	Greenish
Water:	Dry to medium
Suggested Usage	Shade Tree, Street Tree, Rain Garden
Sun:	Full Sun

Soil:	Dry Soil
Biodiversity:	Birds, Mammals
Stormwater Retention:	High

71. Sassafras

Sassafras albidum

Description

Commonly called Sassafras, is a native, small to medium-sized deciduous tree which occurs in wood margins, fence rows, fields, thickets and roadsides. Shrubby in youth, but matures to a dense, pyramidal tree up to 60 feet tall (Missouri botanical garden 2019). Spreads by root suckers to form large colonies in the wild. All of the trees in a colony may rise from the same parent. Attractive, yellow flowers appear in clusters at the branch ends in spring. Flowers on female trees give way to small pendant clusters of bluish-black berries which are borne in scarlet cup-like receptacles on scarlet stalks (Missouri botanical garden 2019). Fruits mature in September and long leaves in three shapes ovate, mitten-shaped and three lobed are bright green. Excellent yellow, purple and red fall color. Culinary uses have included: sassafras tea (bark), root beer flavoring (root oil) and a gumbo-thickening agent called filé or stem pith (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium, well-drained soil in full sun to part shade. Prefers moist, acidic, loamy soils. Tolerates dry, sandy soils. Large taproot makes transplanting of established trees difficult. If root suckers are not removed, tree will spread and begin to take on the appearance of a large multi-stemmed shrub (Missouri botanical garden 2019). Excellent for screens where they are given lots of space to colonize. (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Leaves may turn yellow while veins remain green in alkaline soils.

Attributes	Variables
Height:	30 to 60 feet

Spread:	25 to 40 feet
Bloom Time:	April to May
Bloom Description:	Greenish-Yellow
Water:	Medium
Suggested Usage	Flowering Tree
Sun:	Full Sun to Part Shade
Soil:	Clay Soil
Biodiversity:	N/A
Stormwater Retention:	High

72. Tulip Tree

Liriodendron tulipifera

Description

Commonly called Tulip Tree or Yellow Poplar, is a large, deciduous tree of eastern North America that typically grows 60 to 90 feet all with a pyramidal to broad conical habit (Missouri botanical garden 2019). Although widely planted throughout the state of Ohio it is indigenous to rich woods. Trunks of mature trees may reach 4-6 feet in diameter, usually rising column-like with an absence of lower branching (Missouri botanical garden 2019). It is named for its cup-shaped, tulip like flowers that bloom in spring. Flowers are yellow with an orange band at the base of each petal. Although the flowers are 2" in length, they can go unnoticed on large trees because the flowers appear after the leaves are fully developed (Missouri botanical garden 2019). Flowers are followed by dry, scaly, oblong, cone-shaped brown fruits, each bearing numerous winged seeds. Four-lobed bright green leaves turn golden yellow in fall. Wood is used for furniture, plywood, boatbuilding, paper pulp and general lumber. Native Americans made dugout canoes from tulip tree trunks (Missouri botanical garden 2019).

Establishment/Management

Best grown in moist, organically rich, well-drained soil in full sun. Tolerates part shade. Very large shade or lawn tree for large landscapes. Generally, not recommended as a street tree (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Watch for aphids and scale. Potential diseases include verticillium wilt, mold, mildew and canker (Missouri botanical garden 2019).

Attributes	Variables
Height:	60 to 90 feet
Spread:	30 to 50 feet
Bloom Time:	May to June
Bloom Description:	Yellow with Orange Band at Petal Bases

Water:	Medium
Suggested Usage	Shade Tree or Flowering Tree
Sun:	Full Sun
Soil:	Clay Soil and Wet Soil
Biodiversity:	Moths
Stormwater Retention:	High

73. Tupelo or Blackgum

Nyssa sylvatica

Description

Commonly called black gum, is a slow growing, deciduous, native tree which occurs in a wide range of soils (Missouri botanical garden 2019). It is primarily a lowland tree found in wet woods, bottomlands and pond areas. Has a straight trunk and rounded crown that typically grows 30 to 50 feet tall, but occasionally gets to 90 feet (Missouri botanical garden 2019). Small white flowers appear in spring on long stalks. Flowers are not showy, and they are an excellent nectar source for bees. Flowers give way to oval, long fruits which are technically edible but sour. Fruits mature to a blue and are attractive to birds and wildlife. Spectacular scarlet fall color. Entire to slightly toothed leaves are dark green above and paler below (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium to wet soils in full sun to part shade. Prefers moist, acidic soils. Tolerates poorly-drained soils and can grow in standing water (Missouri botanical garden 2019). Tolerates some drought at least in the wild. Long taproot precludes moving established trees. Female trees need a male pollinator to set fruit. Great ornamental shade tree for lawns or street tree. Also grows well in moist woodland gardens or low spots subject to periodic flooding or in boggy areas. Slow growing and difficult to transplant (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Some susceptibility to leaf spots, canker, rust, and leaf miner.

Attributes	Variables
Height:	30 to 50 feet
Spread:	20 to 30 feet
Bloom Time:	May to June
Bloom Description:	Greenish White
Water:	Medium to Wet
Suggested Usage	Shade Tree, Street Tree or Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Clay Soil or Wet Soil
Biodiversity:	Bees, Birds
Stormwater Retention:	High

74. Pawpaw

Asimina Triloba

Description

Native small understory tree or large shrub which typically grows 15 to 20 feet tall and occurs in low bottom woods, wooded slopes, ravines and along streams (Missouri botanical garden 2019). Often spreads by root suckers to form colonies. Large, slightly drooping, green leaves retain green color well into fall before turning to a bright yellow (Missouri botanical garden 2019). Cup-shaped, purple flowers appear in spring and give way to edible,yellowish green fruits which mature in early autumn to a brown. A sweet-flavored fruits resembles bananas or mango. Fruits are frequently eaten raw or used in ice creams or pies. Wildlife such as raccoons, squirrels and opossums seek out the fruits and often beat humans to the harvest. Early Americans made a yellow dye from the pulp of the ripened fruit (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium wet, well-drained soil in full sun to part shade. Prefers moist, acidic, fertile soils. Will grow in shade. Good for use in naturalize in a native plant or wild garden or grow in a shrub border or woodland margin. Effective in damp areas along ponds or streams (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems.

Attributes	Variables
Height:	15 to 30 feet
Spread:	15 to 30 feet
Bloom Time:	April to May
Bloom Description:	Purple
Water:	Medium to Wet
Suggested Usage	Rain Garden
Sun:	Full Sun to Part Shade
Soil:	Wet Soil
Biodiversity:	Mammals
Stormwater Retention:	High

EVERGREENS

75. Cedar

Juniperus virginiana

Description

Commonly called Eastern Red Cedar, it typically occurs on limestone bluffs and glades, wood margins, fields, pastures and fence rows throughout the state. It is a broadly conical, sometimes columnar, dense, evergreen conifer with horizontal branching that typically grows to 30 to 65 feet tall (Missouri botanical garden 2019). Gray to reddish bark exfoliates in thin strips on mature trees. Trunks are often fluted at the base. Heartwood is light brown and has a great aromatic and is commonly used for cedar chests. Dark blue green foliage. Foliage may turn brown in winter. Cultivars of this species often retain better foliage color in winter. This is a dioecious species, separate male and female trees. Female trees produce round, blackish berry like cones that ripen in fall the first year. Berry like cones are attractive to many birds (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, dry to moist, well-drained soils in full sun. Tolerates a wide range of soils and growing conditions, from swamps to dry rocky glades. Prefers moist soils but is intolerant of wet soils. It has the best drought resistance of any conifer native to the eastern United States. Good for landscape and large screens. Avoid planting near apple trees, they will kill them (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Cedar apple rust is a common problem for many different junipers. Susceptible to twig blight and scale and watch for bagworms (Missouri botanical garden 2019).

Attributes	Variables
Height:	30 to 65 feet
Spread:	8 to 25 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering

Water:	Dry to Medium
Suggested Usage	Natural Barriers, Open Spaces
Sun:	Full Sun
Soil:	Dry Soil or Shallow-Rocky Soil
Biodiversity:	Birds
Stormwater Retention:	Low

76. Eastern Hemlock

Tsuga canadensis

Description

Commonly called Canadian Hemlock or Eastern Hemlock, is a dense, pyramidal conifer of the pine family that is native to moist woods, moist slopes, rocky hillsides, wooded ravines and stream valleys. It grows to 40 to 75 feet tall in the wild (Missouri botanical garden 2019). This species is known for having the smallest needles and cones in the genus. Flat sprays of lacy evergreen foliage give this tree a graceful form. Short green needles with two white bands beneath are arranged in two opposite rows (Missouri botanical garden 2019). Thick and ridged bark on mature trees is red brown. This is also the state tree of Pennsylvania (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium moisture, well-drained soils in part shade to full shade (Missouri botanical garden 2019). Best in part shade in sheltered locations protected from strong winds and hot afternoon sun. Tolerates full sun in cool northern climates but dislikes the hot and humid summers of the South where sun may damage the foliage when temperatures consistently exceed 95 degrees Fahrenheit (Missouri botanical garden 2019). Intolerant of drought and should be watered regularly in prolonged dry spells, particularly when plants are young (Missouri botanical garden 2019). Appreciates a thick winter mulch. Evergreen conifer that is best for shady areas of the landscape.

Pests and Potential Problems

Potential disease problems for plants in the genus Tusga include needle blight (needles turn yellow and die), canker, rusts and rots (Missouri botanical garden 2019). Potential insect problems include bagworms, borers, leaf miner, saw fly and spider mites. Prolonged drought can be fatal.

Attributes	Variables
Height:	40 to 70 feet
Spread:	25 to 35 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Medium
Suggested Usage	Hedge
Sun:	Part Shade to full shade
Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	High

77. Juniper, Common

Juniperus communis

Description

Commonly called Common Juniper, is a dioecious, needled, evergreen conifer that grows in a variety of different shapes. It is one of the most widespread conifers growing in the world today. It is primarily native to coniferous forests, alpine open areas and plains in a circumpolar distribution which includes sites in Europe, Asia and North America (Missouri botanical garden 2019). Growth habit and form in part depend upon such factors as geographic location, temperature and the amount of exposure to the elements. In the USA Common Juniper is most frequently seen as a shrub or spreading shrubby plant. Prickly, green, needle-like leaves grow in whorls of three. Exfoliating bark is often an attractive reddish-brown. Small yellow spring flowers in April to June, but give way on female plants to spherical, 1/2" diameter seed cones or fruits which are commonly referred to as juniper berries (Missouri botanical garden 2019).

Establishment/Management

Best grown in medium moisture, well-drained soils in full sun. Tolerates a wide range of soils, including very poor or rocky soils. Established plants have good drought tolerance. Plants are particularly noted for their superior tolerance for cold temperatures and superior intolerance for heat and humidity (Missouri botanical garden 2019). Plants will survive in the wild within the Arctic Circle but are not recommended for planting in locations south of USDA Zone 6 (USDA 2002). Evergreen ground cover, shrub or small tree are the best uses for this tree. Use depends in large part upon form and size (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Juniper blight can be a serious problem on many of the different species of juniper. Lesser problems include cedar apple rust and wilt. Insect problems include mites, borers, scale, midges and bagworms (Missouri botanical garden 2019).

Attributes	Variables
Height:	2 to 3 feet
Spread:	1 to 2 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Medium
Suggested Usage	Rock Gardens & Natural Barriers
Sun:	Full Sun
Soil:	Dry Soil or Shallow-Rocky Soil
Biodiversity:	N/A
Stormwater Retention:	Low

78. Mountain Laurel

Kalmia latifolia

Description

Commonly called Mountain Laurel, is a multi-stemmed, broadleaf evergreen shrub or small tree that is native to Eastern North America where it is found in a variety of habitats including open rocky or sandy woods, meadows, mountain slopes and woodland (Missouri botanical garden 2019). It is known for its lovely spring flowers and quality year-round foliage. It typically grows as a dense rounded shrub to 5 to 15 feet tall, opening and developing branches with age (Missouri botanical garden 2019). Mountain laurel will rarely grow as a small tree particularly on slopes in the Appalachian Mountains. Flowers appear in clusters typically covering the shrub in late May to early June for several weeks with a bloom. Each flower is cup shaped with five sides and ranges in color from rose to white with purple markings inside. If not deadheaded, flowers give way to brown fruits that persist into winter. Leathery, glossy evergreen leaves up to 5 inches long are dark green above and yellow green beneath. All parts of this plant are toxic if ingested (Missouri botanical garden 2019).

Establishment/Management

Best grown in cool, moist, acidic, well-drained soils in part shade. Mulch dirt below to retain moisture and keep root zones cool. Plants tolerate a wide range of light conditions from full sun to full shade but are best in part shade. Raised plantings should be considered in order to promote better drainage. Plants do not grow well in heavy clay soils (Missouri botanical garden 2019). Remove spent flower clusters immediately after bloom. Prune lightly after bloom to promote bushy growth. Superior flowering shrub for groups or massing in shrub borders, woodland areas or wild/naturalized areas are the best uses for this plant (Missouri botanical garden 2019).

Pests and Potential Problems

Susceptible to leaf spots and blights. Also susceptible to borers, scale, white fly and lace bugs (Missouri botanical garden 2019).

Attributes	Variables
Height:	5 to 15 feet
Spread:	5 to 15 feet

Bloom Time:	May
Bloom Description:	Rose to White with Purple Markings
Water:	Medium
Suggested Usage	Hedges, Slopes, Natural Barriers
Sun:	Part Shade
Soil:	Acidic, Well-Drained
Biodiversity:	N/A
Stormwater Retention:	Low

79. Eastern White

Pinus strobus

Description

Commonly called Eastern white pine, is a rapid-growing, long-lived, needled evergreen tree that is native to the northeastern United States and Canada (Missouri botanical garden 2019). Is the state tree of Maine and Michigan. Although pyramidal in its early years, it matures to a broad oval habit with an irregular crown and typically grows 50 to 80 feet tall but can grow to 100 feet tall in the wild (Missouri botanical garden 2019). Landscape size and shape can be controlled through pruning. Bluish green needles are soft to the touch and appear in bundles of five. Cylindrical, brown cones are usually not produced until 5 to 10 years of age (Missouri botanical garden 2019). An important timber tree which was and is valued for its lightweight wood.

Establishment/Management

Easily grown in acidic, medium moisture, well-drained soil in full sun. Prefers fertile soils and cool climates. Intolerant of compacted, clayey soils, alkaline conditions and many air pollutants such as sulfur dioxide and ozone (Missouri botanical garden 2019). An excellent tree for lawns or parks. Site in areas with adequate space to accommodate future growth. Maybe planted as a hedge and cut regularly to control growth (Missouri botanical garden 2019).

Pests and Potential Problems

In cool summer locations, white pine can grow quite well. It is, however, susceptible to many insect and disease problems. Blights and rusts are the main diseases, with its most dangerous enemy being white pine blister rust which is a bark disease that is usually fatal (Missouri botanical garden 2019).

Attributes	Variables
Height:	50 to 80 feet
Spread:	20 to 40 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Medium
Suggested Usage	Hedges & Open Spaces
Sun:	Full Sun to Part Shade
Soil:	Acidic, Well-Drained
Biodiversity:	Birds
Stormwater Retention:	Low

80. Yew

Taxus canadensis

Description

Taxus x media is a hybrid designation for many shrubby, often wide-spreading crosses of English yew and Japanese yew (not native to Ohio). These hybrids are known for combining the ornamental excellence of English yew with the winter hardiness of Japanese yew. In appearance, the various hybrid cultivars can vary considerably in size and character (Missouri botanical garden 2019). Height ranges from 2 to 20 feet tall depending on the kind (Missouri botanical garden 2019). Pointed, long to needle-like, olive to green leaves. Bark is scaly brown. Female plants produce red, berry-like fruits instead of cones (Missouri botanical garden 2019). Each fruit has a single seed almost surrounded by a fleshy red aril. All parts of this plant are poisonous if ingested (Missouri botanical garden 2019).

Establishment/Management

Easily grown in average, medium moisture, well-drained soils in full sun to part shade. Tolerates shade and is an excellent evergreen for shady conditions. Prefers moist, sandy soil, but plants have no tolerance for wet conditions which must be avoided. Good soil drainage is essential for this plant. Tolerates urban conditions overall. Best sited in locations protected from cold winter winds. Accepts pruning and shearing well. Pruning is best done in early spring before new growth appears (Missouri botanical garden 2019).

Pests and Potential Problems

No serious insect or disease problems. Susceptible to winter burn, particularly in exposed sites. Root rot may occur in poorly drained soils (Missouri botanical garden 2019).

Attributes	Variables
Height:	30 to 60 feet
Spread:	15 to 25 feet
Bloom Time:	Non-Flowering
Bloom Description:	Non-Flowering
Water:	Medium
Suggested Usage	Hedges, Natural Barriers
Sun:	Full Sun to Part Shade
Soil:	Well-Drained
Biodiversity:	N/A
Stormwater Retention:	Low

AGRICULTURAL COVER CROPS

81. Crimson Clover

Trifolium incarnatum

Description

Crimson clover is a winter annual or summer annual legume nitrogen source, soil builder, erosion prevention, reseeding inter-row ground cover, forage (Sustainable Agriculture Research & Education 2012). Should be mixed with rye and other cereals, vetches, annual ryegrass, sub-clover, red clover, black medic (Sustainable Agriculture Research & Education 2012). With its rapid growth, crimson clover provides early spring nitrogen for full-season crops. Rapid fall growth, or summer growth in cool areas, also makes it a top choice for short rotation as a weed suppressing and green manure. Popular as a staple forage and roadside cover crop, crimson clover is gaining increased recognition as a summer cover in colder regions. Is sometimes used between rows of blueberries and in nut groves. Crimson clover has nice red blossoms. They produce abundant nectar and are visited by various types of bees (Sustainable Agriculture Research & Education 2012).

Establishment/Management

Crimson clover will grow well in any type of well-drained soil, especially sandy. It may do poorly on heavy clay, waterlogged, extremely acid or alkaline soils (Sustainable Agriculture Research & Education 2012). Once established, it thrives in cool, moist conditions. For winter annual use you must seed six to eight weeks before the average date of first frost at 15 to 18 lb (Sustainable Agriculture Research & Education 2012). As with other winter legumes, the ideal date varies with elevation. Don't plant too early or crimson clover will go to seed in the fall and not regrow in spring. Early to mid-August seeding is common in the northern part of crimson clover's winter annual range. For summer annual usage plant as soon as all danger of frost is past. Mowing after early bud stage will kill crimson clover.

Crimson clover is excellent for grazing and haying. It will regrow if grazed or mowed no lower than 3 or 4 inches before the early bud stage (Sustainable Agriculture Research & Education 2012). Timely mowing four to six weeks before bloom improves growth, reduces lodging and will cause more uniform flowering and seed ripening on highly fertile soils (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

Crimson clover is a secondary host to plant pests of the Heliothus species, which include corn earworm and cotton bollworm (Sustainable Agriculture Research & Education 2012).

82. Berseem Clover

Trifolium alexandrinum

Description

Also called Egyptian clover summer annual or winter annual legume suppress weeds, prevent erosion, green manure, chopped forage, grazing (Sustainable Agriculture Research & Education 2012). Should be mixed with oats or ryegrass. A fast-growing summer annual. It's a heavy Nitrogen producer and the least winter hardy of all true annual clovers. Berseem clover draws down soil Nitrogen early in its cycle. Once soil reserves are used up, it can fix 100 to 200 lb. Nitrogen or more (Sustainable Agriculture Research & Education 2012). It establishes well with an oat nurse crop, making it an excellent cover for small grain, corn, soybean rotations in the Midwest. Its tolerance to drought and excess moisture (Sustainable Agriculture Research & Education 2012).

Establishment/Management

Berseem prefers slightly alkaline and silty soils but grows in all soil types except sands. Soil phosphorus can limit berseem clover growth (Sustainable Agriculture Research & Education 2012). Berseem tolerates saline conditions better than other clovers. Broadcast or drill berseem seed alone or with spring grains onto a firm, well-prepared seedbed or closely cropped sod so that it is 1/4-inch deep with a light soil covering (Sustainable Agriculture Research & Education 2012). To improve seed-soil contact and to maintain seed-zone moisture, cultipack or roll soil before and after broadcast seeding (Sustainable Agriculture Research & Education 2012). Dry, loose soil will suppress germination. Recommended seeding rates are 8 to 12 lb./A drilled or 15 to 20 lb./A broadcast (Sustainable Agriculture Research & Education 2012). Excessive rates will create an overly thick stand that prevents tillering and spreading of the root crowns. For Ohio seed after April 15 to avoid crop loss due to a late frost (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

Berseem clover residue incorporated directly into the seed zone may suppress germination and seedling development of onion, carrot and tomato (Sustainable Agriculture Research & Education 2012).

Lygus bugs have been a serious problem in seed production, and virus outbreaks can cause serious damage during wet springs where berseem grows as a winter annual. Is susceptible to crown rot and other root diseases common to forage legume species (Sustainable Agriculture Research & Education 2012). Berseem, like other clovers, shows little resistance to root-knot nematode. It seems to be particularly favored by rabbits for food (Sustainable Agriculture Research & Education 2012).

83. Red Clover

Trifolium pratense

Description

Short-lived perennial or winter annual legume. Is a nitrogen source, soil builder, weed suppressor, and insectary crop. Should be mixed with small grains, sweet clover, corn, soybeans, vegetables, grasses (Sustainable Agriculture Research & Education 2012). Red clover is a dependable, low-cost, readily available workhorse that is winter hardy in much of the USA. Easily overseeded or frost seeded into standing crops adds a moderate amount of Nitrogen, helps to suppress weeds and breaks up heavy soil (Sustainable Agriculture Research & Education 2012). Its most common uses include grazing, seed harvest, plow down Nitrogen and as hay. Well as provide weed suppression and manage Nitrogen (Sustainable Agriculture Research & Education 2012).

Establishment/Management

In spring in cool climates, red clover germinates in about seven days quicker than many legumes, but seedlings develop slowly (Sustainable Agriculture Research & Education 2012). Traditionally it is drilled at 10 to 12 lb./A with spring-sown grains, using auxiliary or “grass seed” drill boxes (Sustainable Agriculture Research & Education 2012). Red clover’s tolerance of shade and its ability to germinate down to 41 degrees Fahrenheit give it a remarkable range of establishment niches. It can be overseeded at 10 to 12 lb (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

If poor establishment or winterkill leads to weed growth that can’t be suppressed with clipping or grazing, evaluate whether the anticipated cover crop benefits warrant weed control (Sustainable Agriculture Research & Education 2012). Root rots and foliar diseases typically kill common medium red clover in its second year, making it function more like a biennial than a perennial (Sustainable Agriculture Research &

Education 2012). Disease-resistant cultivars that persist three to four years cost 20 to 40 cents more per pound (Sustainable Agriculture Research & Education 2012).

84. Subterranean Clovers

Trifolium subterraneum, T. yanninicum, T. brachycalcycinum

Description

Weed and erosion suppressor, nitrogen source, living or dying mulch, continuous orchard floor cover, forage (Sustainable Agriculture Research & Education 2012). Needs to be mixed with other clovers and sub-clovers. Subterranean clovers offer a range of low growing, self-reseeding legumes with high N contribution, excellent weed suppression and strong persistence in orchards and pastures (Sustainable Agriculture Research & Education 2012). Fall-planted sub clovers thrive on moist winters and dry summers on soils of low to moderate fertility, and from moderately acidic to slightly alkaline pH soils(Sustainable Agriculture Research & Education 2012).

Most cultivars require at least 12 inches of growing-season rainfall per year (Sustainable Agriculture Research & Education 2012). A summer dry period limits vegetative growth but increases hard seed tendency that leads to self-reseeding for fall reestablishment. Sub-clovers generally grow close to the ground, piling up their biomass in a compact layer (Sustainable Agriculture Research & Education 2012).

Establishment/Management

Sub-clovers grow best when they are planted in late summer or early autumn and grow until early winter. They go dormant over winter and resume growth in early spring. In late spring, plants flower and seeds mature in a bur at or below the soil surface as the plant dries up and dies (Sustainable Agriculture Research & Education 2012). Will persistence over many seasons justifies the investment in seed and careful establishment. Initial growth will be a little slower than that of crimson, but faster than white clover(Sustainable Agriculture Research & Education 2012). Broadcast at 20-30 lb./A in a firm, weed-free seedbed (Sustainable Agriculture Research & Education 2012). Cover seed with a light, trailing harrow or with other light surface tillage to a depth of less than one-half inch. Add lime if soil is highly acid anything below pH 5.5. Soils low in pH may require supplemental molybdenum for proper growth, and phosphorus and sulfur may also be limiting nutrients (Sustainable Agriculture Research & Education 2012). Sub-clover often is planted with rose clover and crimson clover in orchard mixes. Crimson and sub-clover usually

dominate, but hard-seeded rose clover persists when dry weather kills the other two (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

No serious insect or disease problems.

85. Sweet Clovers

Yellow sweetclover (Melilotus officinalis) and white sweetclover (M. alba)

Description

Sweet clover is a biennial, summer annual or winter annual legume soil builder, fertility source, subsoil aerator, weed suppressor, erosion preventer (Sustainable Agriculture Research & Education 2012). Should be mixed with small grains or red clover. Within a single season on even marginally fertile soils, this tall-growing biennial produces biomass. Given fertile soils and a second season, it lives up to its full potential for nitrogen and organic matter production (Sustainable Agriculture Research & Education 2012). Early in the second year it provides new top growth to protect the soil surface as its roots anchor the soil profile. It is the most drought-tolerant of forage legumes, is quite winter-hardy and can extract from the soil then release phosphorus (Sustainable Agriculture Research & Education 2012).

Biennial yellow sweet clover can produce up to 24 inches of vegetative growth (Sustainable Agriculture Research & Education 2012). During the second year, plants may reach 8 feet tall. Root mass and penetration are greatest at the end of dormancy in early spring. A distinguishing sweet clover feature is bracts of tiny blooms through much of its second year. White biennial sweet clovers are taller, more coarsely stemmed, less drought tolerant (Sustainable Agriculture Research & Education 2012). White types bloom 10 to 14 days later than yellow, but bloom for a longer season. Tall, stemmy cultivars are better for soil improvement overall (Sustainable Agriculture Research & Education 2012).

Establishment/Management

Sweet clover does well in loam soils with near-neutral pH are best. It will not thrive on poorly drained soils. For high yields, sweet clover needs P and K in the medium to high range. Sweet clover produces 50 percent or more hard seed that can lie in soil for 20 years without germinating (Sustainable Agriculture Research & Education 2012). Top growth peaks in late summer as the plant's main taproot continues to grow and thicken. Second-year growth comes from crown buds that form about an inch below the soil surface (Sustainable Agriculture Research & Education 2012). Avoid mowing or grazing of sweet

clover in the six- to seven-week period prior to frost when it is building final winter reserves. Sweet clover establishes well when sown with winter grains in fall, but it can outgrow the grain in a wet season and complicate harvest. Note, flooding will kill the plants (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

Sweet Clover weevil is a major pest in some areas, destroying stands by defoliating newly emerged seedlings (Sustainable Agriculture Research & Education 2012). Cultural practices have not helped change the cycle but planting early with a non-competitive nurse crop gives sweet clover plants the best chance to survive weevil foraging (Sustainable Agriculture Research & Education 2012).

86. White Clover

Trifolium repens

Description

White clover is long-lived perennial or winter annual legume. Can be used as living mulch, erosion protection, green manure, beneficial insect attraction (Sustainable Agriculture Research & Education 2012). They are persistent, widely adapted perennial nitrogen producers with tough stems and a dense shallow root mass that protects soil from erosion and suppresses weeds. Depending on the type, plants grow just 6 to 12 inches tall, but thrive when mowed or grazed (Sustainable Agriculture Research & Education 2012). Once established, they stand up well to heavy field traffic and thrive under cool, moist conditions as well as shade.

Establishment/Management

White clover can tolerate wet soil and short dry spells and survives on medium to acid soils down to pH 5.5 (Sustainable Agriculture Research & Education 2012). It volunteers on a wider range of soils than most legumes but grows better in clay and loam soils than on sandy soils but prefers sandy or medium loam soils. Late-summer seeding must be early enough to give white clover time to become well established, because fall freezing, and thawing can readily heave the small, shallow-rooted plants (Sustainable Agriculture Research & Education 2012). Seeding about 40 days before the first killing frost is usually enough time. Best conditions for summer establishment are humid, cool and shaded overall. Legumes suffer less root damage from frost heaving when they are planted with grasses. Mowing no lower than 2 to 3 inches will keep white clover healthy (Sustainable Agriculture Research & Education 2012). To

safely overwinter white clover, leave 3 to 4 inches to prevent frost damage (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

White clovers are tolerant of nematodes and leaf diseases but are susceptible to root and stolon roots. Leading insect pests are the potato leafhopper, meadow spittlebug, clover leaf weevil, alfalfa weevil and Lygus bug (Sustainable Agriculture Research & Education 2012). Protect against pest problems by selecting resistant cultivars, rotating crops, maintaining soil fertility and employing a cutting schedule (Sustainable Agriculture Research & Education 2012).

87. Woollypod Vetch

Vicia villosa ssp. Dasycarpa

Description

Woollypod vetch is a legume and cool-season annual. Can be used as nitrogen source, weed suppressor, erosion preventer, add organic matter, attract bees. Should be mixed with other legumes and grasses (Sustainable Agriculture Research & Education 2012). Woollypod vetch provide dependable, abundant N and organic matter, as well as excellent weed suppression. Can mow the vetch during winter and in late spring after it reseeds. Some vineyard managers seed woollypod vetch each year with oats or as part of a legume mix (Sustainable Agriculture Research & Education 2012).

Establishment/Management

Woollypod does well on many soil types even poor, sandy soil, and tolerates moderately acidic to moderately alkaline conditions. It's well-adapted to most orchard and vineyard soils. It establishes best in recently tilled, nutrient deficient fields. When seeding 1/2 to 1 inch deep is best, although up to 2 inches will work for early seedings. Planted in early spring, woollypod vetch can provide plowdown N by Memorial Day for a summer annual of the Northeast (Sustainable Agriculture Research & Education 2012). Woollypod vetch can survive freezing conditions for days.

Pests and Potential Problems

Woollypod vetch outcompetes weeds and will quickly resolve most weed problems if seeded at high rates (Sustainable Agriculture Research & Education 2012). Woollypod also provides some allelopathic benefits. Can be a host of Sclerotinia minor, a soilborne pathogen that causes lettuce drop, a fungal disease affecting lettuce, basil and cauliflower crops (Sustainable Agriculture Research & Education 2012).

88. Cereal Rye

Secale cereale

Description

Cereal Rye is a cool season annual cereal grain. Prevent erosion, add organic matter while suppressing weeds. Should be mixed with legumes, grasses or other cereal grains (Sustainable Agriculture Research & Education 2012). The hardiest of cereals, rye can be seeded later in fall than other cover crops. Extensive soil-holding root system, significant reduction of nitrate leaching and weed suppression. Inexpensive and easy to establish (Sustainable Agriculture Research & Education 2012). Likes sandy or acidic soil or can grow on poorly prepared land. Best grown in cool, temperate zones. Taller and quicker growing than wheat, rye can serve as a windbreak and trap snow or hold rainfall over winter (Sustainable Agriculture Research & Education 2012). Pair rye with winter annual legume such as hairy vetch to offset rye's tendency to tie up soil nitrogen in spring is one of the best mixes for this plant (Sustainable Agriculture Research & Education 2012).

Establishment/Management

Rye prefers sandy soils and will germinate even in dry soil. It also will grow in heavy clays and poorly drained soils and can tolerate a lot of water. Rye can establish in very cool weather. It will germinate at temperatures as low as 34 ºF. Seed from late summer to mid fall in Hardiness Zones 3 to 7 and from fall to midwinter in Zones 8 and warmer (Sustainable Agriculture Research & Education 2012). In the Upper Midwest, seed two to eight weeks earlier than a wheat or rye grain crop to ensure maximum fall, winter and spring growth (Sustainable Agriculture Research & Education 2012). Rye is more sensitive to seeding depth than other cereals, so plant no deeper than 2 inches. In a Maryland study, a mix of 42 pounds of rye and 19 pounds of hairy vetch per acre was the optimum fall seeding rate (Sustainable Agriculture Research & Education 2012). Planting with clovers, seed rye at a slightly higher rate, about 56 lb. per acre (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

No serious insect or disease problems.

89. Oats

Avena sativa

Description

Oats are great to suppress weeds, prevent erosion, scavenge excess nutrients, add biomass, nurse crop (Sustainable Agriculture Research & Education 2012). Needs to be mixed with clover, peas, vetch, other legumes or other small grains. If you need a low-cost, reliable fall cover Oats are the best. Oats provide quick, weed-suppressing biomass, take up excess soil nutrients and can improve the productivity of legumes when planted in mixtures. The root system also holds soil during cool-weather, and the ground cover provides a mulch before other crops. An upright, annual grass, oats thrive under cool, moist conditions on well-drained soil. Plants can reach heights in excess of 4 feet (Sustainable Agriculture Research & Education 2012). Oats fare poorly in hot, dry weather.

Establishment/Management

Time seeding to allow at least 6 to 10 weeks of cool-season growth (Sustainable Agriculture Research & Education 2012). Moderately fertile soil gives the best growth. For a winter killed cover, spring oats usually are seeded in late summer or early fall. Broadcasting or overseeding will give the best results for the least cost. Seed at the highest locally recommended rate (probably 3 to 4 bushels per acre) at least 40 to 60 days before your area 's first killing frost (Sustainable Agriculture Research & Education 2012). Adequate moisture for quick germination, the oat stand should provide some soil-protecting, weed-suppressing mulch. Seeded oats, at 2 to 3 bushels per acre 1/2 to 1 inch deep, or 1 1/2 inches when growing grain you plan to harrow for weed control (Sustainable Agriculture Research & Education 2012). Shallow seeding in moist soil provides rapid emergence and reduces incidence of root rot disease (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

No serious insect or disease problems.

90. Buckwheat

Fagopyrum esculentum

Description

Buckwheat is a quick soil cover, weed suppressor, nectar for pollinators and beneficial insects, topsoil loosener, rejuvenator for low-fertility soils (Sustainable Agriculture Research & Education 2012). Best if mix with sorghum-sudangrass hybrids or sunn hemp. Buckwheat is the speedy short season cover crop. It establishes, blooms and reaches maturity in just 70 to 90 days and breaks down quickly (Sustainable Agriculture Research & Education 2012). Buckwheat suppresses weeds and attracts beneficial insects like pollinators with its abundant blossoms such as bees.

Buckwheat thrives in cool, moist conditions but it is not frost tolerant at all. Buckwheat is not drought tolerant. Few cover crops establish as rapidly and as easily as buckwheat. Its rounded pyramid like shaped seeds germinate in just three to five days. That's why it was often the first crop planted on cleared land during the settlement of woodland areas. However, buckwheat does not do well in compacted, droughty or excessively wet soils (Sustainable Agriculture Research & Education 2012).

Establishment/Management

Buckwheat prefers light to medium, well-drained soils that are sandy and silt loams (Sustainable Agriculture Research & Education 2012). It performs poorly on heavy, wet soils or soils with high levels of limestone. Buckwheat grows best in cool, moist conditions, but is not frost-tolerant (Sustainable Agriculture Research & Education 2012). It is also not drought tolerant. Plant buckwheat after all danger of frost. In untilled, minimally tilled or clean-tilled soils, drill 50 to 60 lb./A at 1/2 to 11/2 inches deep in 6 to 8-inch rows (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

No serious insect or disease problems.

91. Barley

Hordeum vulgare

Description

Barley prevent erosion, suppress weeds, scavenge excess nutrients, add organic matter. Needs Mix with an annual legumes, ryegrass or other small grains.

Inexpensive and easy to grow, barley provides erosion control and weed suppression in semi-arid regions and in light soils. It is more salt tolerant than other small grains and can sop up excess subsoil moisture to help prevent saline. It's a good choice for reclaiming overworked, weedy or eroded fields. Barley prefers cool, dry growing areas. As a spring cover crop, it can be grown farther north than any other cereal grain, largely because of its short growing period (Sustainable Agriculture Research & Education 2012).

Establishment/Management

It grows best in well-drained, fertile loams or light, clay soils in areas having cool, dry, mild winters (Sustainable Agriculture Research & Education 2012). It also does well on light, droughty soils and tolerates somewhat alkaline soils. Many are well-adapted to high altitudes and cold, short growing seasons.

For a spring annual crop drill at 50 to 100 lb./A (1 to 2 bushels) from 3/4 to 2 inches deep into a prepared seedbed (Sustainable Agriculture Research & Education 2012). Barley can be used as a winter annual cover crop. It is less winter-hardy than rye. Plantings before Nov. 1 generally fare best, largely due to warmer soil conditions(Sustainable Agriculture Research & Education 2012). Barley works well in mixtures with other grasses or legumes.

Pests and Potential Problems

Cutworms and other small grain pests can be occasional problems.

92. Hairy Vetch

Vicia villosa

Description

Hairy Vetch is a winter annual or summer annual legume. Is great at nitrogen source, weed suppressor, topsoil conditioner, reduce erosion(Sustainable Agriculture Research & Education 2012). Should be mixed with small grains, field peas, bell beans, crimson clover, buckwheat. Hairy vetch is a top nitrogen provider in temperate and subtropical regions (Sustainable Agriculture Research & Education 2012). The cover grows slowly in fall, but root development continues over winter. Growth quickens in spring, when hairy vetch becomes a sprawling vine up to 12 feet long (Sustainable Agriculture Research & Education 2012). Field height rarely exceeds 3 feet unless the vetch is supported by another crop. Its abundant, viney biomass can be a benefit and a challenge (Sustainable Agriculture Research & Education 2012).

Establishment/Management

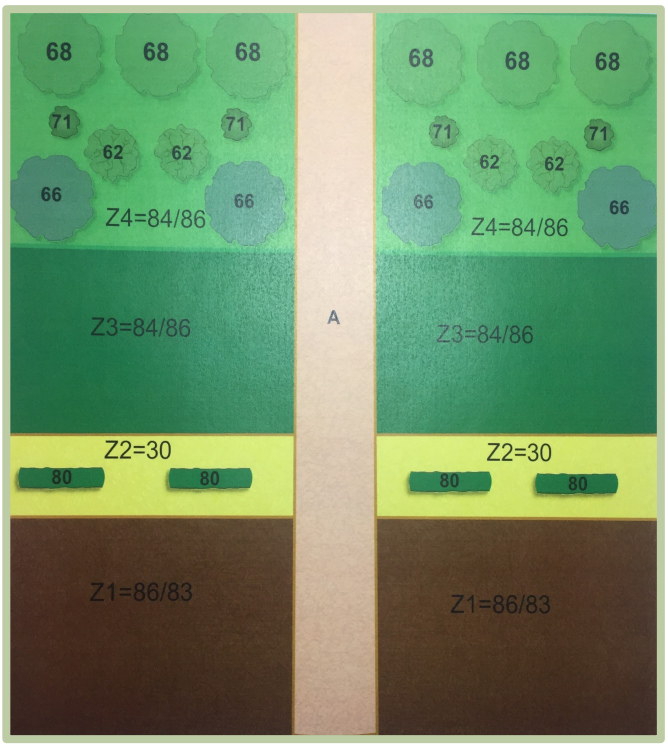
Hairy vetch likes dry conditions often reduce germination of hairy vetch. Select a higher rate if you are seeding in spring, late in the fall, or into a weedy or sloped field. Irrigation would help germination. Plant vetch 30 to 45 days before killing frost for winter annual management; in early spring for summer growth; or in July if you want to kill (Sustainable Agriculture Research & Education 2012). Seed vetch/rye mixtures, at 15-25 lb. hairy vetch with 40-70 lb. rye/A (Sustainable Agriculture Research & Education 2012).

Pests and Potential Problems

Soybean cyst nematode and root-knot nematode sometimes increase under hairy vetch (Sustainable Agriculture Research & Education 2012).

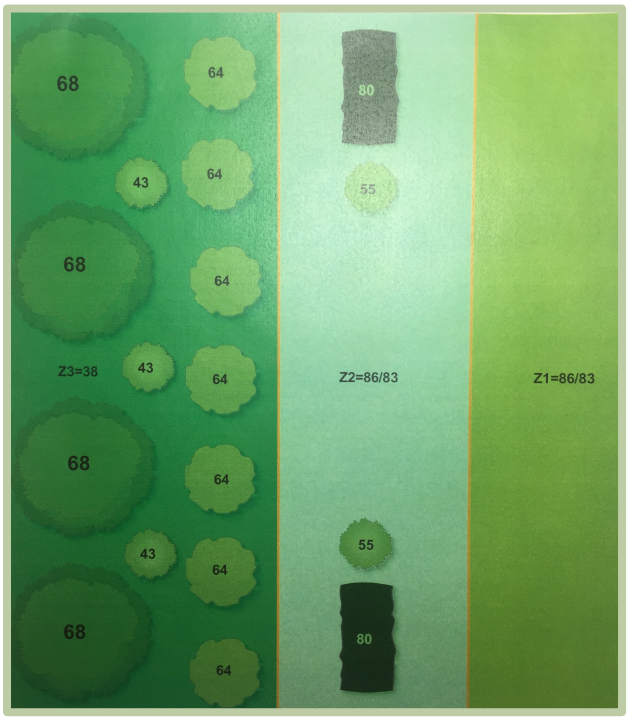
LANDSCAPE LAYOUT AND DESIGN

Design A



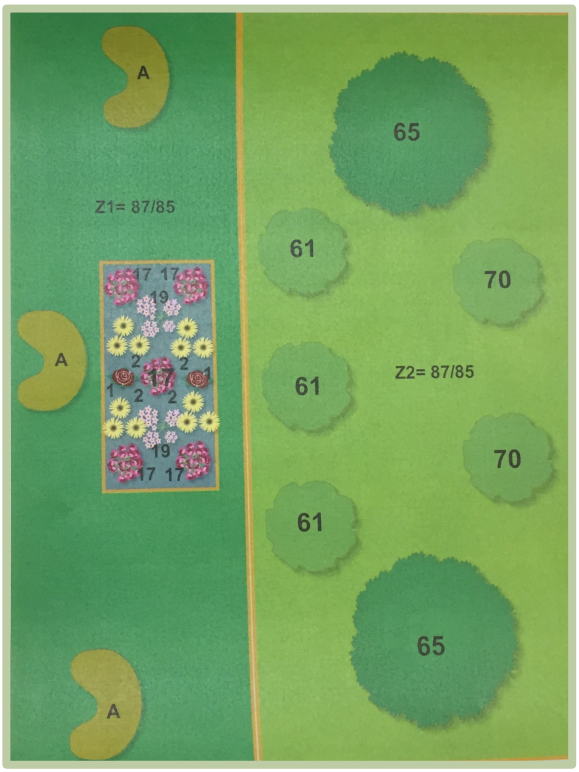
This design is influenced by an English garden. Throughout the British Isles strong hardy bushes and shrubs are used as natural barriers to layout boundary lines. In zone 3 and 4 you will see Subterranean Clover (84) and mixed with White Clover (86) as the groundcover, with zone 4 containing larger trees and shrubs. In zone three has just a general groundcover going up against zone 2. Under natural barrier you will see violets (30) as a ground covering up to the barrier. They are shade tolerant and will grow well as a ground cover. The natural barrier itself is yew (80), a traditionally used evergreen shrub that, whenever pruned into shape, acts as a solid border. You can allow taller native plant species to grow behind while still having the site looked clean and organized. Letter A represents a pebble path or mowed strip to go through the center of the site. The strip should be 5 feet wide and run the length of the site.

Design B



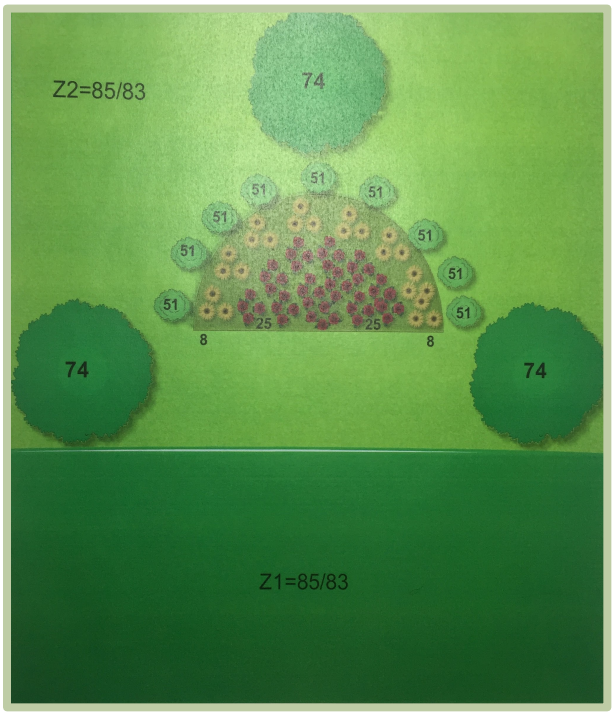
For design B there are three zones within this layout. Zone one and zone two will be covered with a mix of Red Clover (83) and White Clover (86). For zone three the groundcover will be Wood Fern (38), which does well underneath trees and bushes. This design shows partial reforestation. With larger trees and bushes located in zone three are to be a mixture of large trees bushes in order to fill in the understory just like a natural forest. The main large tree that will be used in this effort is a Red Oak (68) alongside Ohio Buckeye (62) and Cucumber tree (63). Smaller trees and shrubs to fill in under the larger trees will be Red Maple (65) and Bayberry (43). For zone two and there is more ground cover with Spicebush (51) and Hawthorne (55) on sides of design. Zone one will only be ground cover that will need some maintenance.

Design C



Design C is focused on stormwater retention. Throughout the design you will see bioswales represented by a A symbol. Bioswales are small indentations in the ground to filter stormwater much like a natural wetland would. Between the bioswales you will find a rain garden represented by the symbol with a mixture of rain garden flowers from New England Aster (1) to Obedient plant (17) mixed with many other great perennials. Will need to be some sloping work in order to direct stormwater. Will vary with each site's location. Rain garden and bioswales can be found in zone one. Zone one and two are covered by Sweet Clover (85) Mixed with Woollpod Vetch (87). In zone two will be large or small trees that are known for their water retention qualities such as Birch (61), Red maple (65), and Shumard Oak (70).

Design D

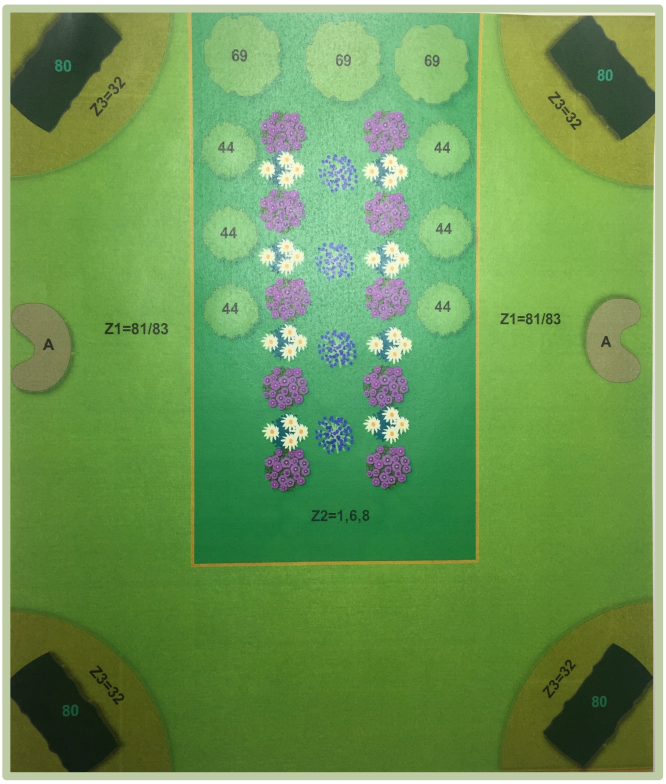


Design D is a small arch pollinator garden surrounded by Paw Paw trees (74) that are beneficial to pollinators as well. Around the back of the pollinator garden you will see Spicebush, which is a native bush that is also very beneficial to pollinators and birds. Two species of flowers used in this pollinator garden are Black Eyed Susans (8) and wild Geranium (25). These two plants grow well together. Black Eyed Susans should be put behind because they are much taller than Geranium, which does well in shaded areas so it will not be bothered by the size of the Black Eyed Susans. For both zone one and two the ground cover will be Sweet Clover (85) mixed with Red Clover (83).

Design E

This design is inspired by an English garden. On the corners of layout you will see evergreen shrub Yew (80). These evergreens can be shaped into many different forms by pruning. They are very hardy bushes that can take extreme cold weather and very humid summers. In the center of this design you will see a diamond shaped layout for wildflowers. The wildflowers on display are Jerusalem Artichoke (3), Fox gloves (2), Common Milkweed (6), Compass Plant (7), Cardinal Flower (10), and New England Asters (1). The ground cover for zone one is a mixture of Red Clover (83) with Crimson Clover (81). Both turn a beautiful red whenever they bloom. When the Crimson Clover dies away it will let red clover show through in the late season. Around the Yew in zone two you will find May apple (26) which is a good ground cover along hedges because it's quite tolerant of shade.

Design F

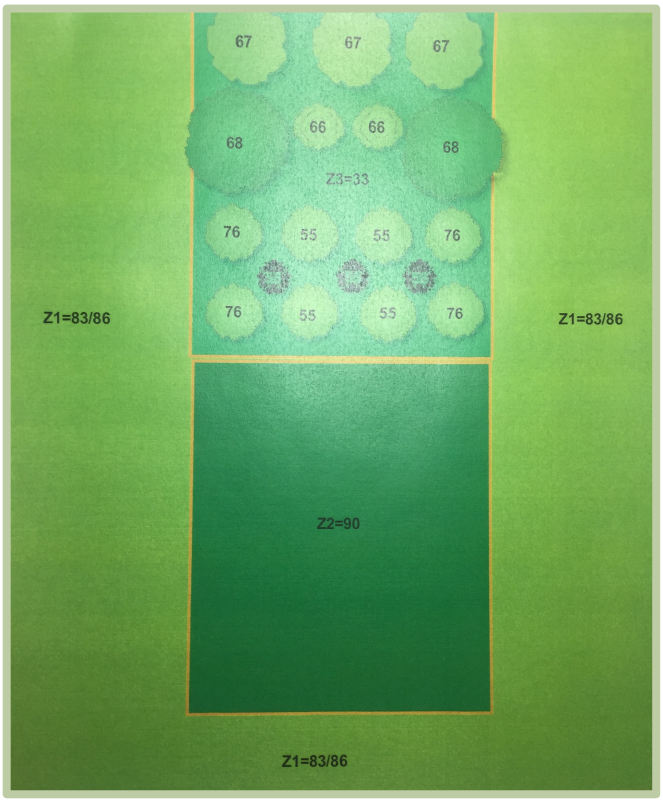


Design F is a mixture of English garden in stormwater retention area. Each corner you will see a natural barrier using Yew (80) This will be stepped into the property by 5 feet to keep it away from neighboring properties. For this example, the shrubs should be shaped into a rectangle. Pruning twice a year in the first year and second, will drop to once a year after that. Zone three around the hedge should have a groundcover of foam flower (32) that grows very well in the shade of hedges. Represented by the letter A are two bioswales on each side of zone one. This benefits the plants overall because it holds onto water distributed throughout the property after a storm event. Zone one will have a groundcover of Crimson Clover (81) mixed with Red Clover (83). In zone two is a mix of wildflowers in the center: New England Asters (1), Common Milkweed (6), and Black Eyed Susans (8). Around the perimeter of zone two you will find Buttonbush (44) along the wildflowers with the back of the property having Scarlet Oaks (69) which will grow to be quite tall when they reach full maturity.

Design G

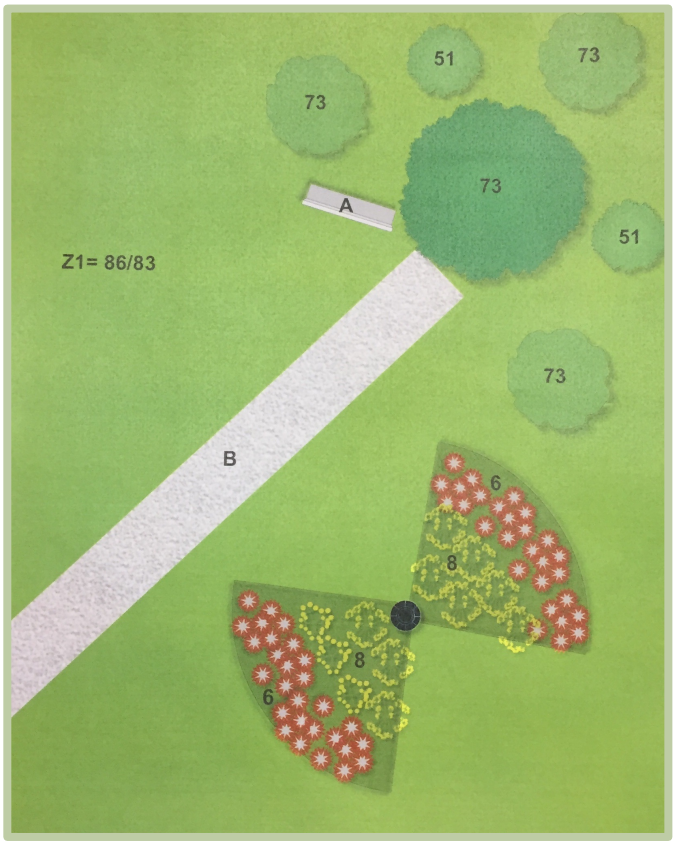
Design G demonstrates a prairie wildflower mix in the center of the design. Zone two contains New England Asters (1), Common Milkweed (6), Compass plant (7), Butterfly weed (9), Ironweed (13), Joe pye weed (14), Meadow Rue (15), and Queen of the Prairie (19) for the mix of prairie wildflowers. Zone one which will have a groundcover of Red Clover (83) and Sweet Clover (85). All plants in this design are great supporters of native pollinators. For zone two there will be no mowing maintenance. For zone one there will be some mowing maintenance even though it will be much lower frequency than grass maintenance.

Design H

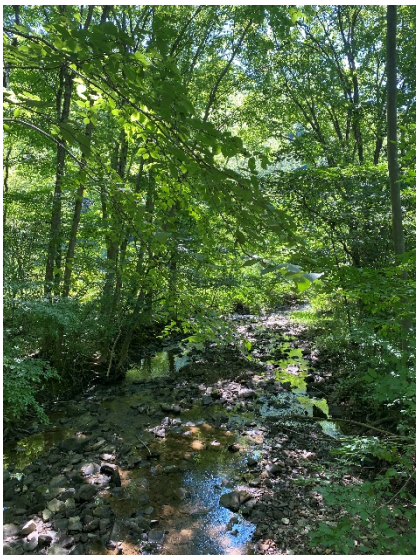


Design H shows a property transformed partially back into forest land. Zone three holds all of the trees and shrubs in this design. This can be added onto if organization wants to expand forest land on a property. This would be the first step in reforesting an area. For groundcover in the zone the suggestion is wild Ginger that grows very well under the forest canopy. For the trees on the back of the property, use tall Burr Oak (67) on the sides stepping forward in the property Red Oaks (68) with a line mixed with Eastern Hemlock (76) Hawthorne (55) Serviceberry (58) and Sugar Maples (66) to fill in the understory. Zone two will use an agricultural groundcover of buckwheat (90) which will help with soil restoration on the land so trees and shrubs can be planted later. Zone one will need a small amount of mowing and trimming. The groundcover is a mix of Red Clover (83) and White Clover (86), which will stay relatively short.

Design I



This design is an interactive pollinator garden with a walking path (B) going down through the middle to a grove of trees with a bench (A). On one side of the path there is a pollinator garden that is displayed with signage and art for design. This is intended for people to walk through and learn about native pollinating plants. The tree grove is made up of Gray Dogwood (46) and Spicebush (51) that also supports pollinators. The bench will be located under a Tupelo (73) tree, which grows to be quite large. The ground cover for zone one is White Clover (86) mixed with Red Clover (83).



RECOMMENDATIONS

1. Ecosystem Design

Ecosystem design takes into consideration all the natural systems to keep its environment healthy. This is in complete contrast to modern landscaping practices. Ecosystem design looks at regulating local climate by use of plants and trees. Also, it uses the plants to help with cleaning of water, air and soil. Trees and plants are also excellent at controlling and regulating water supply within an environment by retaining water. Plants are also excellent at controlling erosion. Native plants are best for erosion control because their roots tend to be longer and adapt to local soils. Plants also provide a refuge and food for local animal species. They can help to break down and treat waste within a region. They provide economic value, such as trees after being harvested as timber, human health and well-being benefits by taking in pollutants and helping with mental and emotional health. They are also a great opportunity for cultural enrichment and education. Ecosystem design takes into consideration a whole system, not just one part.

Link:
https://www.ecolandscaping.org/07/designing-ecological-landscapes/landscape-design/changing-the-conversation-on-ecological-design/

2. Civic-Ecology and Place Making

According to Cornell, civil ecology practices such as stream restoration, tree planting, litter clean up, urban restoration, construction of bioswales and gardening give rise to the definition of civil ecology that is described as the study of the individual, community and environmental outcomes of these practices and their roles in government and ecosystem of a region. There are 10 principles of civil ecology: 1) civil ecology practices emerge in broken places; 2) re-creating and reclaiming of broken places; 3) re-creating community; 4) draws on social memory to recreate place and community; 5) civil ecology practices promote ecosystem services; 6) civil ecology practice fosters well-being; 7) civil ecology provides opportunity for learning; 8) starts out at the local level and expands to encompass multiple partners; 9) practices are in embedded in cycles of renewal which in turn helps with social, economic and ecological systems; and 10) policymakers have a role to play in growing civil ecology practices within their community. Youngstown is the perfect fit for a civil ecology movement. This guide was created to start using native plants for beautification and ecosystem services purposes. This correlates with making because you are giving back to the community by giving back native identity through plants, and by holding up community through elements such as the Ohio buckeye tree, which helps to build a community identity and become sources of personal pride. There is a link to the full report from Cornell's 10 principles of civil ecology listed in the reference section of this guide.

Links:
https://www.civicecology.org/
https://civeco.files.wordpress.com/2015/12/krasny_snyder_mooc_stories_2016.pdf

3. Greenhouse for Native Plant Development

In order to provide native plants for site design, the organization may consider constructing a greenhouse. My suggestion for the most sustainable greenhouse for northern Ohio is the Geo-Dome design that is used often in Canada and Colorado. It is very durable and can deal with harsh winter climate and short growing season. Its shape and design makes it more energy efficient, and it is made 100% from renewable materials. It can be controlled by solar energy and is resistant to high winds, snow and hail. These dome greenhouses are made from polycarbonate panels that allows 65% of light transmission while protecting plants from UV rays. This material is also more adorable than glass and will last longer. These come in many different sizes and models for the uses by a nonprofit organization A medium size which is an 18-foot diameter greenhouse kit 250 ft.² would be around $10,000. For a larger model that is 26 feet in diameter and 550 ft.² would

be $18,000. Either one of these models and sizes would be a good fit for starting native plants and will fit very comfortably on any vacant property. There are companies located in Toronto and also in Colorado. Quotes came from Growing Spaces in Pagoda Springs, CO. There is a link on the reference page to the company's website.

RESOURCES

Below is a list of grant resources that are available to your organization. This is just a reference to what is available. Over time funding may change.

1. **Community Investment Grant - Wean Foundation**
   Link to grant's website: https://rjweanfdn.org/grantmaking/community-investment-grants/.

2. **Community Services Block Grant (Office of the Administration for Children and Families)**
   The Community Services Block Grant (CSBG) provides funds to alleviate the causes and conditions of poverty in communities. This grant is by the Office of the Administration for Children and Families. Link to grant's website: https://www.acf.hhs.gov/ocs/programs/csbg/about.

3. **Recreational Trails Program (ODNR)**
   For development of urban trail linkages, trailhead and trailside facilities; maintenance of existing trails; restoration of trail areas damaged by usage; improving access for people with disabilities; acquisition of easements and property; development and construction of new trails; purchase and lease of recreational trail construction and maintenance equipment; environment and safety

education programs related to trails. Link to grant's website: http://realestate.ohiodnr.gov/outdoor-recreation-facility-grants.

4. **Five Star and Urban Waters Restoration Grant Program (National Fish and Wildlife Fund)**
   The Five Star and Urban Waters Restoration Program seeks to develop nation-wide-community stewardship of local natural resources, preserving these resources for future generations and enhancing habitat for local wildlife. Projects seek to address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff and degraded shorelines caused by development. Link to grant's website: https://www.nfwf.org/fivestar/Pages/home.aspx.

5. **Central Appalachia Habitat Stewardship Program (National Fish and Wildlife Fund)**
   The Central Appalachia Habitat Stewardship Program restores and sustains healthy forests, rivers and streams that provide habitat for diverse native bird and aquatic populations. The program supports projects in portions of the Appalachian regions of Maryland, New York, Ohio, Pennsylvania, Virginia and West Virginia. Link to grant's website: https://www.nfwf.org/centralapps/Pages/home.aspx.

6. **INCREASE CREATIVE CAPACITY TO SHAPE HEALTHIER NEIGHBORHOODS (Kresge Foundation)**
   The Arts & Culture Program will accept letters of inquiry for Creative Placemaking activities in neighborhoods and Field Building initiatives that seek to position culture and creativity as drivers of more just communities. Link to grant's website: https://kresge.org/programs/arts-culture/increase-creative-capacity-shape-healthier-neighborhoods.

7. **Placemaking Program & Grant (REALTOR Association)**
   The Placemaking Grant funds the creation of new public spaces and destinations in a community. The grant focuses on "lighter, cheaper, quicker" placemaking projects, which can be built under a year. Link to grant's website: https://www.nar.realtor/grants/placemaking-grant.

8. **Underrepresented Community Grants (The National Park Service)**
   The National Park Service's Underrepresented Community Grant Program (URC) works towards

diversifying the nominations submitted to the National Register of Historic Places. URC grants are funded by the Historic Preservation Fund (HPF) and are administered by the NPS. Projects include surveys and inventories of historic properties associated with communities underrepresented in the National Register, as well as the development of nominations to the National Register for specific sites. Grants are awarded through a competitive process and do not require non-Federal match. Eligible applicants are limited to State Historic Preservation offices, Federally Recognized Tribes, Alaska Natives, Native Hawaiian Organizations and Certified Local Governments. Link to grant's website: https://www.nps.gov/preservation-grants/community-grants.html.

9. **Native Plant Society of Northeastern Ohio**

   The Native Plant Society provides financial support for the work of others who pursue the mission of our Society in research, conservation, or education. Each grant is $500. A founding member and first president, Ann Malmquist established an endowment that funds the grants awarded. Application deadline dates are announced annually. Link to grant's website: https://nativeplantsocietyneo.squarespace.com/annual-grant-program.

10. **Seed A Legacy Pollinator Habitat Program**

    The Seed A Legacy Pollinator Habitat Program works with private, public and corporate landowners and managers to establish high-quality pollinator habitat to improve the health of honeybees, monarch butterflies and other pollinators in a 12-state region of the Midwest and Great Plains. Link to grant's website: https://beeandbutterflyfund.org/habitat-programs/seed-a-legacy-program/ohio-application.

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