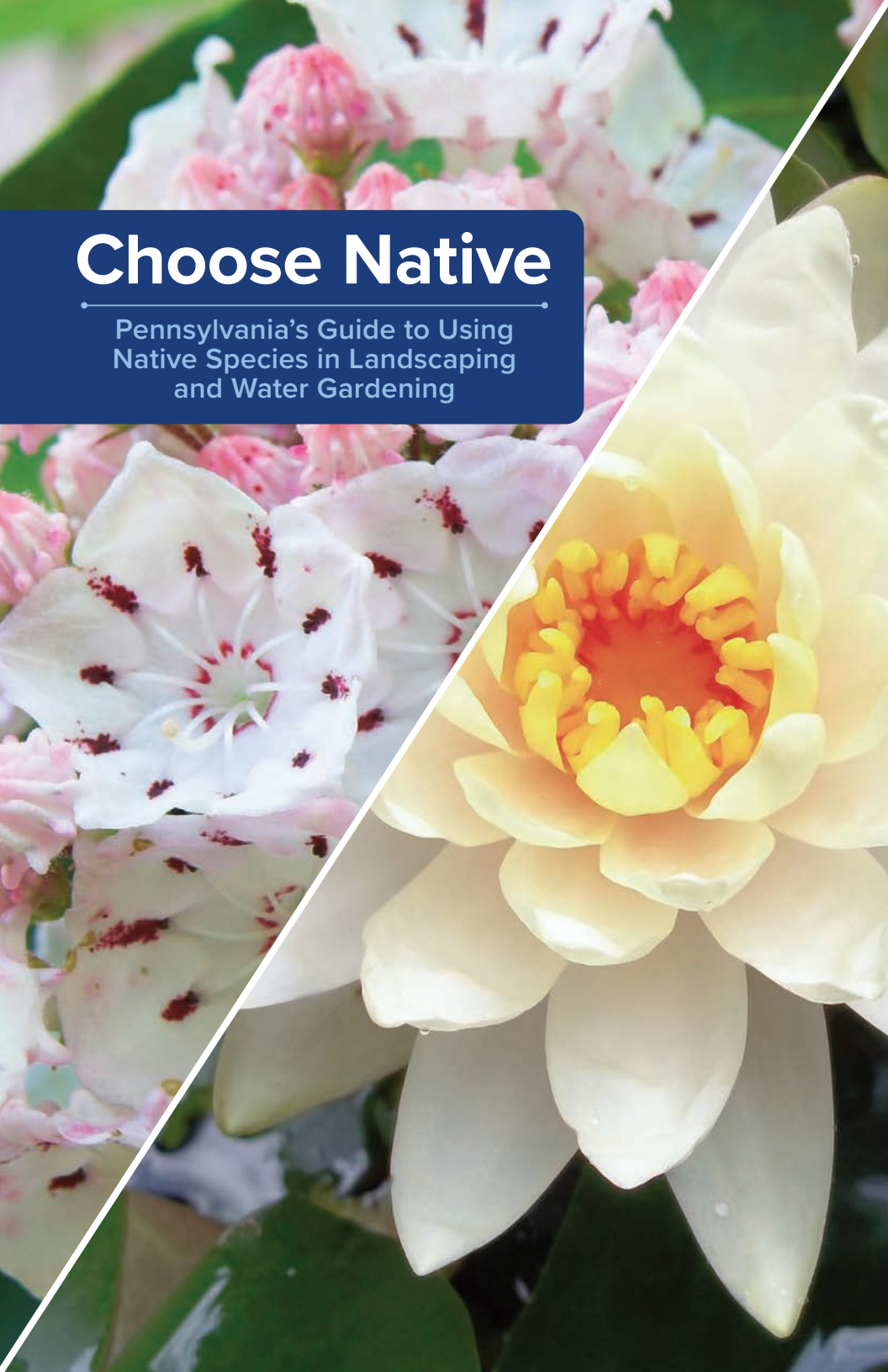

# Choose Native

## Pennsylvania's Guide to Using Native Species in Landscaping and Water Gardening

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**This guide is also available in Spanish. However, please note that due to linguistic differences of the Spanish language, the species list may not follow the English alphabetical order.**

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# Choose Native

## Pennsylvania's Guide to Using Native Species in Landscaping and Water Gardening

## Table of Contents



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## Using the Choose Native Guide

This guide serves as a portable resource to assist professional landscapers, homeowners, and garden enthusiasts in selecting native species over non-native, ornamental, or even invasive species for landscaping, gardens, and water gardens.

Whether constructing a garden from scratch, converting an existing garden, or completely transforming an unwieldy non-native area into a native garden, choosing the right native species for the space is a critical step. Incorporating native species will benefit wildlife while also providing the visual appeal that every gardener desires.

This guide profiles non-native species commonly found at garden centers in Pennsylvania and nearby states. For each non-native species, there are generally two native alternatives featured. These native species are considered 'top picks' by the Choose Native team, meaning that they are the best native replacement in terms of size, color, performance, and other factors.

To help you choose the right native species for the right space, each native species description includes details such as the growth height, soil and sun requirements, hardiness zones, and tolerances. In some cases, the descriptions also include unfavorable or challenging aspects to consider, such as plant spread, or even the potential harm to humans or animals.

Thank you for choosing native!

Common Milkweed (*Asclepias syriaca L.*)



# Choose Native

Welcome to *Choose Native*. This guide is the result of a collaborative effort between Pennsylvania Sea Grant and Penn State Extension to help consumers find native alternatives to common ornamental, non-native, or even invasive species that are commonly used for landscaping and water gardening.

Funding was provided by the Richard King Mellon Foundation and the Great Lakes Commission.

## Why Choose Native?

Native species are declining across the world at an alarming rate due to habitat fragmentation, pollution, invasive species introductions, and much more.

Using native species in landscaping and water gardening helps to diversify the ecosystem, provide habitat, food, and resources critically needed by native insects, birds, small mammals, pollinators, and other wildlife.

Since the colonial era, there has been a long tradition of introducing non-native, exotic plants into landscapes. Many of these are horticultural creations with highly manipulated characteristics that focus on appearance and novelty, rather than function. They are often not well-adapted to local conditions and do not play a healthy role in regional ecology. Non-native plants have limited ecological functions and contribute to habitat degradation because they fail to provide necessary support to the interconnected network of native species, from essential microbial life to beneficial insects, birds, and wildlife.

Native plants, or plants that have developed regionally without human intervention, have evolved to be well-adapted to local conditions. The genetic variability of naturally propagated seed-grown native plants often makes them more resilient and survivable in unfavorable conditions, such as extreme heat or cold, disease, or pest pressure. They also tend to have a deeper, more diverse root architecture which not only helps stabilize soils and trap stormwater and runoff pollutants, but also contributes to survivability during drought.

Most importantly, native plants have co-evolved with other Pennsylvania native species and provide nourishing food, appropriate nesting sites, and other ecosystem functions that support life. Large and small-scale habitat destruction and fragmentation has resulted in significant declines in native species of all types. Choosing native species in your garden helps buffer against changing climate and plummeting biodiversity.




Butterfly Weed
(*Asclepias tuberosa*)

Integrating more native plants into existing landscapes and water gardens starts by considering more than just blooms. Native plants should be selected for not just beauty, but also for the benefits they contribute to site conditions and increased ecological functions. This includes providing year-round cover to the soil, offering multiple types of nectar and seeds at different times of the year, capturing pollutants, improving soil infiltration, providing nesting materials, creating sheltered spaces, increasing genetic diversity, and more. Native plants can easily be added to containers, currently unplanted spaces, or used to replace areas of low ecological value, such as portions of existing lawn or annual beds.

## Tips for Landscaping with Native Plants

The most important first step is to assess the existing property to note what plants are currently in the landscape and the percentage of native, non-native, and invasive plants. Begin with trees and shrubs, because they play a large role in ecosystems, are longer-lived, and have a greater impact on surrounding plants.


Green Hawthorn
(*Crataegus viridis*)

Completing this process will help prioritize the addition of beneficial new plants and identify those to remove immediately, and over time. Targeting non-native plants for removal is critical but may need to be done in stages to allow time for replacements to grow and provide habitat. Ideally, for ecosystem function, aim for a minimum of 70% native plants (including turf/lawn areas). Keep in mind that no turf grasses are native to any part of North America. That doesn't mean there is no place for lawn in the home landscape, but if included, turf should be limited to areas where it is functionally useful, such as gathering spaces, play areas for children, or outdoor space for pets.

A monarch butterfly enjoying a native pollinator garden.

Observe and take note of the site conditions of the property and planting areas, including existing vegetation, amount and direction of sunlight, wind impacts, slope, drainage, and soil properties. For significantly different areas of the property, have the soil tested for fertility. Note any goals for the plantings, such as attracting specific types of wildlife or providing visual interest. Consider primary issues such as erosion, challenging soils, or water management. Become familiar with local ordinances before making significant changes to the landscape to ensure that new plants are maintained to meet community standards.

## Planting Plan

Once a site assessment has been completed, begin to create a planting plan. Use plant lists and other resources, like this guide, to inform decisions. Consider plant communities and functionality, as well as clustering plants to facilitate wildlife benefits. Also, pay attention to site conditions and plant sizes, such as locating taller plants in the center or rear and shorter plants toward the front or outer edges, to improve the visual appeal of the landscape. A drawing may help with this visualization prior to planting.



## Management Practices

It's important to create a management plan to help ensure the new landscape looks its best and meets your goals. A good management plan will serve as a reminder to regularly observe the garden and remove any invasive species that might return.

Cardinal Flower (*Lobelia cardinalis*)

While fertilizing and mowing will likely no longer be required, weedy competitors, especially invasive plants, will need to be removed periodically. Selectively trim or cut back plants and paths to maintain a neat appearance, particularly in highly visible areas.

Additionally, expect native plantings to change over time. Unlike many popular nursery plants created by cloning to ensure sterile and genetically identical seedlings, native plants will have some natural variation and may also multiply and move to new areas where site conditions are favorable. Some plants will naturally appear or disappear over time, and shorter-lived plants, such as the cardinal flower (*Lobelia cardinalis*), may need to be replanted. This provides an opportunity to redesign and modify the planting plan, learn from, and enjoy the changing landscape.

Management tips including strategies for planting, pruning, and cutting back are included in the beginning of each section, *Woody Terrestrials*, *Terrestrial Forbes*, and *Aquatics*.

Use the chart on the following pages as a general management plan, keeping in mind that local conditions and plant species may vary, which may alter timing for maintenance. Please consult local experts to make sure tasks are done at the correct time of year.

| TASK AND/OR INSPECTION | DORMANT SEASON | | | LATE WINTER/EARLY SPRING | | |
|---|---|---|---|---|---|---|
| | Nov | Dec | Jan | Feb | Mar | Apr |
| Cut Back Grasses | | | | X | X | |
| Cut Back Perennials | | | | X | X | |
| Edging | | | | | X | |
| Leaf removal[1] | | | | | X | |
| Monitoring[2] | X | X | | | X | X |
| Mowing | | | | | | |
| Mulching[3] | | | | | | X |
| Plant Perennials | | | | | | |
| Shrub Planting | X | | | | | |
| Shrub Pruning[4] | | | | X | X | X |
| Soil Testing | | | | | | X |
| Splitting Perennials[5] | | | | | | |
| Tree Inspection | | | X | | | X |
| Tree Planting | X | | | | | |
| Tree Pruning | | X | X | | | |
| Watering[6] | | | | | | |
| Weeding[7] | | | | | | X |

[1] Remove leaves as needed.

[2] Check for weeds and mulch conditions.

[3] Use shredded pine or hardwood mulch and keep away from shrub and tree trunks.

[4] Prune dead or broken branches; pruning for aesthetics can vary by species.

[5] Splitting time can vary by species.

[6] Water as needed, under drought, or very hot conditions. For new plantings, water frequently for the first several weeks while they establish if the area receives less than 1" of rain per week.

[7] Weed as needed – ideally every two weeks.



| GROWING SEASON | | | PLANT MATURITY SEASON | | |
|---|---|---|---|---|---|
| May | Jun | Jul | Aug | Sep | Oct |
| | | | | | |
| | | | | | |
| | | | X | | |
| | | | | | |
| X | X | X | X | X | X |
| | X | X | X | X | X |
| | | | | | |
| | | X | X | X | |
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| | | X | | | X |
| | | | | | X |
| | | | | | |
| | | | | | |
| X | X | X | X | X | X |

Chart adapted from the 2017 Chesapeake Bay Landscape Professional (CBLP) Manual. Consider taking the CBLP Level 1 training for a more in depth understanding.

Aromatic Aster (*Aster oblongifolius*)

## Purchasing Tips

**Seed Packets:** If buying a wildflower mix, check to see if it contains species that are native to the Northeastern or Mid-Atlantic regions. Many wildflower mixes contain non-native annual species. When the words wildflower or native are used, they should be followed by a geographic range.

**Plant Names:** Common names, and even scientific ones, can vary between nursery and garden centers. Multiple common names for one plant can be used within the industry and between plant enthusiasts. When scientific names change, it may take several years for nurseries to adopt the updated names. When looking for a specific plant, do a little research ahead of time to see what other names it might be listed under.

**Be Aware:** When adding plants or animals to a landscape or water garden, be aware of State and Federal Noxious Weeds Lists and the Banned Species List. These lists are updated by regulatory agencies and all plants and animals listed are illegal to propagate, sell, and transport. Note that some species on noxious weeds lists are given a grace period of sale to phase them out of market.



### Plant Hardiness Zone Map

Maintained by the U.S. Department of Agriculture
https://planthardiness.ars.usda.gov/

### Pennsylvania Noxious Weeds List

Maintained by the Pennsylvania Department of Agriculture (PDA) https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/NIPPP/Pages/Controlled-Plant-Noxious-Weed.aspx

### Pennsylvania Banned Species List

Maintained by the Pennsylvania Fish and Boat Commission (PAFBC)
https://www.fishandboat.com/Conservation/AIS/Pages/default.aspx

### Federal Noxious Weeds List

Maintained by the United States Department of Agriculture (USDA)
https://www.aphis.usda.gov/plant-pests-diseases/noxious-weeds

# Woody Terrestrials

Mountain Laurel (*Kalmia latifolia*)

Red Maple (*Acer rubrum*)

# Trees & Shrubs

**Consider the planting location's slope, soil type, hardiness zone, exposure, amount of light, soil compaction, drainage, space, and nutrient availability. Also consider the maximum height and width of the new addition to ensure it will not conflict with existing structures or other trees or shrubs. Remember to choose the right tree for the right space and the right space for the new tree!**

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**Planting:** The best time to plant trees and shrubs is spring and late fall. Planting should occur as soon as possible after purchase. The width of the planting hole should be twice the width of the root ball, and the depth should be no deeper than the root ball. Break up the hardened soil on the root ball by scraping it with a hand rake or your fingers. Position it in the hole so that the surface of the root ball is at or just above the surrounding surface of the ground. Refill the excess soil into the sides of the hole and tamp it down lightly to avoid creating air pockets. Once backfilled, rake the soil surface to make it even. Finish the planting with a three-inch layer of compost mulch if available. However, be sure to keep mulch away from the trunk as it may cause decay or impact the roots. To do this, create a 'mulch donut' around the trunk. Staking may be required if the tree does not remain stable. Be sure to water the new tree or shrub after planting and throughout the first growing season, especially during warm weather and dry conditions.



**Pruning:** Pruning is a common practice that alters the growth and appearance of trees and shrubs. Pruning can help promote plant health in the early stages by preventing insect and disease damage. Pruning may also be necessary for safety reasons, to maintain a manicured look, or to improve the appearance of the tree or shrub.

Flowering shrubs require special pruning considerations, based on whether they flower on old or new wood. Old wood shrubs, such as lilac, forsythia, and weigela, form flower buds for next year's blooms during the current year. Those buds are carried through winter and blossom in early spring, except for some hydrangea species that blossom in summer. Prune old wood shrubs immediately after blooming has ended. Pruning too early removes the flower buds before the shrub can blossom.

New wood shrubs, such as sweet pepperbush, roses, and smooth hydrangea (*Hydrangea arborescens*), do not create flower buds until after growth begins in spring. The new wood is made, and buds form on the new wood and blossom in the same year. Prune new wood shrubs early in spring, just as new growth begins. General pruning tools include pruning shears, lopping shears, hedge shears, hand saws, pole saws, and even small chain saws.

### General pruning guidelines

Remove:

- Dead, broken, or diseased branches, and any downward-growing branches.
- One of any crossing branches that can entangle or intertwine.
- Suckers coming from the roots or bottom of the trunk.

Prune:

- Close to the branch collar at the base of the limb.
- "Thinning" cuts remove entire branches at the branch collar.
- "Heading" cuts remove only part of a branch and encourage vegetation growth below the cut.

## Non-native

**Boxwood Species (*Buxus* spp.)**

Boxwoods are a group of ornamental shrubs that grow 3 to 12 feet tall. They have greenish-yellow flowers that blossom between April and May and prefer well-draining, sandy, loamy, moist soils in sunny to partly shaded areas. Boxwoods are a common evergreen used in landscaping for edging and privacy. This ornamental species originates from Europe and Asia and thrives in hardiness zones 5 – 10.



## Native Alternatives

### Sweet Pepperbush (*Clethra alnifolia*)

- **Max Growth Height (ft):** 12
- **Flower Color:** white, pink
- **Bloom Time:** July - August
- **Soil Type:** acidic, sands, clays
- **Soil Moisture:** moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds, butterflies, and hummingbirds; special value to native bees, bumble bees, and honeybees; pollinators use flowers; many birds and mammals eat fruit; fragrant, showy summerflowers, outstanding fall color; tolerant of heavy shade, erosion, clay or wet soils; new wood growth.

### Virginia Sweetspire (*Itea virginica*)

- **Max Growth Height (ft):** 10
- **Flower Color:** white
- **Bloom Time:** March - June
- **Soil Type:** acidic, sands, clays
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 6 to 9

**More Information:** attracts birds and is used by nectar-loving insects; provides cover habitat, beneficial in erosion control; showy flowers; tolerant of heavy shade, erosion, clay soils, and wet soils; old wood growth.

### Other Native Alternatives

Black Chokeberry (*Aronia melanocarpa*)*, Dwarf Witch Alder (*Fothergilla gardenii*), Inkberry Holly (*Ilex glabra*)*, native Viburnums*, Ninebark (*Physocarpus opulifolius*), Northern White-Cedar (*Thuja occidentalis*), Witch Alder (*Fothergilla major*).
**Maintaining a pruned hedge will sacrifice fall fruit.*

## Non-native

**Burning Bush (*Eunymous alatus*)**

Burning bush is an invasive ornamental shrub that grows up to 20 feet tall. It has yellow to green flowers that bloom in May and prefers well-draining, moist soils in sunny to partly shaded areas. This ornamental invasive species originates from Northeast and Central Asia and thrives in hardiness zones 4 – 8. Burning bush is listed as a Class B Pennsylvania noxious weed.



## Native Alternatives

### Possumhaw (*Viburnum nudum*)

- **Max Growth Height (ft):** 20
- **Flower Color:** white
- **Bloom Time:** May - July
- **Soil Type:** mucky, acidic soils
- **Soil Moisture:** moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 5 to 9

**More Information:** attracts butterflies, songbirds, water birds, shorebirds, and small mammals; tolerant of wet soil; excellent for use as a hedge or in a rain garden; old wood growth.

### Southern Arrowwood (*Viburnum dentatum*)

- **Max Growth Height (ft):** 15
- **Flower Color:** white
- **Bloom Time:** May - July
- **Soil Type:** acidic, sands
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 2 to 8

**More Information:** attracts birds and butterflies, larval host for butterflies; used by gamebirds, songbirds, and small mammals; tolerant of clay soil and black walnut juglone; old wood growth.

### Other Native Alternatives

Black Chokeberry (*Photina melanocarpa*), Bottlebrush Buckeye (*Aesculus parviflora*), Dwarf Witch Alder (*Fothergilla gardenii*), Highbush Blueberry (*Vaccinium corymbosum*), Oakleaf Hydrangea (*Hydrangea quercifolia*), Red Chokeberry (*Aronia arbutifolia*), Red-Osier Dogwood (*Cornus sericea*), Swida Sericea (*Cornus sericea, Swida sericea*), Witch Alder (*Fothergilla major*).

## Non-native

**Butterfly Bush (*Buddleja davidii*)**

Butterfly bush is an invasive ornamental plant that grows up to 12 feet tall. It has purple and orange flowers that blossom between June and September and prefers well-draining, moist soils in sunny areas. This ornamental invasive species originates from Asia and thrives in hardiness zones 5 – 9. Despite its name, the butterfly bush does not provide nutritious food for native insects.



## Native Alternatives

### Elderberry (*Sambucus canadensis*)

- **Max Growth Height (ft):** 12
- **Flower Color:** white
- **Bloom Time:** May - July
- **Soil Type:** rich, slightly acidic
- **Soil Moisture:** wet
- **Light Requirements:** part shade
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds and butterflies; berries, twigs, and foliage used as a food source by many birds and mammals; provides nesting materials and structure for native bees; supports conservation biological control (attracts predatory insects that feed on pests); tolerant of erosion, clay soil, and wet soil.

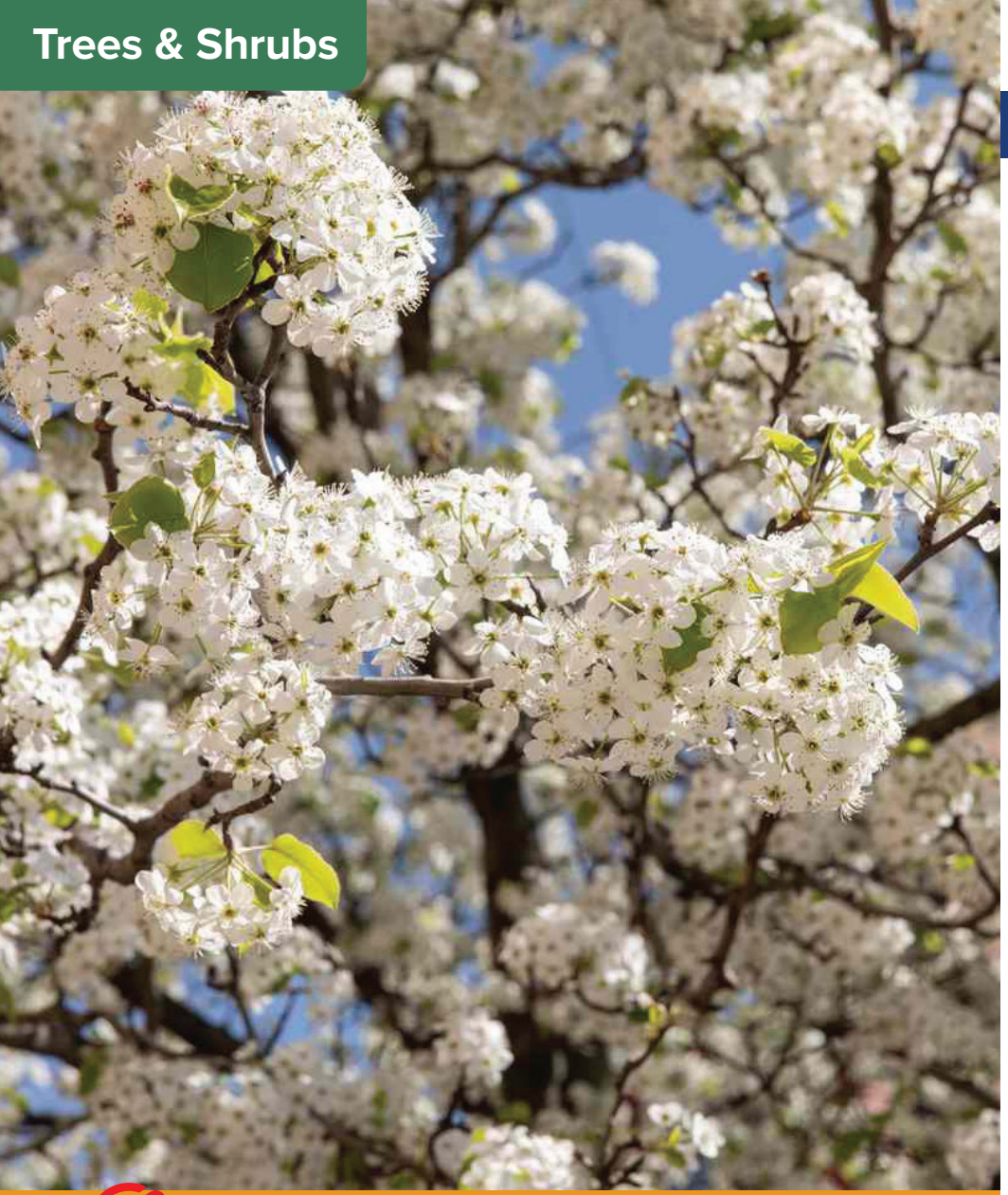
### Sweet Pepperbush (*Clethra alnifolia*)

- **Max Growth Height (ft):** 12
- **Flower Color:** white, pink
- **Bloom Time:** July - August
- **Soil Type:** acidic, sands, clays
- **Soil Moisture:** moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds, butterflies, and hummingbirds; special value to native bees, bumble bees, and honeybees; pollinators use flowers; many birds and mammals eat fruit; fragrant, showy summerflowers, outstanding fall color; tolerant of heavy shade, erosion, clay or wet soils; new wood growth.

### Other Native Alternatives

Butterfly Weed (*Asclepias tuberosa*), New Jersey Tea (*Ceanothus americanus*), Red Buckeye (*Aesculus pavia*), Swamp Milkweed (*Asclepias incarnata*).



## Non-native

**Callery Pear (*Pyrus calleryana*)**

Callery pear is an invasive tree that grows up to 40 feet tall. It has white flowers that bloom in April. Callery pear prefers variable dry to moist soil types in sunny areas. This ornamental species originates from Asia and is listed as a Pennsylvania Class B noxious weed.



## Native Alternatives

### Green Hawthorn (*Crataegus viridis*)

- **Max Growth Height (ft):** 50
- **Flower Color:** white
- **Bloom Time:** March - May
- **Soil Type:** sandy, medium loam, clay
- **Soil Moisture:** wet
- **Light Requirements:** part shade
- **Hardiness Zones:** 4 to 7

**More Information:** attracts fruit-loving birds and nectar-loving insects; provides cover and nesting habitat; special value to native bees; larval host to many species of butterflies and moths; tolerant of deer browse, drought, clay soil, and dry soil; rarely needs to be pruned.

### Pagoda Dogwood (*Cornus alternifolia*)

- **Max Growth Height (ft):** 35
- **Flower Color:** white
- **Bloom Time:** April - June
- **Soil Type:** cool, moist, acid, well-drained soils
- **Soil Moisture:** moist
- **Light Requirements:** part shade, shade
- **Hardiness Zones:** 3 to 7

**More Information:** attracts butterflies, birds, and many mammals; fruits provide food for game birds, songbirds, and squirrels; larval host for the Spring Azure butterfly (*Celastrina ladon*); tolerant of deer browse and black walnut juglone; new wood growth.

### Other Native Alternatives

Cornelian Cherry (*Cornus mas*), Eastern Redbud (*Cercis canadensis*), Serviceberry (*Amelanchier arborea*), Sweetbay Magnolia (*Magnolia virginiana*), Two-wing Silverbell (*Halesia diptera*).

## Non-native

**Heavenly Bamboo (*Nandina domestica*)**

Heavenly bamboo is not a true bamboo species, but is an invasive ornamental shrub that grows up to 8 feet tall. It has yellow to white flowers that bloom in June and prefers well-draining, rich, humusy, moist soils in sunny to partly shaded areas. This ornamental invasive species originates from India and Japan.



## Native Alternatives

### Virginia Sweetspire (*Itea virginica*)

- **Max Growth Height (ft):** 10
- **Flower Color:** white
- **Bloom Time:** March - June
- **Soil Type:** acidic, sands, clays
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 6 to 9

**More Information:** attracts birds and is used by nectar-loving insects; provides cover and habitat, beneficial in erosion control; showy flowers; tolerant of heavy shade, erosion, clay soils, and wet soils; old wood growth.

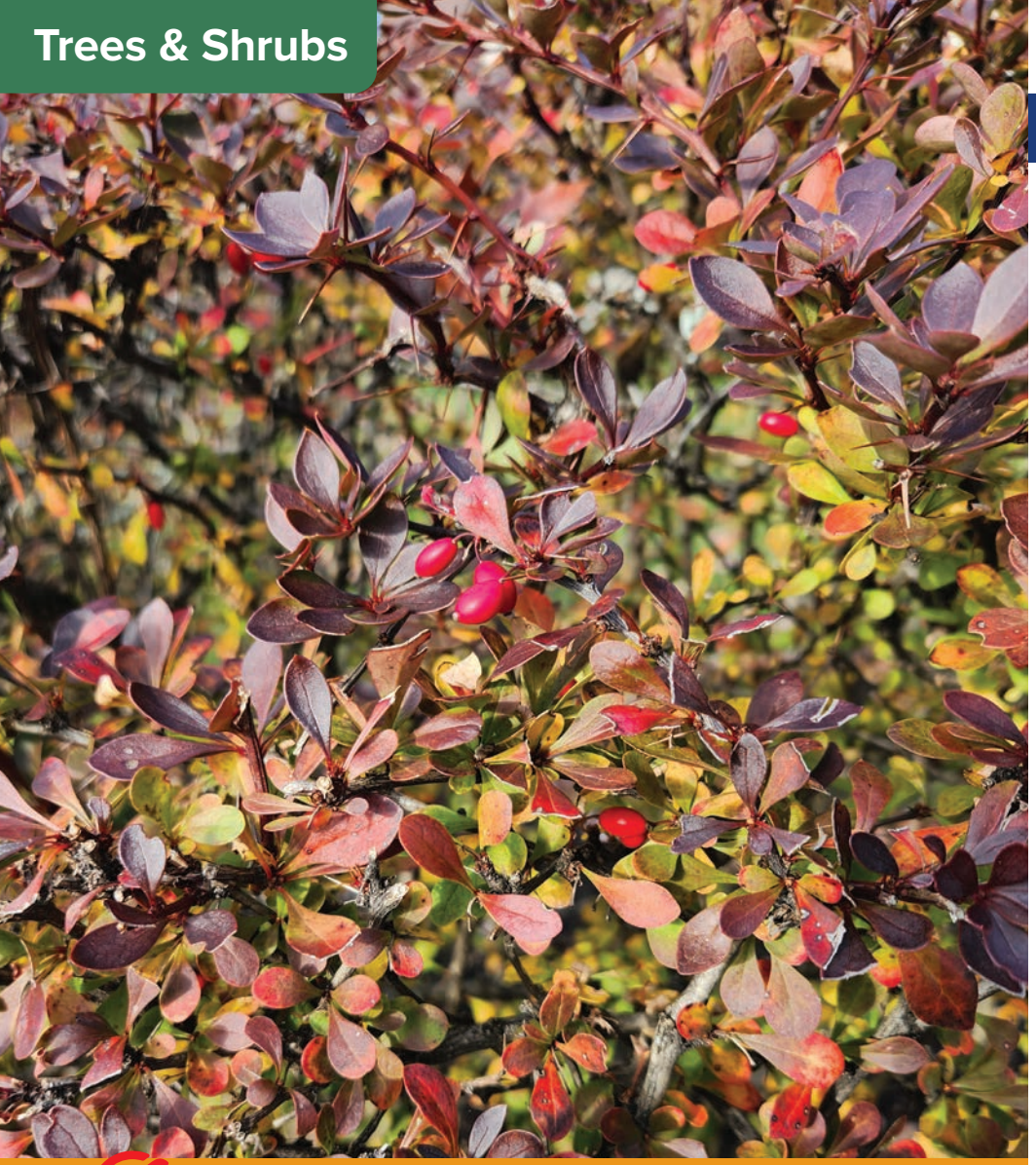
### Winterberry Holly (*Ilex verticillata*)

- **Max Growth Height (ft):** 10
- **Flower Color:** white, yellow, green, brown
- **Bloom Time:** April - July
- **Soil Type:** acidic, sands, clays
- **Soil Moisture:** dry, moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 9
- **Somewhat toxic if ingested**

**More Information:** attracts fruit-eating birds, butterflies, and nectar-loving insects; larval host to Henry's Elfin butterfly (*Callophrys henrici*); ornamental, attractive fruits; used for cover and nesting habitat; tolerant of erosion, clay soil, wet soil, and air pollution; new wood growth.

### Other Native Alternatives

Inkberry Holly (*Ilex glabra*).



## Non-native

**Japanese Barberry (*Berberis thunbergii*)**

Japanese barberry is an invasive ornamental shrub that grows up to 6 feet tall. It has yellow flowers that blossom between April and May and prefers well-draining, dry to moist soils in sunny areas. This ornamental invasive species originates from Japan and thrives in hardiness zones 4 – 8. Japanese barberry is listed as a Class B Pennsylvania noxious weed.



## Native Alternatives

### Northern Bush Honeysuckle (*Diervilla lonicera*)

- **Max Growth Height (ft):** 3
- **Flower Color:** red, orange, yellow, purple
- **Bloom Time:** May - August
- **Soil Type:** rocky, slightly acidic
- **Soil Moisture:** dry
- **Light Requirements:** part shade, shade
- **Hardiness Zones:** 3 to 7

**More Information:** attracts hummingbirds and butterflies.

### Winterberry Holly (*Ilex verticillata*)

- **Max Growth Height (ft):** 10
- **Flower Color:** white, yellow, green, brown
- **Bloom Time:** April - July
- **Soil Type:** acidic, sands, clays
- **Soil Moisture:** dry, moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 9
- Somewhat toxic if ingested

**More Information:** attracts fruit-eating birds, butterflies, and nectar-loving insects; larval host to Henry's Elfin butterfly (*Callophrys henrici*); ornamental, attractive fruits; used for cover and nesting habitat; tolerant of erosion, clay soil, wet soil, and air pollution; new wood growth.

### Other Native Alternatives

Dwarf Witch Alder (*Fothergilla gardenii*), Oakleaf Hydrangea (*Hydrangea quercifolia*), Sweet Pepperbush (*Clethra alnifolia*), Virginia Sweetspire (*Itea virginica*).

## Non-native

**Japanese Honeysuckle (*Lonicera japonica*)**

Japanese honeysuckle is an invasive ornamental shrub that grows up to 30 feet tall. It has yellow to white flowers that blossom between June and October and prefers well-draining, sandy, loamy, dry to moist soils in sunny to partly shaded areas. This ornamental invasive species originates from Eastern Asia.



## Native Alternatives

### Coral Honeysuckle (*Lonicera sempervirens*)

- **Max Growth Height (ft):** 20
- **Flower Color:** red, yellow
- **Bloom Time:** March - June
- **Soil Type:** various, rich preferred
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 4 to 9

**More Information:** attracts birds, butterflies, and bees; larval host for several native butterfly and moth species; fruits attract game birds and songbirds; tolerant of deer browse, clay soil, and black walnut juglone.

### Spicebush (*Lindera benzoin*)

- **Max Growth Height (ft):** 15
- **Flower Color:** white, yellow, green
- **Bloom Time:** March - May
- **Soil Type:** moist, sandy, well-drained soils. Caliche type, limestone-based, sandy loam, medium loam
- **Soil Moisture:** dry, moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 4 to 9

**More Information:** attracts birds and butterflies; larval host for several species of swallowtail butterflies; tolerant of deer browse, drought, heavy shade, clay soil, wet soil, and black walnut juglone; rarely requires pruning.

### Other Native Alternatives

Snowberry (*Symphoricarpos albus*), Sweetshrub (*Calycanthus floridus*).

### Other Non-native Honeysuckle Species

Amur Honeysuckle (*Lonicera mackii*), Bell's Honeysuckle (*Lonicera x bella*), Morrow's Honeysuckle (*Lonicera morrowii*), Standish/Fragrant Honeysuckle (*Lonicera standishii*), and Tatarian Honeysuckle (*Lonicera tatarica*) are listed as Class B noxious weeds.

## Non-native

**Norway Maple (*Acer platanoides*)**

Norway maple is a popular invasive tree that grows up to 50 feet tall. It has yellow flowers that bloom between March and April and prefers well-draining, moist soil types in sunny to partly shaded areas. This ornamental species originates from Eastern Europe.



## Native Alternatives

### American Elm (*Ulmus americana*)

- **Max Growth Height (ft):** 80
- **Flower Color:** red, green
- **Bloom Time:** February - April
- **Soil Type:** sandy, medium loam, clay, limestone-based
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 2 to 9

**More Information:** attracts birds and butterflies; larval host to many moth species; provides food for seed-eating (granivorous) birds and small mammals; provides cover and nesting habitat; shade tree, fast growing; tolerant of drought, black walnut juglone, and air pollution; a disease resistant variety is available.

### Red Maple (*Acer rubrum*)

- **Max Growth Height (ft):** 60
- **Flower Color:** red, yellow
- **Bloom Time:** March - April
- **Soil Type:** slightly acidic
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 3 to 9
- **Wilted or dried leaves and bark are poisonous to livestock**

**More Information:** attracts birds and deer, special value to native bees and honeybees; larval host to several moth species, including the Cecropia moth (*Hyalophora cecropia*); tolerant of wet soil, black walnut juglone, and air pollution.

### Other Native Alternatives

Blackgum (*Nyssa sylvatica*), Cucumber Magnolia (*Magnolia acuminata*), Hackberry (*Celtis occidentalis*), Pin Oak (*Quercus palustris*), Red Oak (*Quercus rubra*), Sweetgum (*Liquidambar styraciflua*), Sugar Maple (*Acer saccharum*), Tuliptree (*Liriodendron tulipifera*), White Oak (*Quercus alba*).

## Non-native

**Privet (*Ligustrum sinense, Ligustrum vulgare, Ligustrum japonicum*)**

Privet is a popular non-native hedging shrub that grows up to 15 feet tall. It has white flowers that bloom in June and prefers well-draining, dry to moist soils in sunny to partly shaded areas. This ornamental invasive species originates from Northern Europe, the Mediterranean, North Africa, and Asia. In Pennsylvania, *Ligustrum japonicum* is listed as a Class A noxious weed, and *Ligustrum sinense* and *Ligustrum vulgare* as Class B noxious weeds.



## Native Alternatives

### Black Chokeberry (*Aronia melanocarpa*)

- **Max Growth Height (ft):** 6
- **Flower Color:** white, pink
- **Bloom Time:** March - June
- **Soil Type:** acidic
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 3 to 8

**More Information:** attracts and provides an intermediate food source for birds; edible fruit; tolerant of wet soils.

### Sweet Pepperbush (*Clethra alnifolia*)

- **Max Growth Height (ft):** 12
- **Flower Color:** white, pink
- **Bloom Time:** July - August
- **Soil Type:** acidic, sands, clays
- **Soil Moisture:** moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds, butterflies, and hummingbirds; special value to native bees, bumble bees, and honeybees; pollinators use flowers; many birds and mammals eat fruit; fragrant, showy summerflowers, outstanding fall color; tolerant of heavy shade, erosion, clay or wet soils; new wood growth.

### Other Native Alternatives

Viburnums (*Viburnum* spp.) (only pruned directly after flowering), Virginia Sweetspire (*Itea virginica*), Winterberry (*Ilex verticillata*), Ninebark (*Physocarpus opulifolius*).

### Other Non-native Privet Species

Border privet (*Ligustrum obtusifolium*) is listed as a Class B noxious weed.

## Non-native

**Weeping Willow (*Salix babylonica*)**

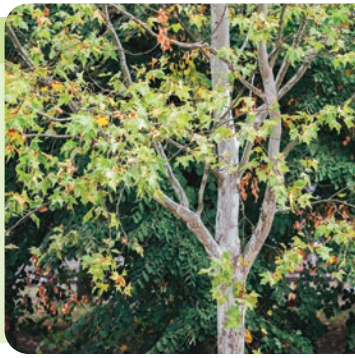
Weeping willow is a popular non-native tree that grows up to 50 feet tall. It has silvery green flowers blossoming between April and May and prefers well-draining, moist soils in sunny to partly shaded areas. This ornamental species originates from Northern China.



## Native Alternatives

**American Sycamore (*Platanus occidentalis*)**

- **Max Growth Height (ft):** 150
- **Flower Color:** red, yellow, green, brown
- **Bloom Time:** March - April
- **Soil Type:** moist, sandy loams, silty clays
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 4 to 9



**More Information:** attracts birds; provides plenty of shade and can be used in a rain garden; tolerant of deer browse, wet soil, black walnut juglone, and air pollution; mature trees can be very tall and are not ideal for street shade trees.

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**Black Willow (*Salix nigra*)**

- **Max Growth Height (ft):** 60
- **Flower Color:** yellow
- **Bloom Time:** February - June
- **Soil Type:** clay, loam, sand
- **Soil Moisture:** moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 4 to 9

**More Information:** attracts birds and butterflies; larval host to several butterfly and moth species; special value to native bees, bumble bees, and honeybees; supports conservation biological control (attracts predatory insects that feed on pests); fast-growing shade tree; tolerant of erosion.

Flowering Dogwood (*Benthamidia florida*, formerly *Cornus florida*)

## Thoughtful Tree and Shrub Additions

Several tree and shrub species native to Pennsylvania are listed on the following pages. They are excellent choices when looking for a native species of a specific type. Many trees are not labeled with full species names in nurseries and greenhouses, so this list can be helpful when asking about native species.



## Native Options for Dogwoods (*Cornus, Benthamidia,* and *Swida* spp.)

### Flowering Dogwood (*Bemthamidia florida,* formerly *Cornus florida*)

- **Max Growth Height (ft):** 40
- **Flower Color:** white, pink, yellow, green
- **Bloom Time:** March - June
- **Soil Type:** rich, well-drained, acidic
- **Soil Moisture:** dry, moist
- **Light Requirements:** part shade, shade
- **Hardiness Zones:** 5 to 9

**More Information:** attracts butterflies and birds; larval host for the Spring Azure butterfly (*Celastrina ladon*); special value to native bees; supports conservation biological control (attracts predatory insects that feed on pests); tolerant of deer, clay soil, and black walnut juglone; new wood growth.

### Fringetree (*Chionanthus virginicus*)

- **Max Growth Height (ft):** 20 - 30
- **Flower Color:** white
- **Bloom Time:** April - June
- **Soil Type:** average, medium, well-drained
- **Soil Moisture:** moist
- **Light Requirements:** full sun to part shade
- **Hardiness Zones:** 3 to 9

**More Information:** berries are attractive to wildlife and birds; animals browse twigs and foliage; tolerant of clay soil, black walnut juglone, and air pollution.

### Other Native Options for Dogwoods

Two-Wing Silverbell (*Halesia diptera*), Silverbell Tree (*Halesia carolina*), Blackhaw Viburnum (*Viburnum prunifolium*), Service-berry (*Amelanchier arborea*), Sourwood (*Oxydendrum arboreum*).

## Native Options for Hydrangeas (*Hydrangea* spp.)

### Buttonbush (*Cephalanthus occidentalis*)

- **Max Growth Height (ft):** 12
- **Flower Color:** white, pink
- **Bloom Time:** June - September
- **Soil Type:** limestone-based, sandy, sandy loam, medium loam, clay loam, clay
- **Soil Moisture:** wet
- **Light Requirements:** part shade, shade
- **Hardiness Zones:** 5 to 7
- **Buttonbush foliage is poisonous to livestock**

**More Information:** attracts and benefits bees, butterflies, insects, hummingbirds, and fruit-eating birds; showy flowers and fruits; moderately deer resistant; tolerant of erosion and wet soil.

### Hobblebush (*Viburnum lantanoides*)

- **Max Growth Height (ft):** 12
- **Flower Color:** white, pink
- **Bloom Time:** May - June
- **Soil Type:** moist, gravelly or sandy, acid loams
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 7

**More Information:** attracts deer, butterflies, bees, and songbirds; larval host for butterfly and moth species; fruit provides food for game birds, songbirds, and mammals; browsers consume twigs and leaves; old wood growth.

### Other Native Options for Hydrangeas

Sweet Pepperbush (*Clethra alnifolia*), Virginia Sweetspire (*Itea virginica*), Smooth Hydrangea (*Hydrangea arborescens*), Oakleaf Hydrangea (*Hydrangea quercifolia*).



## Native Options for Meadowsweets (*Spiraea* spp.)

### Virginia Sweetspire (*Itea virginica*)

- **Max Growth Height (ft):** 10
- **Flower Color:** white
- **Bloom Time:** March - June
- **Soil Type:** acidic, sands clays
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 6 to 9

**More Information:** attracts birds and is used by nectar-loving insects; provides cover and habitat, beneficial in erosion control; showy flowers; tolerant of heavy shade, erosion, clay soils, and wet soils; old wood growth.

### White Meadowsweet (*Spirea latifolia*)

- **Max Growth Height (ft):** 6
- **Flower Color:** white, pink
- **Bloom Time:** June - September
- **Soil Type:** rich, slightly acidic
- **Soil Moisture:** moist
- **Light Requirements:** sun
- **Hardiness Zones:** 3 to 8

**More Information:** attracts birds, special value to native bees; supports conservation biological control (attracts predatory insects that feed on pests); tolerant of deer browse and wet soil; old wood growth.

### Other Native Options for Meadowsweets

Bunchberry Dogwood (*Cornus canadensis*), Common Ninebark (*Physocarpus opulifolius*), Sweet Pepperbush (*Clethra alnifolia*), Northern Bush Honeysuckle (*Diervilla lonicera*), Wild Bergamot (*Monarda fistulosa*).

## Native Options for Rhododendron (*Rhododendron* spp.)

### Mountain Laurel (*Kalmia latifolia*)

- **Max Growth Height (ft):** 15 - 35
- **Flower Color:** white, pink, purple
- **Bloom Time:** April - July
- **Soil Type:** cool, moist, rocky, or sandy soils
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 4 to 9
- **All parts of the mountain laurel may be toxic to humans if ingested**

**More Information:** attracts birds; larval host to Laurel Sphinx moth (*Sphinx kalmiae*); tolerant of deer and rabbits.

### Great Laurel (*Rhododendron maximum*)

- **Max Growth Height (ft):** 15
- **Flower Color:** white, pink
- **Bloom Time:** June - August
- **Soil Type:** cool, well-drained
- **Soil Moisture:** moist, wet
- **Light Requirements:** part shade
- **Hardiness Zones:** 3 to 7
- **All parts of the great laurel may be toxic to humans if ingested**

**More Information:** attracts butterflies, birds, and hummingbirds; special value to bumble bees; showy flowers, evergreen leaves; tolerant of rabbits and heavy shade.

### Other Native Options for Rhododendron

Wild Bergamot (*Monarda fistulosa*),
Pink Azalea (*Rhododendron periclymenoides*).



## Other Native Options

### Eastern Redbud (*Cercis canadensis*)

- **Max Growth Height (ft):** 30
- **Flower Color:** pink
- **Bloom Time:** March - May
- **Soil Type:** rich, well-drained
- **Soil Moisture:** moist
- **Light Requirements:** part shade, shade
- **Hardiness Zones:** 4 to 9

**More Information:** attracts birds; special value to native bees and bumblebees; provides nesting materials and structure for native bees; tolerant of deer, clay soil, and black walnut juglone.

### Common Ninebark (*Physocarpus opulifolius*)

- **Max Growth Height (ft):** 10
- **Flower Color:** white, pink
- **Bloom Time:** May - June
- **Soil Type:** clay, loam
- **Soil Moisture:** dry, moist, wet
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 2 to 8

**More Information:** attracts birds and benefits native bees and honey bees; fast-growing, disease resistant; tolerant of drought, erosion, clay, dry or wet soil, black walnut juglone.

### American Persimmon (*Diospyros virginiana*)

- **Max Growth Height (ft):** 100
- **Flower Color:** yellow, green
- **Bloom Time:** March - June
- **Soil Type:** variable, moist, rich to sandy, clay, dry
- **Soil Moisture:** dry
- **Light Requirements:** part shade
- **Hardiness Zones:** 4 to 9
- **Fruit is not edible until exposed to frost or consistent low temperatures.**

**More Information:** special value to honey bees; attracts wildlife; produces edible fruit for human consumption; two trees are necessary for fruit production; tolerant of drought, black walnut juglone, and air pollution; remove root suckers to avoid shrubby growth habit.

### Pawpaw (*Asimina triloba*)

- **Max Growth Height (ft):** 40
- **Flower Color:** white, red, yellow, purple
- **Bloom Time:** April - May
- **Soil Type:** rich, slightly acidic
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 5 to 8
- **Fruit and leaves may cause skin irritation when handling.**

**More Information:** attracts birds and butterflies; produces edible fruit for human consumption, fruit-loving birds and other mammals; attracts birds and butterflies; tolerant of deer, wet soil, and black walnut juglone.



### Serviceberry (*Amelanchier arborea*)

- **Max Growth Height (ft):** 60
- **Flower Color:** white
- **Bloom Time:** February - May
- **Soil Type:** moist, well-draining, acidic
- **Soil Moisture:** dry
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 4 to 9

**More Information:** special value to native bees, attracts birds and wildlife; produces edible fruit for human consumption; susceptible to diseases and insects that can cause cosmetic issues; effective in naturalistic plantings, wooded edges, ponds, and streams; tolerant of clay soil and air pollution; remove root suckers to avoid shrubby growth habit.

### Wild Plum (*Prunus americana*)

- **Max Growth Height (ft):** 35
- **Flower Color:** white
- **Bloom Time:** April - June
- **Soil Type:** rich, well-drained loams
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 8

**More Information:** special value to native bees, bumble bees, and honeybees; attracts butterflies; produces edible fruit for human consumption; tolerant of drought, dry soil, and black walnut juglone.

### Other Edible Fruiting Trees

Green Hawthorn (*Crataegus viridis*), Red Buckeye (*Aesculus pavia*).

A *Clematis* exhibits climbing growth habits.

# Vines

**Vines are slender stemmed, trailing, or climbing plants that can't support their own weight. Trailing species grow horizontally along the ground and are widely used in landscaping for ground cover. Climbing species grow vertically. These vines can be used as fast-growing screens on fences and walls, and for shade when grown on a trellis or arbor. Some species display both trailing and climbing growth habits, depending on their location and the availability of vertical support structures.**

**Climbing vines add height to a landscape and take up less space in garden beds. Versatile and useful in tight spaces, vines can create privacy and hide unattractive areas while also reducing noise. Flowering vines can also attract wildlife such as birds, butterflies, bees, and other beneficial insects.**



Aerial rootlets

**Selecting Vines:** When selecting vines, consider the amount of light available throughout the day, the space available for the vine to grow (vertically and horizontally), and the soil drainage. Many sun-loving climbing vines will tolerate being planted in the shade if their support structure is located where they will reach the sun as they grow.

Vines can be annual or perennial, and perennial vines may be deciduous or evergreen. Select a vine that matches your expectations and desired look for the landscape. Another consideration for the selection of vines is flammability. Vines are commonly used as privacy screens for porches and decks in urban landscapes and are therefore grown adjacent to human dwellings. Some species of vines have a high flammability risk and should not be used as screens within the defensible space of a home. Examples include trumpet vine (*Campsis radicans*) and Dutchman's pipe (*Aristolochia* spp.). The flammability of vines and other plant species can be found on the online plant database, *The North Carolina Extension Gardener Plant Toolbox*.

Tendril gripping trellis

Many vines have vigorous growth habits and will need to be supported by structures. Ensure the structure matches the needs of the vine by considering the weight of the mature plant. It is not recommended to allow vines to climb trees as they can strangle and shade them out, especially when trees are young.

**Pruning Vines:** Periodic pruning will keep vines healthy and attractive, as well as prevent them from escaping their intended location. Even native vines will require pruning to keep them manicured depending on the desired look. Regular pruning also helps to create space for air and light availability. Prune vines by removing dead or damaged wood. In general, spring flowering vines have formed buds on the previous year's growth (old wood) and should be pruned right after flowering. All other types of vines should be pruned in late winter.

A light pruning may be useful during the growing season to keep an escaping vine within its bounds. Some vines, like *Clematis* spp. and *Wisteria* spp. have a more complicated pruning cycle. In these cases, research the species and varieties to determine the best time(s) to prune.

### Types of Vines

**Clinging Vines** possess specialized adventitious roots called aerial rootlets that grow along the stems of the vine, attaching to any touchable surface. Consider surrounding surfaces when planting clinging vines as they can damage bricks, rocks, and stucco upon removal.

**Sprawling Vines** do not have natural supports for attaching themselves to structures. While these are generally used as groundcovers, if coverage of a vertical support such as a trellis or arbor is desired, these vines will need to be tied to the support structure.

**Tendril Vines** use tendrils (slim, flexible, structures that may be branched or unbranched) to wrap around and grab onto support structures. Tendrils need something to climb such as a trellis, arbor, or support wires that are small enough for the tendrils to wrap around.

- Some vines produce modified tendrils that have a sucker-like disc at the tip of each tendril branch. These plants produce an adhesive chemical that makes the disc adhere to the surfaces it touches which can damage bricks, rocks, and stucco upon removal. Virginia creeper (*Parthenocissus quinquefolia*) is an excellent example.

**Twining Vines** do not possess natural supports for climbing or attaching to structures, but these vines twine throughout a trellis or arbor more naturally than sprawling vines.



A clinging vine with modified sucker discs climbing a fence.

Some climbing vine species display multiple growth habits. For example, trumpet vine (*Campsis radicans*) produces aerial rootlets to help it cling, but also has a twining habit, which helps it wrap around its support structure.

Finally, some vines use other structural means to climb. For example, the native vine, greenbriar (*Smilax* spp.) uses both tendrils and prickles (thorn-like structures) to climb. The presence of prickles should be considered when selecting vines, especially if they will be located near pathways or playgrounds.

Several native alternatives listed in this section are not traditional vines, but they look and behave like vines in the landscape making them suitable replacements for invasive vine species. For more information about their perennial rooting systems, visit Page 63.

## Non-native

**Chinese Wisteria (*Wisteria sinensis*)**

Chinese wisteria is a non-native ornamental species that grows up to 50 feet. It has blue-violet flowers that blossom between May – June and prefers moist and slightly acidic, humusy, rich, well-drained soils in full sun areas. This ornamental species originates from China and thrives in hardiness zones 5 – 8. It grows rapidly and aggressively and twines around native plants, shading them out and strangling them.



## Native Alternatives

### American Wisteria (*Wisteria frutescens*)

- **Vine Type:** twining
- **Max Height (ft):** 30
- **Flower Color:** white, pink, blue, purple, violet
- **Bloom Time:** May - June
- **Soil Type:** rich, sandy to clay
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 5 to 9

**More Information:** larval host for several butterfly species; less aggressive and damaging than invasive wisterias, can be trained on arbors walls and columns; deer browse resistant.

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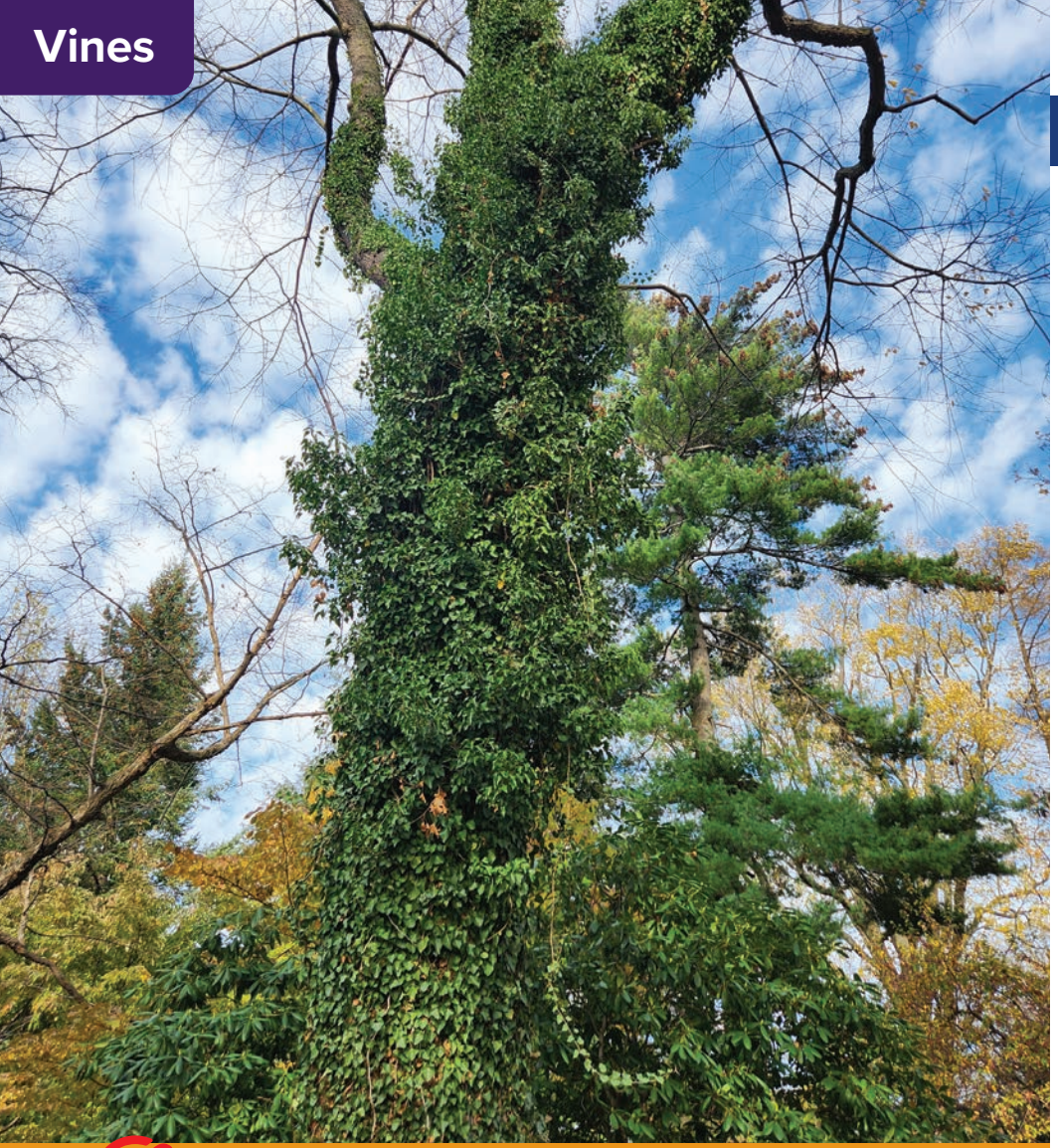
### Virginia Creeper (*Parthenocissus quinquefolia*)

- **Vine Type:** tendril
- **Max Height (ft):** 40
- **Flower Color:** white, green
- **Bloom Time:** May - June
- **Soil Type:** well-drained, sandy, loam, clay
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 9
- Berries are poisonous to humans; plant leaves may cause skin irritation

**More Information:** benefits fruit-eating birds such as chickadees, nuthatches, mockingbirds, and many more throughout winter; larval host for several sphinx moth species; can be trained on screens, walls, arbors, and columns; good ground cover, will not damage buildings.



## Non-native

**English Ivy (*Hedera helix*)**

English ivy is a non-native ground cover species that grows low but can climb up to 80 feet. It has yellow to yellow-green flowers that blossom between September – October and prefers well-drained but moist soils in partly shaded to shaded areas. This ornamental species originates from Northern Europe and thrives in hardiness zones 4 – 9. English ivy can kill native trees by wrapping around them and shading them out.



## Native Alternatives

### American Winterberry, Wintergreen (*Gaultheria procumbens*)

- **Primary Root System:** rhizome
- **Max Height (ft):** 0.5
- **Flower Color:** white, pink
- **Bloom Time:** June - September
- **Soil Type:** variable
- **Soil Moisture:** dry, moist
- **Light Requirements:** part shade, sun
- **Hardiness Zones:** 3 to 8

**More Information:** perennial plant benefits small mammals and game birds; deer eat leaves in winter months; see page 63 for information about the primary root system.

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### Stonecrop (*Sedum ternatum*)

- **Primary Root System:** creeping
- **Max Height (ft):** 1
- **Flower Color:** white
- **Bloom Time:** March - June
- **Soil Type:** thin, limey soils
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 4 to 8

**More Information:** perennial plant attracts butterflies; spreading ground cover needs little to no maintenance; tolerant of deer, rabbits, drought, and air pollution; see page 63 for information about the primary root system.

### Other Native Alternatives

Appalachian Barren Strawberry (*Waldsteinia fragarioides*), Coral Honeysuckle (*Lonicera sempervirens*), Green and Gold (*Chrysogonum virginianum*), Virginia Strawberry (*Fragaria virginiana*), Wild Ginger (*Asarum canadense*).

## Non-native

**Japanese Wisteria (*Wisteria floribunda*)**

Japanese wisteria is a non-native ornamental species that grows up to 25 feet. It has blue-violet, pink, or white flowers that bloom in May and prefers moist and slightly acidic, rich, well-drained soils in full sun areas. This ornamental species originates from Japan and thrives in hardiness zones 4 – 9.



## Native Alternatives

### American Wisteria (*Wisteria frutescens*)

- **Vine Type:** twining
- **Max Height (ft):** 30
- **Flower Color:** white, pink, blue, purple, violet
- **Bloom Time:** May - June
- **Soil Type:** rich, sandy to clay
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 5 to 9

**More Information:** larval host for several butterfly species; less aggressive and damaging than invasive wisterias, can be trained on arbors walls and columns; deer browse resistant.

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### Virginia Creeper (*Parthenocissus quinquefolia*)

- **Vine Type:** tendril
- **Max Height (ft):** 40
- **Flower Color:** white, green
- **Bloom Time:** May - June
- **Soil Type:** well-drained, sandy, loam, clay
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 9
- Berries are poisonous to humans; plant leaves may cause skin irritation

**More Information:** benefits fruit-eating birds such as chickadees, nuthatches, mockingbirds, and many more throughout winter; larval host for several sphinx moth species; can be trained on screens, walls, arbors, and columns; good ground cover, will not damage buildings.

## Non-native

**Periwinkle Species (*Vinca* spp.)**

All periwinkle species found in nurseries and garden centers are non-native to Pennsylvania and are known to be invasive. There are plenty of native options that will provide food and habitat for native insects and animals.



## Native Alternatives

### Downy Alumroot (*Heuchera pubescens*)

- **Primary Root System:** clumping
- **Max Height (ft):** 3
- **Flower Color:** white, pink, yellow
- **Bloom Time:** May - June
- **Soil Type:** rich
- **Soil Moisture:** moist
- **Light Requirements:** part sun, shade
- **Hardiness Zones:** 4 to 9

**More Information:** perennial herb can also replace hostas in landscaping; see page 63 for information about the primary root system.

### Foamflower (*Tiarella stolonifera, Tiarella cordifolia*)

- **Primary Root System:** stolons
- **Max Height (ft):** 1
- **Flower Color:** white, pink
- **Bloom Time:** May - June
- **Soil Type:** variable
- **Soil Moisture:** moist
- **Light Requirements:** shade
- **Hardiness Zones:** 5 to 9

**More Information:** perennial plant provides ground cover, does not spread aggressively in gardens; see page 63 for information about the primary root system.

### Other Native Alternatives

Creeping Phlox (*Phlox subulata, Phlox stolonifera*), Coral Bells (*Heuchera americana*), Green and Gold (*Chrysogonum virginianum*), Hairy Alumroot (*Heuchera villosa*), Native sedges (*Carex platyphylla, Carex plantaginea, Carex pensylvanica*), Partridgeberry (*Mitchella repens*).

English Ivy (*Hedera helix*)

## Other Non-native Vine Species

These vines are invasive or pests and should not be planted in Pennsylvania.



### Autumn Clematis, Sweet Autumn Clematis (*Clematis paniculata*, aka *Clematis terniflora*)

This species is usually retailed as sweet autumn clematis under the name *Clematis paniculata*, but it has been renamed *C. terniflora* and is known to be invasive in Pennsylvania. Instead, consider the native devil's darning needles (*Clematis virginiana*).

### Chocolate Vine, Five-leaf Akebia (*Akebia quinata*)

This is a Class A noxious weed in Pennsylvania. It is illegal to propagate and sell. However, it may be found in nurseries in Pennsylvania and surrounding states. This plant invades forested habitats because it thrives in shaded areas. It can also climb, smother, and kill smaller trees and shrubs.

### Oriental Bittersweet (*Celastrus orbiculatus*)

This vine is a Class B noxious weed in Pennsylvania. It can spread rapidly, shade out native vegetation, and girdle small trees. It can reproduce via seed and therefore should not be used in crafting or décor, such as wreaths and swags, because this can contribute to its spread. While it is illegal to propagate and sell in Pennsylvania, it may be mistaken for American bittersweet (*Celastrus scandens*) and sold as a native. The easiest way to tell them apart is through the location of flowers and fruits. *C. orbiculatus* produces flowers and fruits in the axils (location where a leaf meets the stem) while *C. scandens* produces flowers and fruits at the end of the stem.

### Porcelain Berry Vine (*Ampelopsis glandulosa var. brevipedunculata*)

The variegated cultivars including 'Elegans' and 'Marbled' are typically the varieties available in nurseries. Both spread by seed and the offspring may be variegated, have solid-green leaves, and resemble grapes. This vining plant invades streambanks, pond margins, forest edges, and other disturbed areas. It forms thick mats that can shade out native, low-growing species.

# Terrestrial Forbs

Common Sunflower (*Helianthus annuus*)

Turk's Cap Lily (*Lilium michiganense*)

## Tips for Selecting Plants

Whether choosing a native annual or perennial, research the characteristics and growth habits for each plant to be sure it will meet your goals, compliment other plantings, and thrive in its new space. Many of the native plants in this guide have physical characteristics, needs, and habits listed, but this is just a stepping stone toward landscaping with native plants. A bit more research about each plant species of interest will go a long way toward choosing the right native plants for your location.

**Plant With a Purpose:** There are many benefits of planting with native species. Using your planting plan, consider your goals and potential benefits such as attracting pollinators, food or shelter for wildlife, managing stormwater, groundcover, erosion control, reduced mowing needs, air quality improvements, and/or elevated aesthetics.



**Site Conditions:** Inspect and fully understand the conditions of the planting site before making plant purchases. Consider sun exposure, hardiness zone, soil type and moisture, soil pH, site space and plant growth habit (clumping habit vs. spreading habit), wind exposure, drainage, elevation, and proximity to sources of disturbance (such as winter de-icing application, heavy use areas, or pets).

**Bloom Time:** Most native species bloom for a short period of time. Select a variety of plants that bloom in spring, summer, and fall, ensuring flowers are available throughout the growing season. Doing so will ensure that valuable resources are continuously available for pollinators, while also contributing interest and color to a landscape.

**Plant Height:** Consider a variety of low, medium, and high growing plants to add depth and contrast. Be sure to check the maximum growth height of native species before purchasing so as not to plant something that will grow higher than desired.

### Perennial Root Systems

**Clumping** and **spreading plants** will grow differently in landscapes over time.

**It is important to note that even native species with spreading habits may crowd out or overtake neighboring plants.**

**Clumping plants** grow in a mound that gradually increases in diameter. Their roots are compact and grow more down than out.

**Spreading plants** have fibrous root systems that spread out from the original planting site. Spreading plants have either stolons, vining stems, or rhizome roots.

- **Stolons** are long, horizontal, above surface plant stems or branch runners that can form new plantlets from each node.
- **Vining stems** grow from the main plant and creep along the ground or climb by tendrils.
- **Rhizome roots** grow horizontally at or just below the surface of the ground and send out new roots and shoots from each node.

Wild Geranium (*Geranium maculatum*)

# Annual Forbs

**Annual forbs are plants that complete their life cycles within one growing season. During this time, annuals germinate from seed, produce vegetative growth and flowers, and produce seed. Some annuals will naturally reseed, but many nursery annuals do not. Annuals are easy to grow, provide an instant pop of color, and bloom for most of the growing season. They are often used to fill in space in a landscape project to add color, height, texture, and form.**



## Native Annual Forbs

### Common Sunflower (*Helianthus annuus*)

- **Max Growth Height (ft):** 1.5 - 10
- **Flower Color:** red, yellow, brown
- **Bloom Time:** June - November
- **Soil Type:** dry, disturbed clay or heavy sand
- **Soil Moisture:** dry
- **Light Requirements:** sun
- **Hardiness Zones:** 2 to 11

**More Information:** attracts birds; special value to native bees; seeds consumed by many wild birds.

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### Indian Blanket* (*Gaillardia pulchella*)

- **Max Growth Height (ft):** 2
- **Flower Color:** red, yellow, brown
- **Bloom Time:** May - August
- **Soil Type:** sandy or calcareous soils
- **Soil Moisture:** dry
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 2 to 11

**More Information:** attracts butterflies and birds; special value to native bees; tolerant of drought; grows in disturbed places, prefers grasslands or open places.

**Only annual in northwestern Pennsylvania. Considered perennial in eastern Pennsylvania due to the warmer climate.*

## Native Annual Forbs

### Partridge Pea (*Chamaecrista fasciculata*)

- **Max Growth Height (ft):** 1-3
- **Flower Color:** yellow
- **Bloom Time:** June - October
- **Soil Type:** dry, sandy, clay, or loamy; well-draining
- **Soil Moisture:** dry, moist
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 3 to 9

**More Information:** beneficial to nectar-loving bees, butterflies, and ants; special value to native bees and bumblebees; attracts seed-eating birds; larval host to several butterfly species; supports conservation biological control (attracts predatory insects that feed on pests); does not have a uniform size and shape like marigolds.

### Plains Coreopsis, Garden Tickseed, Golden Tickseed (*Coreopsis tinctoria*)

- **Max Growth Height (ft):** 5
- **Flower Color:** red, yellow, brown
- **Bloom Time:** June - August
- **Soil Type:** moist, sandy
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 2 to 11

**More Information:** attracts butterflies and birds; food source for nectar-loving bees, butterflies, and birds; drought tolerant; clay, dry, shallow-rocky soil tolerant.



## Other Non-native Annual Forbs

**These annuals are invasive or pests and should not be planted in Pennsylvania.**

### Common Morning Glory, Tall Morning Glory, Ivy-leaved Morning Glory (*Ipomoea purpurea, Ipomoea hederacea*)

Morning glory varieties are typically sold as seed, are listed on the Global Compendium of Weeds and are considered invasive in several states.

### Forget-me-nots (*Myosotis scorpiodes*)

This biennial is typically sold as seed. It has escaped cultivation and invaded many aquatic habitats in North America, particularly the Great Lakes Region.

### Four-o'clock Flowers (*Mirabilis jalapa*)

In North America and temperate climates, this plant performs as an annual, but it is capable of escaping garden beds and invading nearby natural and disturbed areas.

### Sweet Alyssum (*Lobularia maritima*), Spider Flowers/plants/weeds (*Cleome* spp.), Snapdragons (*Antirrhinum* spp.)

Non-sterile varieties may spread outside of the landscape; avoid planting these species.

Eastern Purple Coneflower (*Echinacea purpurea*)

# Perennial Forbs

**Perennial forbs are flowering plants that can live for several years, making them an attractive option and alternative to annual forbs and non-native ornamental species. These native perennials can bring bright colors to landscapes and can be maintained in a manicured way, if desired.**



Butterfly Weed (*Asclepias tuberosa*)

## Planting Tips

**Planting time:** Perennials can be planted almost any time of year, but seed-sown plants are best planted in late fall. It is wise to check planting times for specific perennials. Allow perennials sufficient time to establish themselves before blooming or enduring the onset of winter.

Aromatic Aster (*Aster oblongifolius*)

**Selecting Plants:** Choose plants with a purpose. Consider the location and purpose for specific landscaping or water gardening needs. Review the characteristics of perennials to ensure plants are chosen to match the needs of the project. Also consider the needs of the plant to ensure survival. If purchasing perennials from a nursery, consider plants that are compact and dark green. Avoid plants with thin, pale yellow stems and leaves.

Deadheading Eastern Purple Coneflower to deter self-seeding.

**Pruning:** Deadheading is the removal of spent flowers. This might be desired to deter the plant from self-seeding and growing new plants. Pinching is the removal of the top few inches of vegetative growth. This promotes branching and full, sturdy plants and may eliminate the need for staking taller species. Pinching is usually done in late May or early June and should be stopped by July 4th for fall blooming plants. If pinching is staggered it can extend the bloom time of some perennials.

**Dividing:** Dividing perennials is a common practice that helps maintain the health of the plant, thins the plant, and reduces overcrowding. Spring-blooming perennials can be divided after flowering. Fall-blooming perennials can be divided in the springtime when new growth is emerging. Dividing the plant when it's not blooming allows all the energy to be focused on root and leaf growth. Prepare plants for division by watering them well within a day or two of division and cut back the stems and foliage six inches from the ground. Use a shovel or spade to dig around the plant and pry up the root ball.



Perennials have different types of root systems that should be treated differently when dividing the plant. Researching individual plants to understand their root systems and habits will aid in managing a home garden or landscaped area. Refer back to page 63 for more information.

**Seasonal Care:** Be sure to investigate the seasonal care needed for specific perennials. Some may need to be cut back entirely to overwinter; many may be left untouched to serve as shelter for overwintering insects. Spring pruning will vary depending on the type of plant, site characteristics, and desired purpose for planting.

### Dividing Perennials

**Clumping Roots:** These plants can be divided by cutting the crown with a sharp tool or by prying them apart using back-to-back spades or forks. Plant new divisions at the same depth as the original plant. Note that the new divisions may not flower during the first or second year following the division.

**Rhizome Roots:** To divide rhizome rooted plants, first examine the roots for insect or disease damage. If present, cut out and discard damaged sections. Sections to be planted should retain several inches of root and one fan of leaves trimmed back by one half. Replant with the top showing just above soil level.

**Spreading Roots:** These plants have many matted roots that can be pulled apart or cut with pruners or a sharp tool. Larger plants may need to be separated with two hand tools or shovels while using a prying method to separate them into several shoots.

**Stolon Roots:** Follow the same process as described for dividing rhizome roots.

## Non-native

**Catmint (*Nepeta racemosa*)**

Catmint is a common non-native ornamental species that can grow up to 2.5 feet. They have lavender – blue flowers that bloom in May and prefer dry to moist, well-draining soils in full sun to partly shaded areas. This non-native species originates from the Middle East and thrives in hardiness zones 4 – 8. It can spread throughout garden beds and crowd out other plants.



## Native Alternatives

### Hoary Mountain Mint (*Pycnanthemum incanum*)

- **Primary Root System:** rhizomes
- **Max Height (ft):** 3
- **Flower Color:** white, purple
- **Bloom Time:** June - July
- **Soil Type:** acidic, mesic to dry, rich soils
- **Soil Moisture:** dry, moist
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 4 to 8

**More Information:** special value to native bees including bumble bees and honeybees; attracts butterflies; silvery foliage adds beauty to landscape; spreads somewhat aggressively, can be maintained with pruning and pulling.

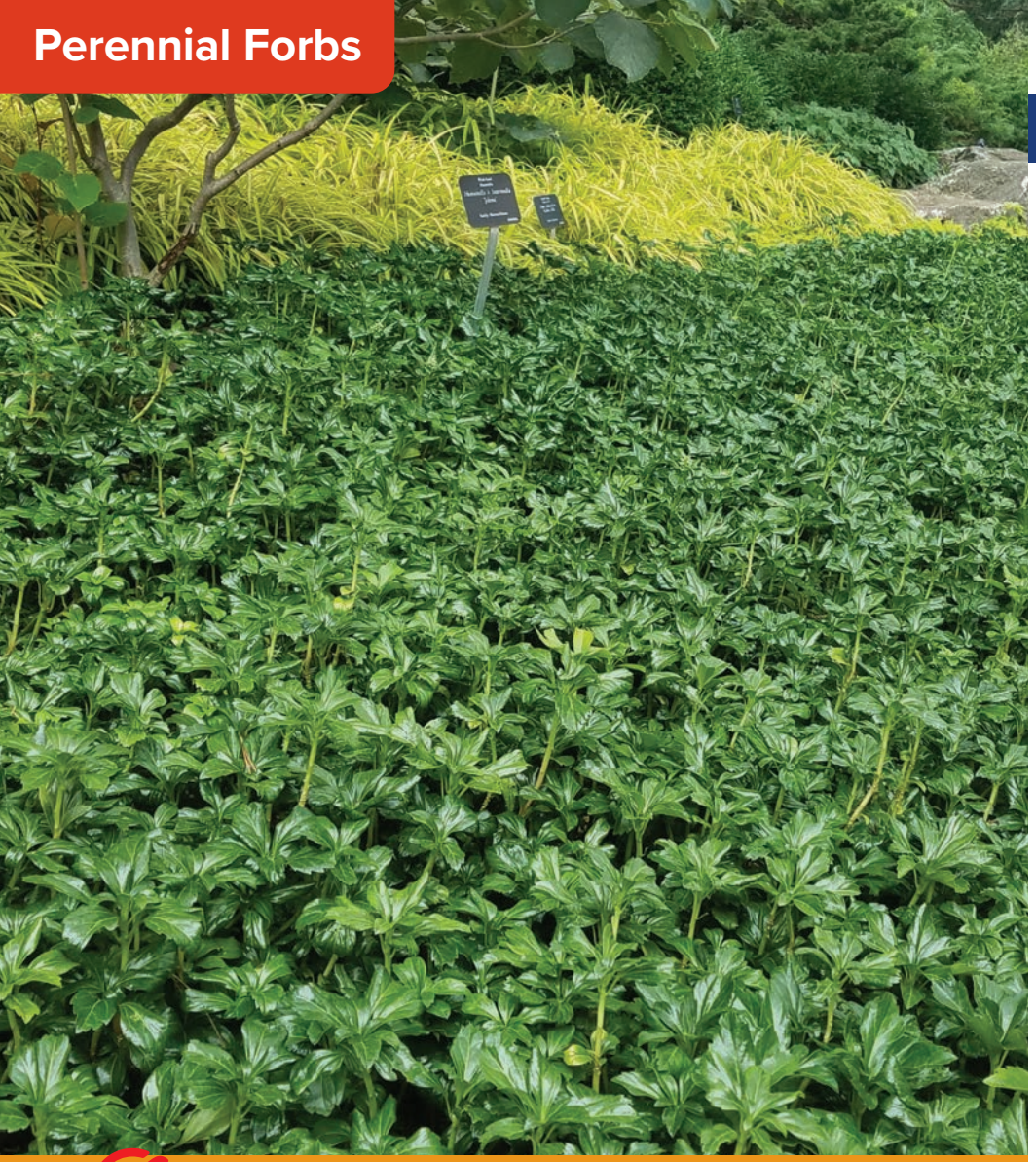
### Purple Poppy-Mallow, Winecups (*Callirhoe involucrata*)

- **Primary Root System:** spreading
- **Max Height (ft):** 3
- **Flower Color:** white, pink, purple
- **Bloom Time:** May - June
- **Soil Type:** well-drained, sandy, loam, clay
- **Soil Moisture:** dry, moist
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 4 to 8

**More Information:** special value to native bees; attracts butterflies, larval host for several moth species; excellent for use as a bedding plant or mixed in a grassy area; does well in a hanging basket; easily grown, long-lasting blooms.

### Other Native Alternatives

Downy Skullcap (*Scutellaria incana*), Great Blue Lobelia (*Lobelia siphilitica*), Slender Mountain Mint (*Pycnanthemum tenuifolium*).



## Non-native

**Japanese Pachysandra (*Pachysandra terminalis*)**

Japanese pachysandra is a non-native species of pachysandra commonly sold in nurseries and garden centers. This shrubby evergreen ground cover grows 8-12 inches tall and spreads via rhizome roots. This common landscaping plant has a native alternative that will add beauty to the landscape while enriching the surrounding ecosystem.



## Native Alternatives

**Allegheny Pachysandra, Allegheny Spurge, Mountain Spurge (*Pachysandra procumbens*)**

- **Primary Root System:** rhizome
- **Max Height (ft):** 1
- **Flower Color:** white, pink
- **Bloom Time:** March - May
- **Soil Type:** moist, humus-rich, acidic
- **Soil Moisture:** moist
- **Light Requirements:** part shade, shade
- **Hardiness Zones:** 4 to 5

**More Information:** well adapted, low ground cover for woodland or shaded gardens; fragrant flowers and evergreen foliage.

Allegheny Pachysandra (*Pachysandra procumbens*)

## Non-native

**Lemon Coral Sedum, or Sedum (*Sedum mexicanum*)**

Lemon coral sedum, or sedum, is a common non-native annual ornamental species. They produce yellow blossoms from April to September and grow 1 foot tall. Native to South America, sedums thrive in hardiness zones 7 – 11.



## Native Alternatives

**Stonecrop (*Sedum ternatum*)**

- **Primary Root System:** creeping
- **Max Height (ft):** 1
- **Flower Color:** white
- **Bloom Time:** March - June
- **Soil Type:** thin, limey
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 4 to 8

**More Information:** attracts butterflies; spreading ground cover needs little to no maintenance; tolerant of deer, rabbits, drought, and air pollution.

Stonecrop (*Sedum ternatum*)

## Non-native

**Orange Daylily, Outhouse Lilies**
***(Hemerocallis fulva, Hemerocallis lilioasphodelus L.)***

Orange daylilies are common non-native ornamental species that grow up to 2.5 feet. They have orange showy flowers that bloom in July - August and prefer moist, well-draining soils in partly shaded areas. This invasive species originates from Asia and thrives in hardiness zones 3 – 9. Although garden centers and greenhouses rarely sell varieties that easily spread, they may be traded amongst home gardeners.



## Native Alternatives

### Butterfly Weed (*Asclepias tuberosa*)

- **Primary Root System:** clumping
- **Max Height (ft):** 3
- **Flower Color:** orange, yellow
- **Bloom Time:** May - September
- **Soil Type:** well-drained, sandy
- **Soil Moisture:** dry, moist
- **Light Requirements:** sun
- **Hardiness Zones:** 3 to 9

**More Information:** attracts butterflies and hummingbirds; larval host of multiple butterfly species; special value to native bees and honeybees; supports conservation biological control (attracts predatory insects that feed on pests); tolerant of drought.

### Turk's Cap Lily (*Lilium michiganense*)

- **Primary Root System:** rhizome
- **Max Height (ft):** 6
- **Flower Color:** red, orange, yellow
- **Bloom Time:** June - August
- **Soil Type:** fertile, moist, cool
- **Soil Moisture:** moist
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 4 to 8

**More Information:** attracts hummingbirds; thrives in rain gardens; useful in shadier areas as opposed to orange daylily's full sun preference; plant bulbs 5-6 inches deep in the fall.

### Other Native Alternatives

Cardinal Flower (*Lobelia cardinalis*), Scarlet Beebalm (*Monarda didyma*), Summer Phlox (*Phlox paniculata*), Wild Bergamot (*Monarda fistulosa*), Wood Lily (*Lilium philadelphicum*).

## Non-native

**Russian Sage, *Perovskia* (*Salvia Yangii, Perovskia atriplicifolia*)**

Russian sage is a non-native ornamental species that can grow 3 – 5 feet tall. It produces lavender – blue flowers that bloom in July to October, and prefers dry to medium, well-draining soils in full sun areas. This ornamental species originates from the Himalayas and Northern China and thrives in hardiness zones 5 – 9.



## Native Alternatives

**Downy Skullcap (*Scutellaria incana*)**

- **Primary Root System:** rhizome
- **Max Height (ft):** 3
- **Flower Color:** purple-blue
- **Bloom Time:** June - September
- **Soil Type:** dry to medium
- **Soil Moisture:** slightly acidic
- **Light Requirements:** full sun to part shade
- **Hardiness Zones:** 5 to 7

**More Information:** ideal in shady areas; attracts deer.

Downy Skullcap (*Scutellaria incana*)

### Aromatic Aster (*Aster oblongifolius*)

- **Primary Root System:** clumping
- **Max Height (ft):** 3
- **Flower Color:** purple, violet
- **Bloom Time:** September - November
- **Soil Type:** rocky, sandy, well-drained
- **Soil Moisture:** dry to moist
- **Light Requirements:** full sun to part shade
- **Hardiness Zones:** 3 to 8

**More Information:** special value to native bees; supports conservation biological control (attracts predatory insects that feed on pests); tolerant of drought, erosion, clay soil, dry soil, shallow-rocky soil; creates mounds of purple flowers in the fall; thin regularly to control.

### Blazing Star, Dense Blazing Star (*Liatris spicata*)

- **Primary Root System:** clumping
- **Max Height (ft):** 6
- **Flower Color:** purple
- **Bloom Time:** July - November
- **Soil Type:** acidic
- **Soil Moisture:** moist
- **Light Requirements:** full sun
- **Hardiness Zones:** 3 to 8

**More Information:** attracts birds, hummingbirds, and butterflies; special value to native bees and bumblebees; tolerant of drought and clay soil; useful in perennial borders, native plant gardens, cottage gardens, prairies, and for cut or dried flower arrangements.



Other Native Perennial Species

### Coral Bells (*Heuchera americana*)

- **Primary Root System:** clumping
- **Max Height (ft):** 3
- **Flower Color:** red, green, purple, brown
- **Bloom Time:** March - August
- **Soil Type:** well-drained, humus-rich, acidic, sometimes rocky
- **Soil Moisture:** dry, moist
- **Light Requirements:** part shade, sun
- **Hardiness Zones:** 4 to 9

**More Information:** attractive foliage, beneficial in rock gardens for color and contrast, good plant for edging, ground cover.

### Dittany (*Cunila origanoides*)

- **Primary Root System:** clumping, spreading
- **Max Height (ft):** 1.5
- **Flower Color:** pink, white, purple
- **Bloom Time:** June - November
- **Soil Type:** shallow, rocky
- **Soil Moisture:** dry to moist
- **Light Requirements:** full sun, part shade
- **Hardiness Zones:** 5 to 8

**More Information:** attracts butterflies; tolerant of drought, dry soil, shallow-rocky soil; showy flowers, fragrant leaves; interesting addition to perennial herb garden, borders, rock gardens, and native plant gardens.

### Downy Alumroot (*Heuchera pubescens*)

- **Primary Root System:** clumping
- **Max Height (ft):** 3
- **Flower Color:** white, pink, yellow
- **Bloom Time:** May - June
- **Soil Type:** rich
- **Soil Moisture:** moist
- **Light Requirements:** part sun
- **Hardiness Zones:** 4 to 9

**More Information:** perennial herb can also replace hostas in landscaping.

### Eastern Purple Coneflower (*Echinacea purpurea*)

- **Primary Root System:** clumping
- **Max Height (ft):** 4
- **Flower Color:** pink, purple
- **Bloom Time:** April - September
- **Soil Type:** well-drained, sandy, rich
- **Soil Moisture:** dry
- **Light Requirements:** sun, part shade
- **Hardiness Zones:** 3 to 8

**More Information:** attracts butterflies, hummingbirds, and seed-eating birds; tolerant of drought, clay soils, dry soils, and shallow-rocky soils.



Other Native Perennial Species

### False Solomon's-seal (*Maianthemum racemosum*)

- **Primary Root System:** clumping
- **Max Height (ft):** 4
- **Flower Color:** white
- **Bloom Time:** March - June
- **Soil Type:** humus-rich, acidic
- **Soil Moisture:** moist
- **Light Requirements:** part shade to full shade
- **Hardiness Zones:** 3 to 8

**More Information:** birds and small mammals eat the berries, deer browse the leaves; showy, fragrant flowers; best used in wild gardens, native plant gardens, and woodland gardens; effective alongside ferns and hostas; can be grown in shady borders or moist areas near water gardens, streams, or ponds.

### Golden Alexander (*Zizia aurea*)

- **Primary Root System:** clumping
- **Max Height (ft):** 3
- **Flower Color:** yellow
- **Bloom Time:** April - August
- **Soil Type:** sandy, sandy-clay
- **Soil Moisture:** moist
- **Light Requirements:** full sun to part shade
- **Hardiness Zones:** 3 to 8

**More Information:** attracts butterflies; larval host for the Black Swallowtail (*Papilio polyxenes*); special value to native bees; supports biological control (attracts predatory insects that feed on pests); moderately deer resistant; does well in open woodland areas, prairies, and native plant gardens.

### Green and Gold (*Chrysogonum virginianum*)

- **Primary Root System:** rhizome
- **Max Height (ft):** 1
- **Flower Color:** yellow
- **Bloom Time:** April – October (rarely blooms for more than a few weeks)
- **Soil Type:** well-drained, acidic
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 5 to 9

**More Information:** tolerant of heavy shade; excellent use as edging plant or ground cover for rock gardens, woodland gardens, and rain gardens; requires containment plans; serves as a substitute for marigold (*Tagetes* spp.), a popular non-native annual forb.

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### Longstalk Tickseed (*Coreopsis lanceolata*)

- **Primary Root System:** clumping
- **Max Height (ft):** 2
- **Flower Color:** yellow
- **Bloom Time:** March - August
- **Soil Type:** sandy, gravelly, clay
- **Soil Moisture:** dry
- **Light Requirements:** sun, part shade, shade
- **Hardiness Zones:** 3 to 8

**More Information:** attracts butterflies; excellent meadow species; drought tolerant; only native to Western Pennsylvania.



Other Native Perennial Species

### Nodding Onion (*Allium cernuum*)

- **Primary Root System:** clumping
- **Max Height (ft):** 1.5
- **Flower Color:** pink
- **Bloom Time:** June - August
- **Soil Type:** well-draining, high organic matter
- **Soil Moisture:** dry to medium
- **Light Requirements:** full sun, part shade
- **Hardiness Zones:** 4 to 8

**More Information:** attracts butterflies; tolerant of deer, drought, dry soil, shallow-rocky soil, black walnut juglone.

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### Black-eyed Susan (*Rudbeckia fulgida*)

- **Primary Root System:** rhizome
- **Max Height (ft):** 4
- **Flower Color:** orange, yellow
- **Bloom Time:** July - October
- **Soil Type:** various
- **Soil Moisture:** moist
- **Light Requirements:** sun
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds; tolerant of drought, clay soils, dry soils, shallow-rocky soils, and air pollution.

### Prairie Petunia (*Ruellia humilis*)

- **Primary Root System:** spreading
- **Max Height (ft):** 2
- **Flower Color:** purple
- **Bloom Time:** May - September
- **Soil Type:** variable
- **Soil Moistur**e: moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 4 to 8

**More Information:** attracts butterflies, larval host for the Buckeye butterfly (*Junonia coenia*); serves as a substitute for the petunia (*Petunia* spp.), a popular non-native annual forb.

### Narrow-leaved Primrose, Sundrops (*Oenothera fruticosa*)

- **Primary Root System:** clumping, spreading
- **Max Height (ft):** 1.5
- **Flower Color:** yellow
- **Bloom Time:** May - June
- **Soil Type:** well-draining, acidic
- **Soil Moisture:** dry to medium moisture
- **Light Requirements:** sun
- **Hardiness Zones:** 4 to 9

**More Information:** special value to native bees; attracts hummingbirds; excellent full sun cover; tolerant of drought, poor soils, and light shade; serves as a substitute for the petunia (*Petunia* spp.), a popular non-native annual forb.



Other Native Perennial Species

### Summer Phlox (*Phlox paniculata*)

- **Primary Root System:** clumping
- **Max Height (ft):** 6
- **Flower Color:** white, pink, purple
- **Bloom Time:** June - October
- **Soil Type:** organic loam
- **Soil Moisture:** moist
- **Light Requirements:** sun
- **Hardiness Zones:** 4 to 8

**More Information:** attracts birds, hummingbirds, butterflies; tolerant of deer, clay soil, and black walnut juglone; serves as a substitute for geranium (*Pelargonium* spp.), a popular non-native annual forb.

### Sweet Pepperbush (*Clethra alnifolia*)

- **Primary Root System:** clumping, suckering
- **Max Height (ft):** 6
- **Flower Color:** pink, white
- **Bloom Time:** July - August
- **Soil Type:** acidic, sands, clays
- **Soil Moisture:** moist, wet
- **Light Requirements:** full sun, part shade, full shade
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds, butterflies, and hummingbirds; special value to native bees, bumble bees, and honeybees; pollinators use flowers; many birds and mammals eat fruit; fragrant, showy summerflowers, outstanding fall color; tolerant of heavy shade, erosion, clay or wet soils; new wood growth.

## Other Native Perennial Species

### Tall Coreopsis (*Coreopsis tripteris*)

- **Primary Root System:** clumping, rhizome
- **Max Height (ft):** 9
- **Flower Color:** yellow
- **Bloom Time:** July - September
- **Soil Type:** sandy, loamy, clay
- **Soil Moisture:** dry, moist, well-draining
- **Light Requirements:** part shade
- **Hardiness Zones:** 3 to 8

**More Information:** attracts butterflies; deer tolerant; can be an aggressive self-seeder; ideal for border areas.

### Wild Geranium (*Geranium maculatum*)

- **Primary Root System:** clumping
- **Max Height (ft):** 3
- **Flower Color:** white, pink, purple
- **Bloom Time:** March - July
- **Soil Type:** rich, acidic
- **Soil Moisture:** moist
- **Light Requirements:** part shade, sun
- **Hardiness Zones:** 3 to 8

**More Information:** attracts butterflies, tolerant of deer, rabbits, drought, and dry soil; serves as a substitute for geranium (*Pelargonium* spp.), a popular non-native annual forb.



## Other Non-native Perennial Species

### Bulbs of Concern (*Geophtyes*)

Many of these bulbs, or Geophytes, can take the place of important spring ephemerals (emerging for only a short time). Native spring ephemerals like foamflower (*Tiarella cordifolia*) and mayapple (*Podophyllum peltatum*) are critical to insects searching for food when the snow begins to melt.

- Italian arum, Italian lords & ladies (*Arum italicum*)
- Summer snowflake (*Leucojum aestivum*)
- Grape hyacinth (*Muscari botryoides*)
- Spanish bluebell (*Hyacinthoides hispanica*)
- Lily of the valley (*Convallaria majalis*)

Grape Hyacinth

### Carpet Bugle, Bugleweed (*Ajuga reptans*)

These species are native to Europe and Northern Africa. This is a dense growing and rapid spreading plant that is often used as ground cover in landscaping. They are listed as invasive in Maryland and West Virginia and should not be planted in Pennsylvania.

### Chameleon Plant, Rainbow Plant (*Houttuynia cordata*)

These species have a creeping habit and spread quickly by rhizome roots. They can continuously spread once planted and can be difficult to control and remove. If planted, a containment plan should be considered such as container plantings in the ground near physical barriers such as sidewalks and driveways.

### Common Wormwood, Absinthe (*Artemisia absinthium*)

This herbaceous perennial is native to Eurasia and Northern Africa. Several Midwest states have listed it as noxious. This plant can grow in disturbed soils and a variety of habitats, and it easily invades open sites such as pastures, rangelands, crop land, stream banks, and more. Each stem can produce up to 50,000 seeds which are small and easily scattered by wind, water, and animals.

**Dames Rocket (*Hesperis matronalis*)**
This species is primarily sold as seed. Although not commonly sold in nurseries, this perennial is readily available for sale online. Often mistaken for a native wildflower, this plant invades woodland prairies, roadsides, ditches, and other habitats. It is known to be invasive in Pennsylvania, and it should be avoided in landscaping. Seed packets may also contain *L. matronalis* so be sure to check the list of species in any seed packet before planting.

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**Exotic Lythrum species, including Purple Loosestrife (*Lythrum salicaria L.*), European Wand Loosestrife (*Lythrum salicaria complex and Lythrum virgatum L.*), their cultivars, and any combination thereof.**
These are Class B noxious weeds in Pennsylvania, making it illegal to propagate and sell them. However, these species can still sometimes be found for sale. These species are highly invasive and create monocultures along stream banks and other natural waterways. Purchasing or trading these invasive species with other gardeners is highly discouraged. Encourage others to remove this plant from their landscapes and gardens and properly destroy it.

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**Golden Creeping Jenny (*Lysimachia nummularia 'Aurea'*)**
Golden creeping jenny has many other common names including creeping charlie, moneywort, wandering jenny, etc. This creeping ground cover can invade garden beds through spreading rhizome roots. Although it prefers moist habitats such as wet meadows, swamps, stream banks, and ponds, it can invade drier areas. If planted, a containment plan should be considered to prevent spread.



Other Non-native Perennial Species

**Variegated Bishop's Weed, Goutweed (*Aegopodium podagraria*)**
Goutweed is native to Europe, and spreads via aggressive roots that produce stolons. Removal attempts, via digging, can prove to be counterproductive because new growth can occur from plant parts. This plant is listed as invasive in Pennsylvania and should not be planted.

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**Variegated Knotweed (*Reynoutria japonica 'Variegata', Polygonum japonicum 'Variegata', and Fallopia japonica 'Variegata'*)**
This is a cultivar of Japanese knotweed (*Fallopia japonica, Polygonum cuspidatum*). Japanese knotweed is a Class B noxious weed in Pennsylvania, meaning it is illegal to sell or propagate it. These species are highly invasive and create monocultures along natural waterways, roadsides, and many other habitats. Japanese knotweed and the cultivar, variegated knotweed, should not be propagated or sold. Gardeners are encouraged to remove this highly invasive species from their landscapes.

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**Yellow Archangel, Deadnettle, Lamium (*Lamium maculatum, formerly Lamiastrum galeobdolon*)**
These species are native to Eurasia and are a popular garden plant. Several states in the Pacific Northwest have listed this member of the mint family as a noxious weed due to its escape and invasion of forested natural areas.

Little Bluestem (*Schizachyrium scoparium*)

# Grasses

**Grasses are a large family (*Poaceae* spp.) of low-growing, non-woody plants. Many rushes (*Juncaceae* spp.) and sedges (*Cyperaceae* spp.) are also included in the general grass category. There are approximately 10,000 species considered to be true grasses. Economically, grasses are one of the most important flowering plants because they provide nutritious grains, soil formation, and erosion prevention by forming deep roots. Grasses also provide forage and shelter for wildlife, construction materials for furniture and utensils, and food for humans.**



## The Value of Grasses in a Landscape

Eastern Gamagrass (*Tripsacum dactyloides*)

**Aesthetics:** Although grasses and sedges don't typically hold showy, colorful flowers, they add a pop of greenery and can be excellent fillers for connecting gaps between vibrant species, adding texture to a landscape. Grasses and sedges are also known for adding contrast between perennials and for the sound and movement they add to landscape. Some grasses and sedges produce beautiful showy flowers in a range of seasons that will bring life and connection to a landscape. Many native grasses grow in bunches that help to fill in gaps between flowering plants, and varying heights of grasses can add depth to a landscape. Grasses grow quickly and can be used for borders and as a living screen to hide unsightly home features or infrastructure.

Bottlebrush Grass (*Elymus hystrix*)

**Soil Benefits:** Native grasses assist in maintaining a healthy, nutrient-rich soil system in gardens and landscapes. They produce extensive root systems up to 16 inches deep that improve stability and reduce erosion, while also allowing themselves to withstand drought.

**Wildlife Benefits:** Although many grasses and sedges don't produce the showy flowers associated with attracting bees, butterflies, and birds, they provide other benefits to backyard visitors. For example, bees nest in grass stems and underground structures and some butterfly species such as the Bunchgrass Skipper (*Problema byssus*) utilize grasses as larval hosts. The cover of grasses between other native plants also provides habitat and shelter for small mammals, birds, insects, and even reptiles.

Many grasses are cultivated and used as turfgrass for standard lawns, or as ornamental additions to landscapes. Native grass, sedge, and rush alternatives are provided for different types of landscapes and uses.

## Non-native

**Blue Lyme Grass (*Leymus arenarius*, formerly *Elymus arenarius*)**

Blue lyme grass is a cool-season grass that is native to Europe. It is hardy in zones 3 to 10. This plant is invasive along coastal regions of the United States, including the Great Lakes region and the Atlantic coast, where it displaces native beach grasses.



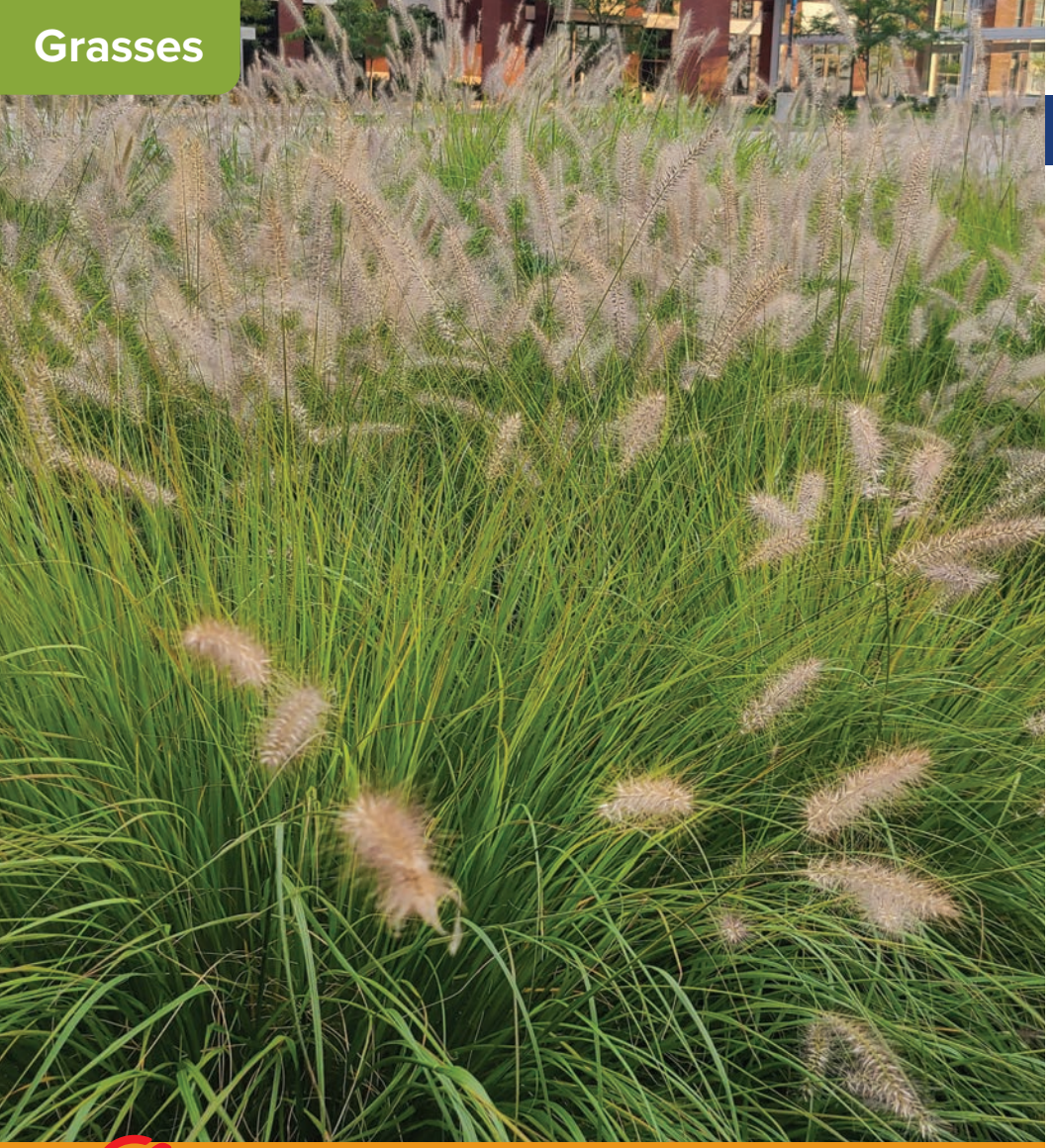
## Native Alternatives

**Little Bluestem (*Schizachyrium scoparium*)**

- **Max Growth Height (ft):** 7
- **Flower Color:** white, green, brown
- **Bloom Time:** June - December
- **Soil Type:** well-drained, sandy-loam, clay
- **Soil Moisture:** dry
- **Light Requirements:** full sun to part shade
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds and butterflies; larval host for several butterfly species; provides graze, cover, nesting material, and seeds for birds and small mammals; resistant to deer, drought, erosion, dry soil, shallow-rocky soil, black walnut juglone, and air pollution.

Little Bluestem (*Schizachyrium scoparium*)



## Non-native

**Fountain Grass (*Pennisetum* spp.); *Cenchrus alopecuroides* and other non-native *Cenchrus* species; formerly classified as *Pennisetum alopecuroides* and still commonly sold under this name.**

Fountain grass is an ornamental grass that grows up to 5 feet tall. It has been reported as spreading by seed in several mid-Atlantic states. This non-native species originates from Asia and Australia and thrives in hardiness zones 6 – 9.



## Native Alternatives

### Bottlebrush Grass (*Elymus hystrix*)

- **Max Growth Height (ft):** 5
- **Flower Color:** green
- **Bloom Time:** June - August
- **Soil Type:** loam
- **Soil Moisture:** dry to moist
- **Light Requirements:** full sun, part shade
- **Hardiness Zones:** 5 to 9

**More Information:** attracts butterflies; larval host for Northern Pearly-eye (*Enodia anthedon*); does well in woodland gardens alongside other species that filter light; tolerant of drought, heavy shade, erosion, dry soil, black walnut juglone, and air pollution.

### Little Bluestem (*Schizachyrium scoparium*)

- **Max Growth Height (ft):** 7
- **Flower Color:** white, green, brown
- **Bloom Time:** June - December
- **Soil Type:** well-drained, sandy-loam, clay
- **Soil Moisture:** dry
- **Light Requirements:** full sun to part shade
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds and butterflies; larval host for several butterfly species; provides graze, cover, nesting material, and seeds for birds and small mammals; resistant to deer, drought, erosion, dry soil, shallow-rocky soil, black walnut juglone, and air pollution.

### Other Native Alternatives

Pennsylvania Sedge (*Carex pensylvanica*), Pink Muhlygrass (*Muhlenbergia capillaris*), Prairie Dropseed (*Sporobolus heterolepis*), Tufted Hairgrass (*Deschampsia cespitosa*).

## Non-native

**Maiden Grass, Chinese Silver Grass, Zebra Grass, Porcupine Grass (*Miscanthus* spp.)**

These ornamental grasses spread aggressively into native habitats outside of landscaped areas, and outcompete native perennials for space and resources, creating a single dominant species in the landscape, or monoculture, that reduces biodiversity. While researchers have developed several sterile, non-spreading varieties, the native alternatives provide greater benefit to the surrounding ecosystem.



## Native Alternatives

### Big Bluestem (*Andropogon gerardii*)

- **Max Growth Height (ft):** 8
- **Flower Color:** white, green, brown
- **Bloom Time:** August - November
- **Soil Type:** well-drained, sandy, loamy, clay
- **Soil Moisture:** moist
- **Light Requirements:** full sun to part shade
- **Hardiness Zones:** 4 to 9

**More Information:** attracts birds and butterflies; larval host to several butterfly species; provides cover and nesting habitat for songbirds, sparrows, wrens, and more; tolerant of deer browse, drought, erosion, dry soil, black walnut juglone, and air pollution.

### Eastern Gamagrass (*Tripsacum dactyloides*)

- **Max Growth Height (ft):** 12
- **Flower Color:** purple, orange
- **Bloom Time:** April - September
- **Soil Type:** sandy, loamy, clay, calcareous, acid-based
- **Soil Moisture:** moist
- **Light Requirements:** part shade
- **Hardiness Zones:** 4 to 9

**More Information:** attracts butterflies and deer; larval host for Bunch-grass Skipper (*Problema byssus*); grows large and stately; cut back in winter but be cautious of the sharp leaf blade edges; adds size and texture to a shaded perennial border; may be grown in woodland gardens, meadows, prairies, naturalized areas and along the edges of ponds or streams; tolerant of black walnut juglone and air pollution.

### Other Native Alternatives

Indiangrass (*Sorghastrum nutans*)

## Non-native

**Ravenna Grass (*Tripidium ravennae*, formerly *Erianthus ravennae* and *Saccharum ravennae*)**

Ravenna grass is an invasive grass that grows up to 12 feet tall. This plant is a threat because it spreads by seeds and populates roadsides and wood edges, outcompeting native plants. It is very difficult to mow for right of way managers. This plant is now on the Pennsylvania Noxious Weed List as a Class A noxious weed, meaning its propagation and sale is prohibited by law. However, it is widely distributed in landscapes throughout Pennsylvania.



## Native Alternatives

### Big Bluestem (*Andropogon gerardii*)

- **Max Growth Height (ft):** 8
- **Flower Color:** white, green, brown
- **Bloom Time:** August - November
- **Soil Type:** well-drained, sandy, loamy, clay
- **Soil Moisture:** moist
- **Light Requirements:** full sun to part shade
- **Hardiness Zones:** 4 to 9

**More Information:** attracts birds and butterflies; larval host to several butterfly species; provides cover and nesting habitat for songbirds, sparrows, wrens, and more; tolerant of deer browse, drought, erosion, dry soil, black walnut juglone, and air pollution.

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- **Soil Type:** sandy, loamy, clay, calcareous, acid-based
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### Other Native Alternatives

Indiangrass (*Sorghastrum nutans*)

## Non-native

**Reed Canary Grass (*Phalaris arundinacea variety picta 'Picta'*) and Variegated Ribbon Grass (*Phalaris arundinacea var. picta 'Feesey'*).**

These grasses spread by seed and rhizome root and can spread aggressively. The variegated ribbon grass has pink or white flowers that bloom June – July and prefers well-draining, clay, moist to wet soil types in sunny to partly shaded areas. This invasive ornamental species originates from northern and southern temperate regions but is considered invasive in Pennsylvania. Thrives in hardiness zones 4 – 9.



## Native Alternatives

### Bottlebrush Grass (*Elymus hystrix*)

- **Max Growth Height (ft):** 5
- **Flower Color:** green
- **Bloom Time:** June - August
- **Soil Type:** loam
- **Soil Moisture:** dry to moist
- **Light Requirements:** full sun, part shade
- **Hardiness Zones:** 5 to 9

**More Information:** attracts butterflies; larval host for Northern Pearly-eye (*Enodia anthedon*); does well in woodland gardens alongside other species that filter light; tolerant of drought, heavy shade, erosion, dry soil, black walnut juglone, and air pollution.

Bottlebrush Grass (*Elymus hystrix*)

# Other Non-native Grass Species

**These grasses are invasive and should not be planted in Pennsylvania.**

### Bamboo Species (*Phyllostachys aurea, P. aureosulcata, and P. bambusoides*)

Bamboos are grasses and several species are currently listed as invasive species in Pennsylvania, including *Phyllostachys aurea*, *P. aureosulcata*, and *P. bambusoides*. Some states have listed the species and other bamboos as invasive, and some states have passed regulations prohibiting their sale.

### Giant Reed (*Arundo donax, Arundo donax 'Variegata'*)

This grass is extremely tall and spreads aggressively by rhizome roots in southern states. The variegated forms are less vigorous. They are not hardy throughout all of Pennsylvania, and cool winters do help to reduce its aggressive nature. Giant reed has been recognized and listed as an invasive species in the Eastern United States, including Pennsylvania.

### Japanese Blood Grass (*Imperata cylindrica 'Rubra', Imperata cylindrica 'Red Baron'*)

In Pennsylvania, Japanese blood grass is considered a Class C noxious weed. It cannot be sold, transported, planted, or otherwise propagated in Pennsylvania. However, previously planted dwarf red cultivars continue to appear in landscapes throughout Pennsylvania. Homeowners are encouraged to remove this species from their landscape and destroy it.



Big Bluestem (*Andropogon gerardii*)

# Aquatics

Cardinal Flower (*Lobelia cardinalis*)

Blue Flag Iris (*Iris versicolor*)

# Aquatic Plants

**When properly planned and maintained, water gardens can be attractive additions to a backyard landscape. Using native aquatic plants can provide habitat, food, and shelter for fish and amphibians.**



## Tips for Water Gardening with Native Plants

Water gardening is a popular hobby and one of the fastest growing areas of the aquarium trade. Water gardens are beautiful and promote feelings of peace and serenity, but they can also create accidental routes of non-native and invasive species introductions. Maintaining water gardens responsibly helps property owners maintain the health of the surrounding ecosystem while still enjoying a beloved hobby. Choosing native species for water gardens can promote local ecosystem diversity without introducing ornamentals or potentially invasive species to the watershed.

Invasive species can move out of a water garden in a variety of ways including direct release by the property owner, escape into a natural waterway after an extreme weather event including flooding and high winds, or improper disposal of unwanted plant material. The following tips will help construct and maintain a water garden so that these unintended consequences can be avoided.

Elodea (*Elodea canadensis*)

**Construction of a New Water Garden:**
Choose a location away from natural waterways and flood-prone areas to ensure that plants and animals from the water garden cannot escape during extreme weather events.

**Adding Plants:** Purchase plants from a licensed nursery and choose species that are native to the region or, at a minimum, not invasive. Take time to review the latest Noxious Weeds and Banned Species lists as plants and animals on these lists should never be purchased or transported due to their extremely invasive nature. Any purchased plants should be rinsed over a trash bin before adding them to the water garden to prevent the introduction of undesired eggs, small animals, and tiny plant pieces that may be hitching a ride.

**Maintenance:** Ensure the water garden is still isolated from natural waterways and flood-prone areas. Remove any uninvited plants and animals that may have colonized. To dispose of unwanted plants,


Woolgrass
(*Scirpus cyperinus*)

freeze in a sealed plastic bag, microwave for 30 seconds, allow them to desiccate indoors, or burn plant material. After the plant is sufficiently deceased, dispose of it in the trash. Composting will not always be a successful method of disposal due to seed and reproductive plant part survivability. Rehome unwanted fish and other animals through a pet retailer, animal shelter, or fellow water gardener. Animals should never be released from captivity into natural waterways, and it is illegal to do so into Pennsylvania waters without authorization.

### Additional Tips for Water Gardeners

- Be mindful to properly manage the pH, nutrients, *and organisms* introduced into the system.
- Remember, just because a plant or animal is invasive doesn't mean it can't be ordered online or purchased locally.
- Unwelcomed hitchhikers often accompany purchased plants. Plants and animals known to be invasive or prohibited in the state are often part of plant orders in the water or plant medium or used for packing.

If it seems likely that the plant has hitchhikers, you can clean emergent plants such as arrowhead (*Sagittaria* spp.) by dipping it in a 10% chlorine solution, swishing it around, and shaking it off. Rinse in tap water after 30 seconds. This technique should not be used on submerged plants like Elodea (*Elodea canadensis*).

Any hardy non-native plant or animal species may become the next problematic invasive species that can clog waterways and damage wildlife habitat. In addition, many closely related plants can hybridize with the native species, often passing on aggressive traits. Use native plants whenever possible.



## Tips for Selecting Plants

**Plant Selection:** Each plant should have a purpose because space is limited. Those purposes might be color, height, algae deterrents, creating visual interest, or improving the health of the water garden.

**Planting Methods:**

- Pockets are created during the construction of the water garden and hold aquatic plants in place. They are commonly found along the edges but can also be used in deeper areas to hold lilies. Plants eventually outgrow pockets and should be maintained to restrict plants to desired locations.
- Containers can be used like underwater pots for aquatic plants. Use regular topsoil without organic matter and containers with holes lined with burlap or landscaping fabric.

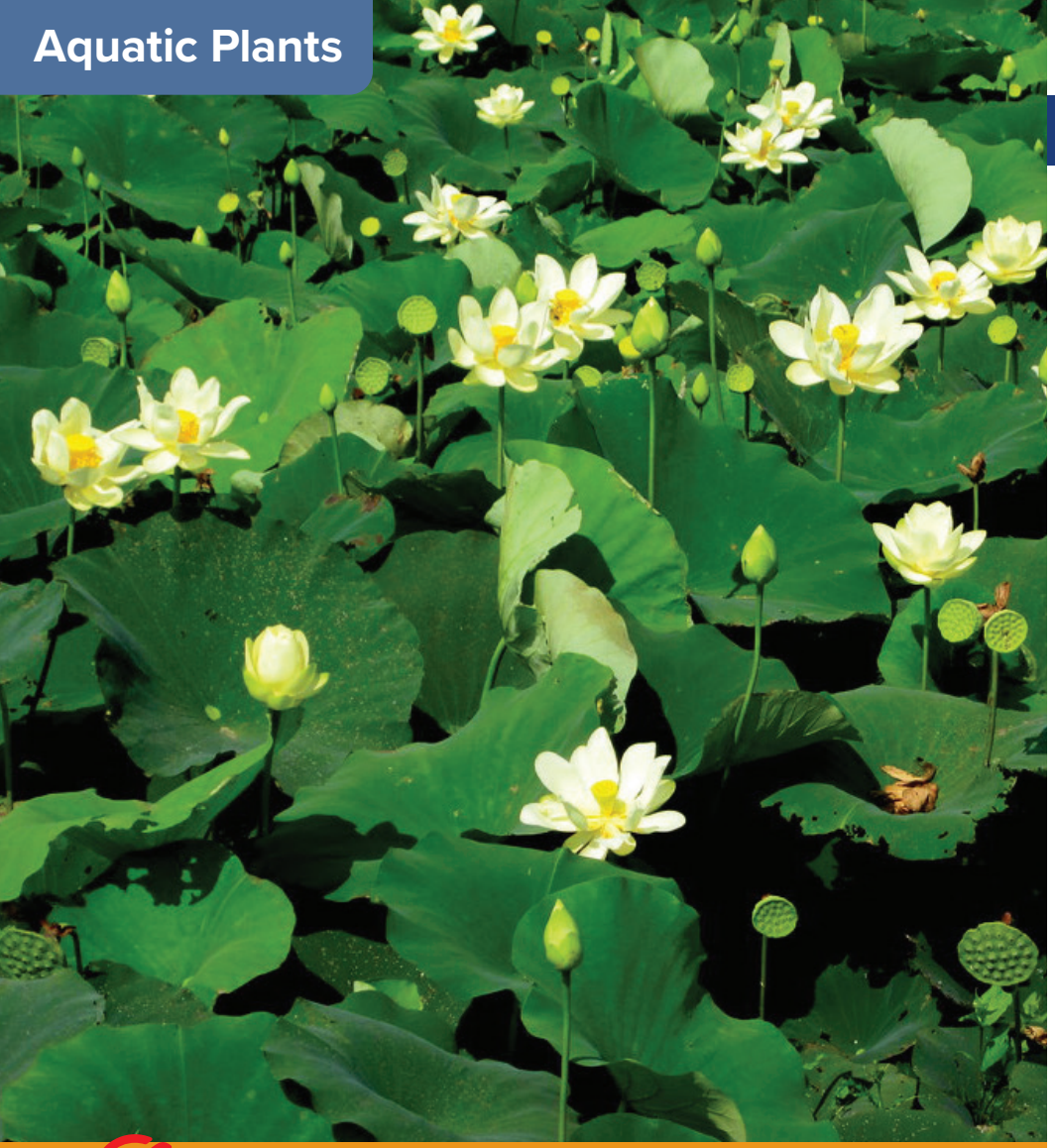
### Aquatic Plant Types

**Emergent Plants:** These rooted plants grow above the water's surface, but their roots are in soil or in the water. Examples include native broadleaf cattail (*Typha latifolia*) and spike rush (*Eliocharis palustris*).

**Floating:** These plants float on the water's surface and survive with little to no soil. They help extract nutrients from the water, act as natural filters, and control algal growth. Native duckweed species (*Lemna* spp.) are examples of floating plants.

**Shallow Marginal:** These plants can survive in 3 inches of standing water. They add color, height, and shape to water gardens, and can help cover up or hide in-ground structures. They can be planted directly into soil or in underwater pots. Examples include native blue flag iris (*Iris versicolor*) and pickerelweed (*Pontederia cordata*).

**Submerged:** These are considered oxygenators of water gardens. Typically rooted, these plants are sold as cuttings and take time to establish. They provide food and shelter for young fish and reduce algal growth by absorbing nutrients. They can be planted as free-floating to self-establish or in pots sunk to the bottom. Native elodea species such as *elodea canadensis* are examples of submerged plants.



## Non-native

**American Lotus (*Nelumbo lutea*)**

The American lotus is a floating leaf aquatic plant with large white-yellowish flowers, making it a popular water garden plant. While beautiful, it can expand rapidly and completely cover a one-acre pond in three to four years. This plant spreads via rhizome roots and seeds and is listed in several neighboring states as invasive. The American lotus is native to the southern United States, Central America, and the Caribbean.



## Native Alternatives

### Fragrant Water Lily (*Nymphaea odorata*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 5
- **Flower Color:** white, pink
- **Bloom Time:** March - October
- **Water Body Type:** bog, pond bottom, shallow water, water garden
- **Water Quality Needs:** somewhat acidic
- **Light Requirements:** sun, part shade, shade
- **Soil Type:** pond bottom with shallow water
- **Hardiness Zones:** 4 to 8

**More Information:** leaves provide shelter for fish and aquatic insects; muskrats may snack on stems; large, fragrant, showy flowers and flat, round leaves with long stems; reproduces via rhizome roots barely covered by soil.

### Pickerelweed, Pickerel Rush (*Pontederia cordata*)

- **Plant Type:** shallow marginal
- **Max Height (ft):** 4
- **Flower Color:** blue, purple
- **Bloom Time:** March - November
- **Water Body Type:** shallow water marshes, water gardens, bogs, ponds
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay, mud
- **Hardiness Zones:** 3 to 10

**More Information:** attracts bees, butterflies, and birds; flowers are showy and bloom throughout summer; can be divided regularly to keep from outgrowing desired space.

## Non-native

**Anchored Water Hyacinth (*Pontederia azurea*, formerly *Eichhornia azurea*)**

This rooted, perennial, aquatic plant was introduced to the United States through the water garden trade, and can be spread easily by fragmentation and hitchhiking. Anchored water hyacinth can form dense mats that block sunlight. This plant is on the Federal Noxious Weed list and should not be bought, sold, or propagated.



## Native Alternatives

### Pickerelweed, Pickerel Rush (*Pontederia cordata*)

- **Plant Type:** shallow marginal
- **Max Height (ft):** 4
- **Flower Color:** blue, purple
- **Bloom Time:** March - November
- **Water Body Type:** shallow water marshes, water gardens, bogs, ponds
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay, mud
- **Hardiness Zones:** 3 to 10

**More Information:** attracts bees, butterflies, and birds; flowers are showy and bloom throughout summer; can be divided regularly to keep from outgrowing desired space.

### Spatterdock, Yellow Pond Lily, Yellow Cow Lily (*Nuphar advena*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 1
- **Flower Color:** green-yellow
- **Bloom Time:** March - October
- **Water Body Type:** shallow lakes, ponds, bayous, bogs, streams
- **Light Requirements:** part shade
- **Soil Type:** sandy, loamy, and clay
- **Hardiness Zones:** 4 to 10

**More Information:** has small flowers; can survive shaded, deep waters; used in large ponds and water gardens; slowly establishes colonies with flat, leathery, heart-shaped leaves that float; produces underwater stems; reproduces via rhizome roots and seeds; best grown in containers for water gardens.

### Other Native Alternatives

Fragrant Water Lily (*Nymphaea odorata*)

## Non-native

**Brazilian Waterweed, Brazilian Elodea, Anacharis**
**(*Egeria densa, Elodea densa*)**

Brazilian waterweed, also sold as *Anacharis*, is a submerged aquatic perennial that can grow 10 ft or more as rooted or free-floating in depths up to 20 ft. Its showy flowers and oxygen generating capabilities make it widely used in aquariums or water gardens. All plants in the United States are male and can only reproduce vegetatively by fragmentation.



## Native Alternatives

**Coontail, Coon's Tail, Hornwort**
**(*Ceratophyllum demersum*)**

- **Plant Type:** submerged
- **Max Height (ft):** 12
- **Flower Color:** pink, yellow, blue
- **Bloom Time:** March - November
- **Water Body Type:** ponds, ditches
- **Water Quality Needs:** acid, neutral, and basic
- **Light Requirements:** part shade
- **Soil Type:** sandy, loamy, clay
- **Hardiness Zones:** 7 to 10

**More Information:** provides shelter for young fish; fast-growing, rooting perennial tolerates shade better than many other submerged aquatic plants; ideal for pond oxygenation; submerged but can be seen floating at surface; reproduces asexually and should be monitored to prevent growth outside desired area.

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**Elodea (native), Canadian Waterweed**
**(*Elodea canadensis*)**

- **Plant Type:** submerged
- **Max Height (ft):** 2
- **Flower Color:** white
- **Bloom Time:** June - August
- **Water Body Type:** water gardens, small ponds
- **Light Requirements:** sun
- **Hardiness Zones:** 4 to 10

**More Information:** can be grown anchored or free-floating in full sun water gardens; thrives in cool water; best controlled by planting in submerged containers and by clipping stems as needed; easy to control in smaller water gardens; not recommended for large ponds.

## Non-native

**Curly-leaf Pondweed (*Potamogeton crispus*)**

Curly-leaf pondweed was introduced in the mid-1800s by aquarium hobbyists. It is now reported throughout the United States and is widespread in Pennsylvania. Reproduction occurs through rhizomes, turions, and fragmentation. Turions can remain viable in sediment for years, until conditions are right and germination is triggered. This plant actively grows during winter months when most plants are dormant, giving it a competitive advantage. On occasion it can spread by the movement of seeds, which can pass through digestive systems of waterfowl and remain viable.



## Native Alternatives

**Broad-leaved Pond Weed; Floating Leaf Pondweed (*Potamogeton natans*)**

- **Plant Type:** partially submerged
- **Max Height (ft):** 1
- **Flower Color:** green
- **Bloom Time:** June - November
- **Water Body Type:** lakes, ponds, and ditches, highly organic substrate
- **Water Quality Needs:** mildly acidic, neutral, and basic
- **Light Requirements:** sun; does not tolerate shade
- **Soil Type:** sandy, loamy, and clay
- **Hardiness Zones:** 7 to 11

**More Information:** creates habitat for fish spawning; can be used as an oxygenator; fast growing, requires consistent monitoring to ensure remains in desired area.

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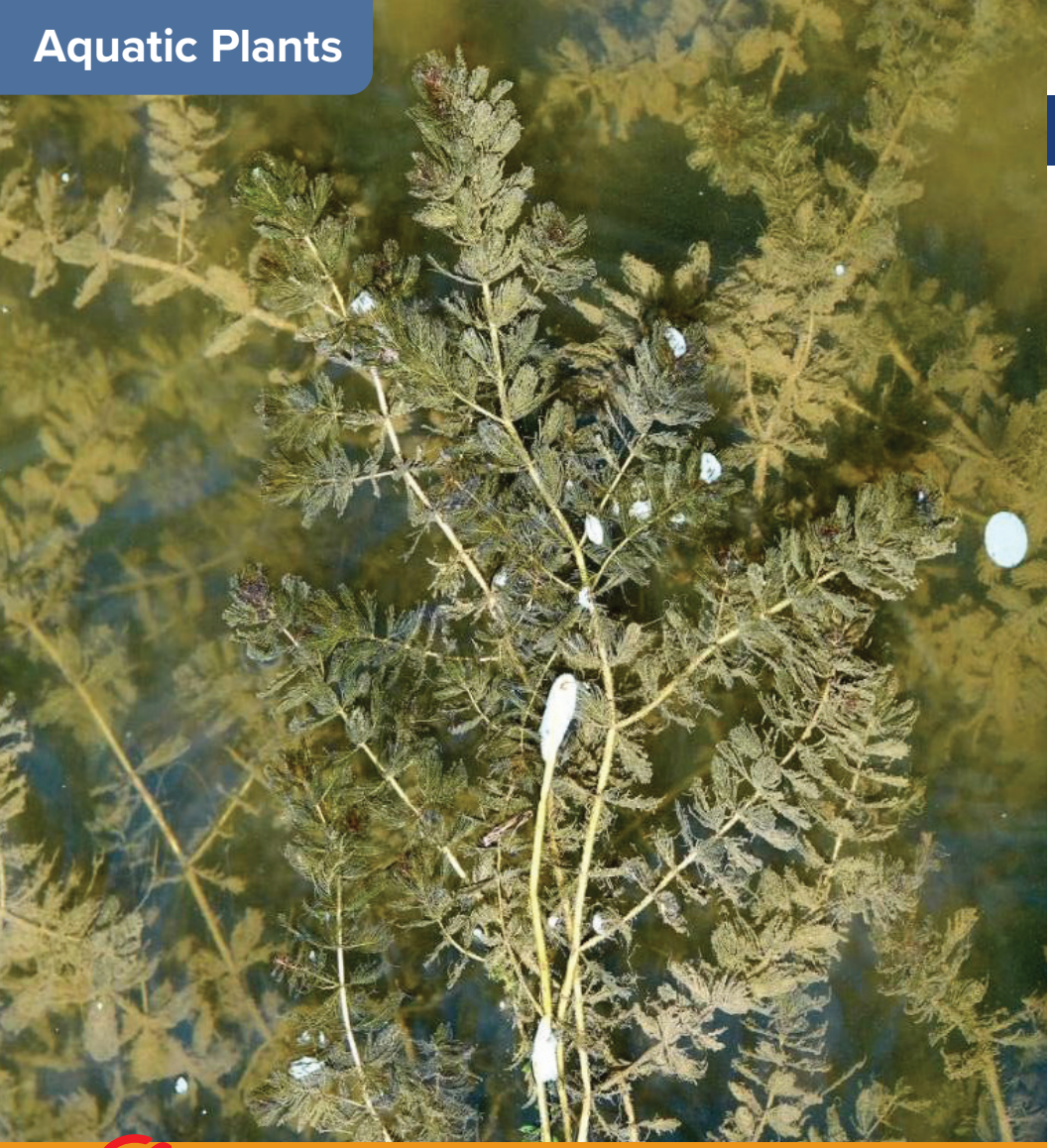
**Water Celery, Eelgrass, Tape Grass (*Vallisneria americana*)**

- **Plant Type:** submerged
- **Max Height (ft):** 6
- **Flower Color:** white
- **Bloom Time:** April - November
- **Water Body Type:** lakes, running streams, wetland gardens
- **Light Requirements:** sun, part shade
- **Soil Type:** wet
- **Hardiness Zones:** 4 to 10

**More Information:** provides habitat for aquatic animals; prefers semi-hard bottoms and survives in depths up to 15 feet; grows in July and August and leaves die back in winter.



## Non-native

**Eurasian Watermilfoil (*Myriophyllum spicatum*)**

Eurasian watermilfoil is a submerged aquatic plant whose roots attach firmly to underwater sediment. In Pennsylvania, these plants usually die back to their roots in winter. This plant may be confused with bladderworts, hornworts, mermaid weeds, and other leafy milfoils. It reproduces by fragmentation which can live for weeks if kept moist. Although not a popular water garden plant, Eurasian watermilfoil is readily available for online purchase.



## Native Alternatives

**Coontail, Coon's Tail, Hornwort (*Ceratophyllum demersum*)**

- **Plant Type:** submerged
- **Max Height (ft):** 12
- **Flower Color:** pink, yellow, blue
- **Bloom Time:** March - November
- **Water Body Type:** ponds, ditches
- **Water Quality Needs:** acid, neutral, and basic
- **Light Requirements:** part shade
- **Soil Type:** sandy, loamy, clay
- **Hardiness Zones:** 7 to 10

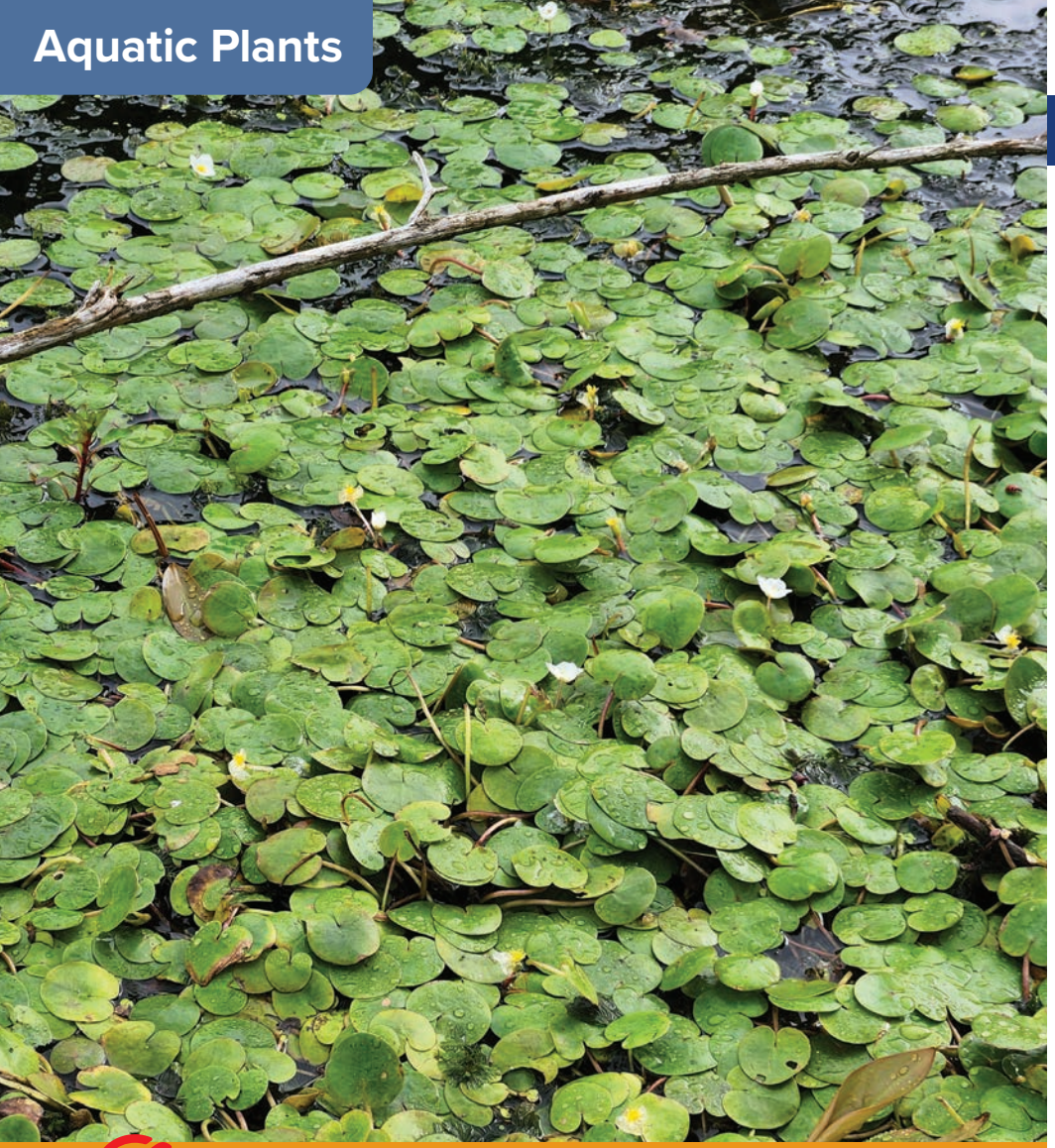
**More Information:** provides shelter for young fish; fast-growing, rooting perennial tolerates shade better than many other submerged aquatic plants; ideal for pond oxygenation; submerged but can be seen floating at surface; reproduces asexually and should be monitored to prevent growth outside desired area.

---

**Elodea (native), Canadian Waterweed (*Elodea canadensis*)**

- **Plant Type:** submerged
- **Max Height (ft):** 2
- **Flower Color:** white
- **Bloom Time:** June - August
- **Water Body Type:** water gardens, small ponds
- **Light Requirements:** sun
- **Hardiness Zones:** 4 to 10

**More Information:** can be grown anchored or free-floating in full sun water gardens; thrives in cool water; best controlled by planting in submerged containers and by clipping stems as needed; easy to control in smaller water gardens; not recommended for large ponds.



## Non-native

**European Frogbit (*Hydrocharis morsus-ranae*)**

European frogbit is a free-floating aquatic plant that resembles a miniature water lily. Dense floating mats restrict sunlight and nutrient availability. It reproduces through fragmentation or turions that spread or hitchhike. One plant can produce 100 to 150 turions per season, which float to the surface and begin to grow in spring. This popular water garden plant can escape enclosures and spread into natural waterways.



## Native Alternatives

### Fragrant Water Lily (*Nymphaea odorata*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 5
- **Flower Color:** white, pink
- **Bloom Time:** March - October
- **Water Body Type:** bog, pond bottom, shallow water, water garden
- **Water Quality Needs:** somewhat acidic
- **Light Requirements:** sun, part shade, shade
- **Soil Type:** pond bottom with shallow water
- **Hardiness Zones:** 4 to 8

**More Information:** leaves provide shelter for fish and aquatic insects; muskrats may snack on stems; large, fragrant, showy flowers and flat, round leaves with long stems; reproduces via rhizome roots barely covered by soil.

### Watershield (*Brasenia schreberi*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 3
- **Flower Color:** blue, purple
- **Bloom Time:** March - November
- **Water Body Type:** still waters, marshes, shallow water
- **Water Quality Needs:** lime-free
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay soils, mildly acidic, neutral
- **Hardiness Zones:** 3 to 10

**More Information:** food source for waterfowl; floating leaves provide shelter for fish and aquatic insects; small lily pad-like leaves float on the water's surface; long single root attaches to the bottom; submerged plant parts are coated in jelly-like substance that prevents it from drying out; can become weedy; emits chemical that can deter growth of nearby aquatic plants.

## Non-native

**Fanwort (*Cabomba caroliniana*)**

Fanwort is a fast-growing freshwater perennial that can be found rooted or floating in waters of up to 20 feet. It is persistent, aggressive, and competitive, forming dense mats. Although fanwort is not typically used in water gardening, it is a popular aquarium plant worldwide. This plant can become invasive in natural waterways if intentionally released from an aquarium or accidentally flooded out of a water garden.



## Native Alternatives

### Beck's Water Marigold (*Bidens beckii, Megalodonta beckii*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 6
- **Flower Color:** yellow, green, brown
- **Bloom Time:** July - September
- **Water Body Type:** lakes, ponds, slow-moving river
- **Light Requirements:** sun
- **Soil Type:** wet
- **Hardiness Zones:** 8 to 11

**More Information:** produces showy yellow flowers above the water's surface; submerged leaves are delicate and feathery; reproduces by fragmentation; good for use in shallow ponds and water gardens with mixed aquatic vegetation.

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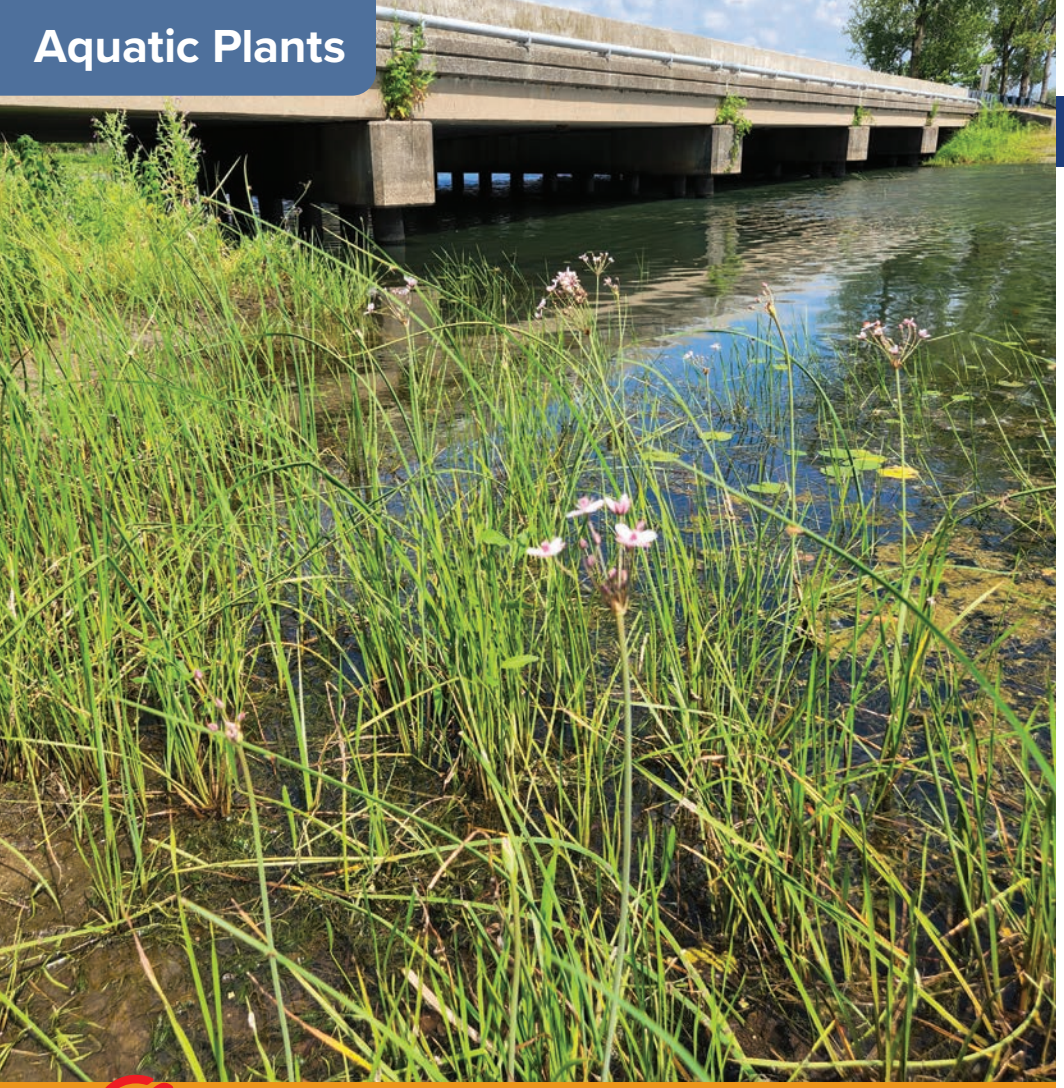
### Water Celery, Eelgrass, Tape Grass (*Vallisneria americana*)

- **Plant Type:** submerged
- **Max Height (ft):** 6
- **Flower Color:** white
- **Bloom Time:** April - November
- **Water Body Type:** lakes, running streams, wetland gardens
- **Light Requirements:** sun, part shade
- **Soil Type:** wet
- **Hardiness Zones:** 4 to 10

**More Information:** provides habitat for aquatic animals; prefers semi-hard bottoms and survives in depths up to 15 feet; grows in July and August and leaves die back in winter.



## Non-native

**Flowering Rush (*Butomus umbellatus*)**

Flowering rush is a perennial aquatic forb that can grow as an emergent plant along shorelines and a submerged plant in lakes and rivers. It is often unnoticed among other wetland plants until it blooms a distinctive spray of attractive flowers in late summer and early fall making it a popular late bloomer along water garden margins. Once in a watershed, flowering rush spreads by rhizome roots, root pieces, and seeds. Movement by wildlife, water, anglers, and boaters and its use as a water garden plant have contributed to its spread.



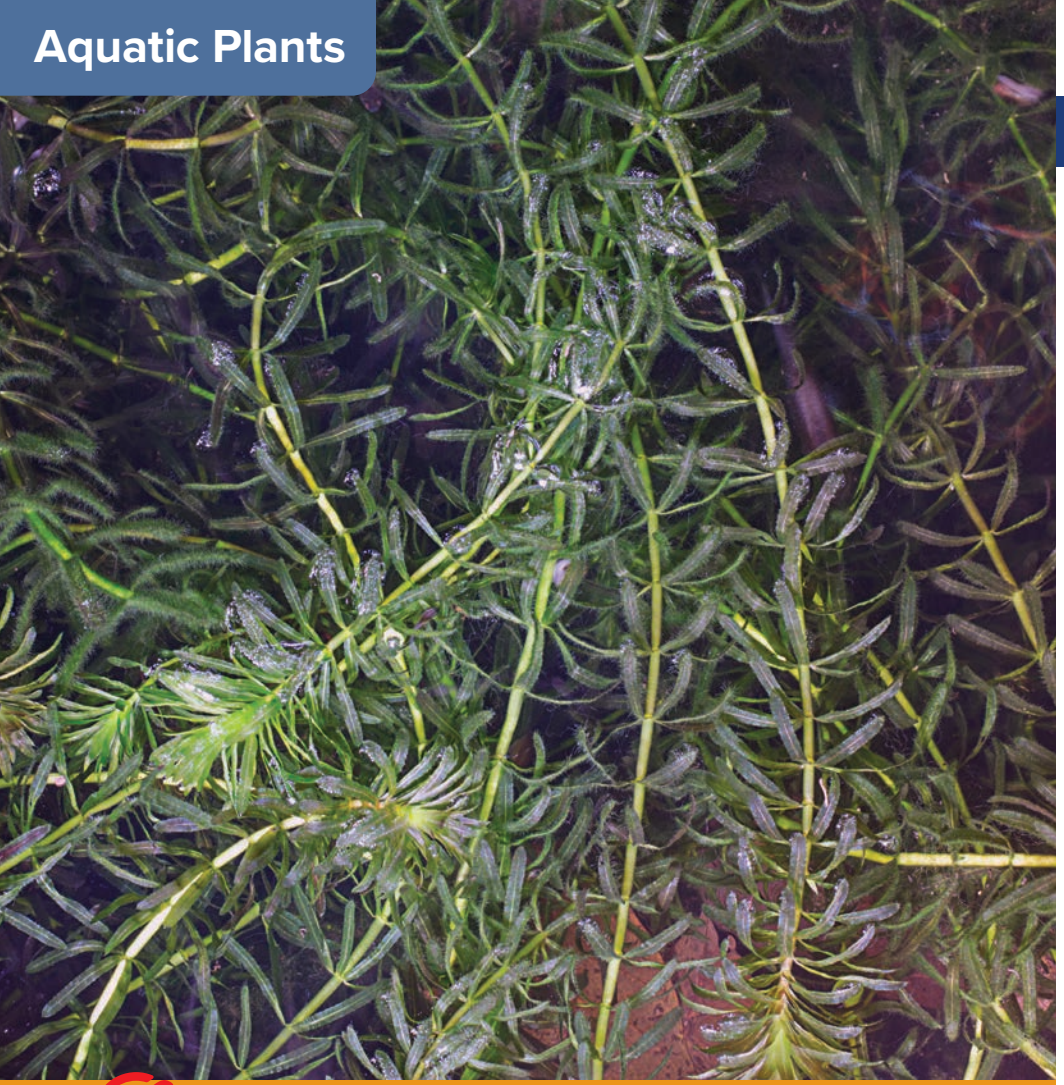
## Native Alternatives

**Spike Rush (*Eliocharis palustris*)**

- **Plant Type:** marginal, emergent
- **Max Height (ft):** 3
- **Flower Color:** green, brown
- **Bloom Time:** June - August
- **Water Body Type:** shore habitats
- **Water Quality Needs:** basic
- **Light Requirements:** part shade
- **Soil Type:** moist to wet, often alkaline, soils
- **Hardiness Zones:** 3 to 8

**More Information:** produces a small terminal flower; excellent for shore stabilization; used in water gardens, bog gardens, and along ponds and streams.

Spike Rush (*Eliocharis palustris*)



## Non-native

**Hydrilla (*Hydrilla verticillata*)**

Hydrilla is an aggressively growing perennial plant that roots to the bottom of water bodies at depths of up to 12 ft. Its long, branching stems reach up to the water's surface, where it quickly spreads and takes over. During the late growing season small white tubers form on the roots and store food, enabling the plant to over-winter. Hydrilla reproduces through fragmentation. Although listed on the Federal Noxious Weeds list, hydrilla is still bought and sold online as a "native elodea" for water gardens and ponds. Buyers should always double check scientific names and purchase from reputable sellers.



## Native Alternatives

**Coontail, Coon's Tail, Hornwort (*Ceratophyllum demersum*)**

- **Plant Type:** submerged
- **Max Height (ft):** 12
- **Flower Color:** pink, yellow, blue
- **Bloom Time:** March - November
- **Water Body Type:** ponds, ditches
- **Water Quality Needs:** acid, neutral, and basic
- **Light Requirements:** part shade
- **Soil Type:** sandy, loamy, clay
- **Hardiness Zones:** 7 to 10

**More Information:** provides shelter for young fish; fast-growing, rooting perennial tolerates shade better than many other submerged aquatic plants; ideal for pond oxygenation; submerged but can be seen floating at surface; reproduces asexually and should be monitored to prevent growth outside desired area.

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**Elodea (native), Canadian Waterweed (*Elodea canadensis*)**

- **Plant Type:** submerged
- **Max Height (ft):** 2
- **Flower Color:** white
- **Bloom Time:** June - August
- **Water Body Type:** water gardens, small ponds
- **Light Requirements:** sun
- **Hardiness Zones:** 4 to 10

**More Information:** can be grown anchored or free-floating in full sun water gardens; thrives in cool water; best controlled by planting in submerged containers and by clipping stems as needed; easy to control in smaller water gardens; not recommended for large ponds.

## Non-native

**Mudmat (*Glossostigma cleistanthum*)**

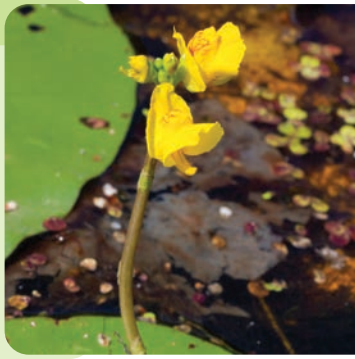
Mudmat is a low-growing, mat-forming, invasive aquatic plant characterized by tiny petals and bright green leaves. It closely resembles some native mudwort species and can also be confused with emergent forms of some bladderworts. Although mudmat is not typically used in water gardening, it is a popular aquarium plant and can become invasive in natural waterways if intentionally released from an aquarium or accidentally flooded out of a water garden.



## Native Alternatives

**Common Bladderwort (*Utricularia macrorhiza*)**

- **Plant Type:** partially submerged
- **Max Height (ft):** 3
- **Flower Color:** red, yellow
- **Bloom Time:** June - September
- **Water Body Type:** bogs, ponds, slow-moving water
- **Light Requirements:** sun
- **Hardiness Zones:** 4 to 7



**More Information:** produces showy yellow flowers; leaves are finely divided with numerous bladders that turn dark from devouring aquatic and mosquito larvae; does well alongside other aquatic plants; overwinters via turions in sediment; can become weedy or invasive in warm climates.

Common Bladderwort (*Utricularia macrorhiza*)

# Aquatic Plants

## Non-native

**Narrowleaf & Hybrid Cattails (*Typha angustifolia, Typha x glauca*)**

Cattails are aquatic perennials that grow in wetland areas and produce distinct velvety brown spikes of flowers. The two most widespread species in the United States are the native broadleaf cattail (*Typha latifolia*) and the invasive narrowleaf cattail (*Typha angustifolia*). The hybrid cattail (*Typha x glauca*) is produced when these two species cross, giving it characteristics of both species. The flower head of a cattail can produce 250,000 seeds, which can remain viable for up to 100 years. Seeds are dispersed by wind and additional spread occurs through an extensive rhizome root system. Cattails are popular in ponds and large water garden margins. Buyers should double check scientific names and ensure they are purchasing from a reputable buyer. The hybridized cattails (*Typha x glauca*) can sometimes only be identified from native species using DNA analysis.



## Native Alternatives

### Broadleaf Cattail (*Typha latifolia*)

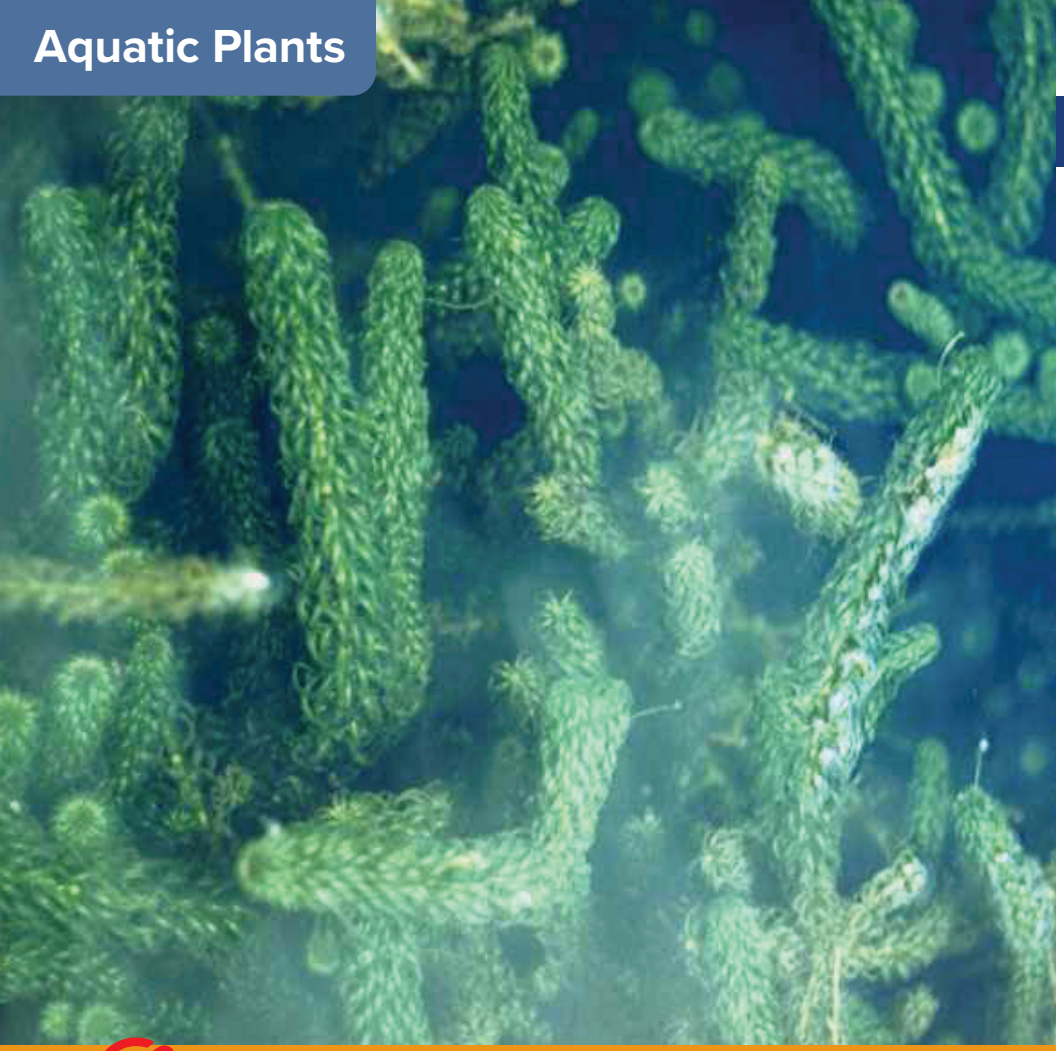
- **Plant Type:** marginal, emergent
- **Max Height (ft):** 10
- **Flower Color:** yellow, green, brown
- **Bloom Time:** March - August
- **Water Body Type:** shallow pools or ponds
- **Light Requirements:** sun, part shade
- **Soil Type:** rich, wet soils, mud, saline tolerant
- **Hardiness Zones:** 3 to 10

**More Information:** provides habitat for birds and aquatic species; creates dense stands; may grow aggressively, can be controlled by planting in containers; excellent accent plant for water gardens and ponds; can be used as privacy screen; reproduces through rhizome roots and seed dispersal.

### Woolgrass (*Scirpus cyperinus*)

- **Plant Type:** shallow marginal
- **Max Height (ft):** 5
- **Flower Color:** green, brown
- **Bloom Time:** May - July
- **Water Body Type:** wet depressions, bogs, sinkhole ponds, pools
- **Water Quality Needs:** acidic, neutral
- **Light Requirements:** sun, part shade
- **Soil Type:** wet soil, standing water
- **Hardiness Zones:** 4 to 8

**More Information:** can be grown in wet soils in shallow standing water, submerged containers in water gardens, or planted along pond or bog margins; clumping habit allows for control through division; reproduces via rhizome roots.



## Non-native

**Oxygen Weed, Curly Waterweed, African Elodea (*Lagarosiphon major*)**

Oxygen weed is an aquatic, submerged plant that can grow in dense mats. It is difficult to control, reproduces by fragmentation and spreads via hitchhiking and release from water gardens. Although not yet documented in the United States, this plant has potential to be invasive in Pennsylvania if introduced. Oxygen weed can be bought and sold online as a "African elodea" and "curly waterweed." Buyers should always double check scientific names and purchase from reputable sellers. This plant should never be used outside of an aquarium setting.



## Native Alternatives

**Coontail, Coon's Tail, Hornwort (*Ceratophyllum demersum*)**

- **Plant Type:** submerged
- **Max Height (ft):** 12
- **Flower Color:** pink, yellow, blue
- **Bloom Time:** March - November
- **Water Body Type:** ponds, ditches
- **Water Quality Needs:** acid, neutral, and basic
- **Light Requirements:** part shade
- **Soil Type:** sandy, loamy, clay
- **Hardiness Zones:** 7 to 10

**More Information:** provides shelter for young fish; fast-growing, rooting perennial tolerates shade better than many other submerged aquatic plants; ideal for pond oxygenation; submerged but can be seen floating at surface; reproduces asexually and should be monitored to prevent growth outside desired area.

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**Elodea (native), Canadian Waterweed (*Elodea canadensis*)**

- **Plant Type:** submerged
- **Max Height (ft):** 2
- **Flower Color:** white
- **Bloom Time:** June - August
- **Water Body Type:** water gardens, small ponds
- **Light Requirements:** sun
- **Hardiness Zones:** 4 to 10

**More Information:** can be grown anchored or free-floating in full sun water gardens; thrives in cool water; best controlled by planting in submerged containers and by clipping stems as needed; easy to control in smaller water gardens; not recommended for large ponds.

## Non-native

**Parrot Feather (*Myriophyllum aquaticum*)**

Parrot feather forms dense mats and competes with native aquatic plants for space and resources, and creates habitat for mosquito larvae. It spreads through fragmentation and from whole plants, and it can be dispersed by people dumping aquariums into rivers and ponds. Animals can carry fruits and fragments to new waterbodies. Although parrot feather is not typically used in water gardening, it is a popular aquarium plant and can become invasive in natural waterways if intentionally released from an aquarium or accidentally flooded out of a water garden.



## Native Alternatives

**Coontail, Coon's Tail, Hornwort (*Ceratophyllum demersum*)**

- **Plant Type:** submerged
- **Max Height (ft):** 12
- **Flower Color:** pink, yellow, blue
- **Bloom Time:** March - November
- **Water Body Type:** ponds, ditches
- **Water Quality Needs:** acid, neutral, and basic
- **Light Requirements:** part shade
- **Soil Type:** sandy, loamy, clay
- **Hardiness Zones:** 7 to 10

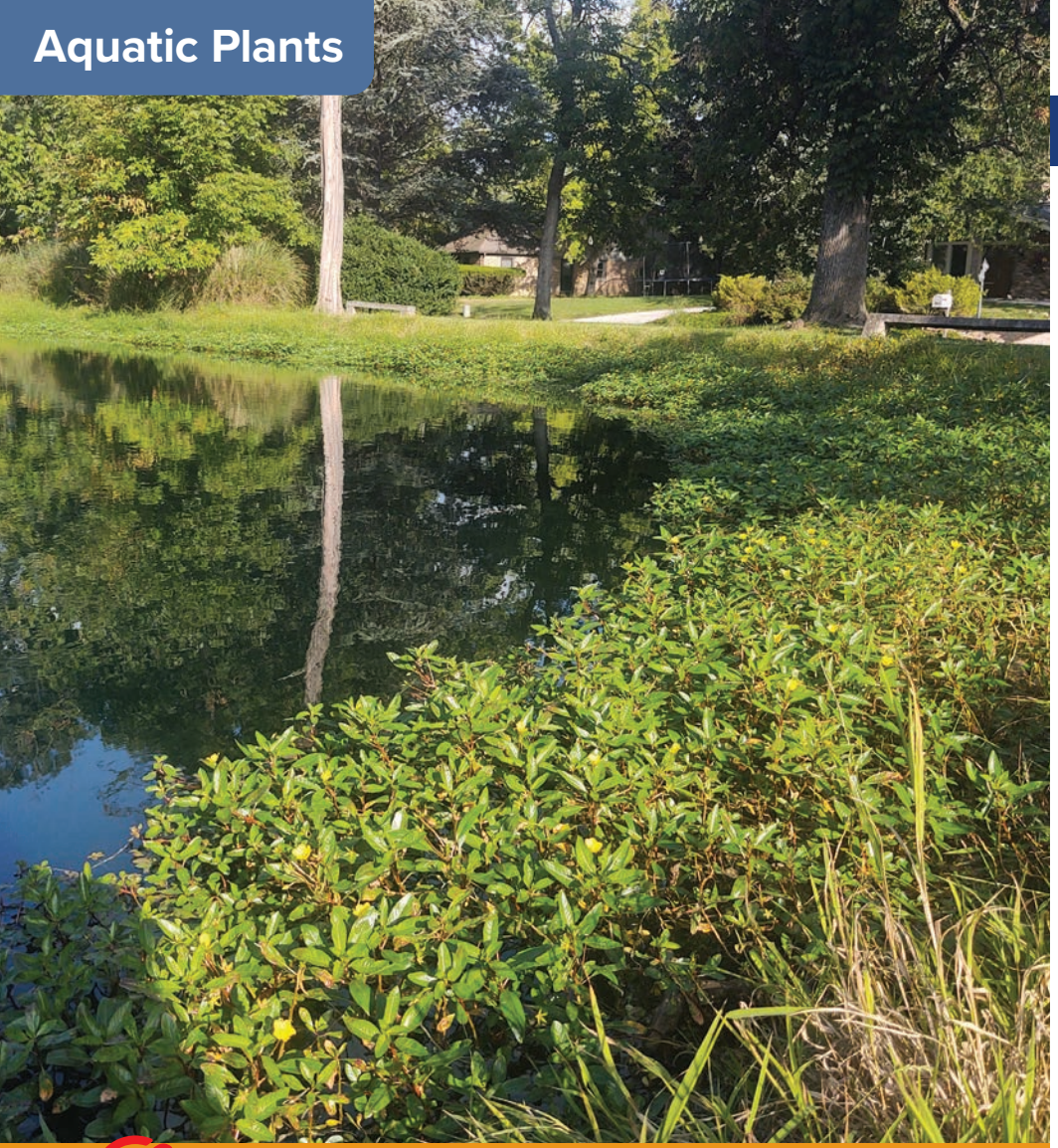
**More Information:** provides shelter for young fish; fast-growing, rooting perennial tolerates shade better than many other submerged aquatic plants; ideal for pond oxygenation; submerged but can be seen floating at surface; reproduces asexually and should be monitored to prevent growth outside desired area.

---

**Elodea (native), Canadian Waterweed (*Elodea canadensis*)**

- **Plant Type:** submerged
- **Max Height (ft):** 2
- **Flower Color:** white
- **Bloom Time:** June - August
- **Water Body Type:** water gardens, small ponds
- **Light Requirements:** sun
- **Hardiness Zones:** 4 to 10

**More Information:** can be grown anchored or free-floating in full sun water gardens; thrives in cool water; best controlled by planting in submerged containers and by clipping stems as needed; easy to control in smaller water gardens; not recommended for large ponds.



## Non-native

**Peruvian Primrose (*Ludwigia peruviana*)**

This invasive plant has showy, attractive yellow flowers making it a popular marginal plant in water gardens and ponds. Dense growth interferes with natural water flow and blocks sunlight. Reproduction occurs through heavy seeding or through suckers from submerged stems and stem fragments. Ninety-nine percent of the seeds produced by Peruvian primrose are viable and can remain in the seedbank for years.



## Native Alternatives

**Water Willow (*Justicia americana, Dianthera americana*)**

- **Plant Type:** shallow marginal
- **Max Height (ft):** 3
- **Flower Color:** white, pink, purple, violet
- **Bloom Time:** April - October
- **Water Body Type:** water gardens
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay
- **Hardiness Zones:** 4 to 10

**More Information:** underground rhizome roots provide habitat for aquatic insects and fish; blooms throughout summer; marginal plant that will grow in a few feet of water.

Water Willow (*Justicia americana, Dianthera americana*)

## Non-native

**Purple Loosestrife, non-native Loosestrifes (*Lythrum salicaria, Lysimachia* spp.)**

This hardy perennial was introduced via the water garden industry and escaped cultivation, invading natural waterways. One mature plant can produce over 1 million seeds in a year, which allows it to quickly spread. Purple loosestrife crowds out native species and creates monocultures along streams, ponds, and lakes. Although the invasive nature of purple loosestrife, and other non-native loosestrifes, is well known, many of these plants are still available for sale online and in stores.



## Native Alternatives

### Pickerelweed, Pickerel Rush (*Pontederia cordata*)

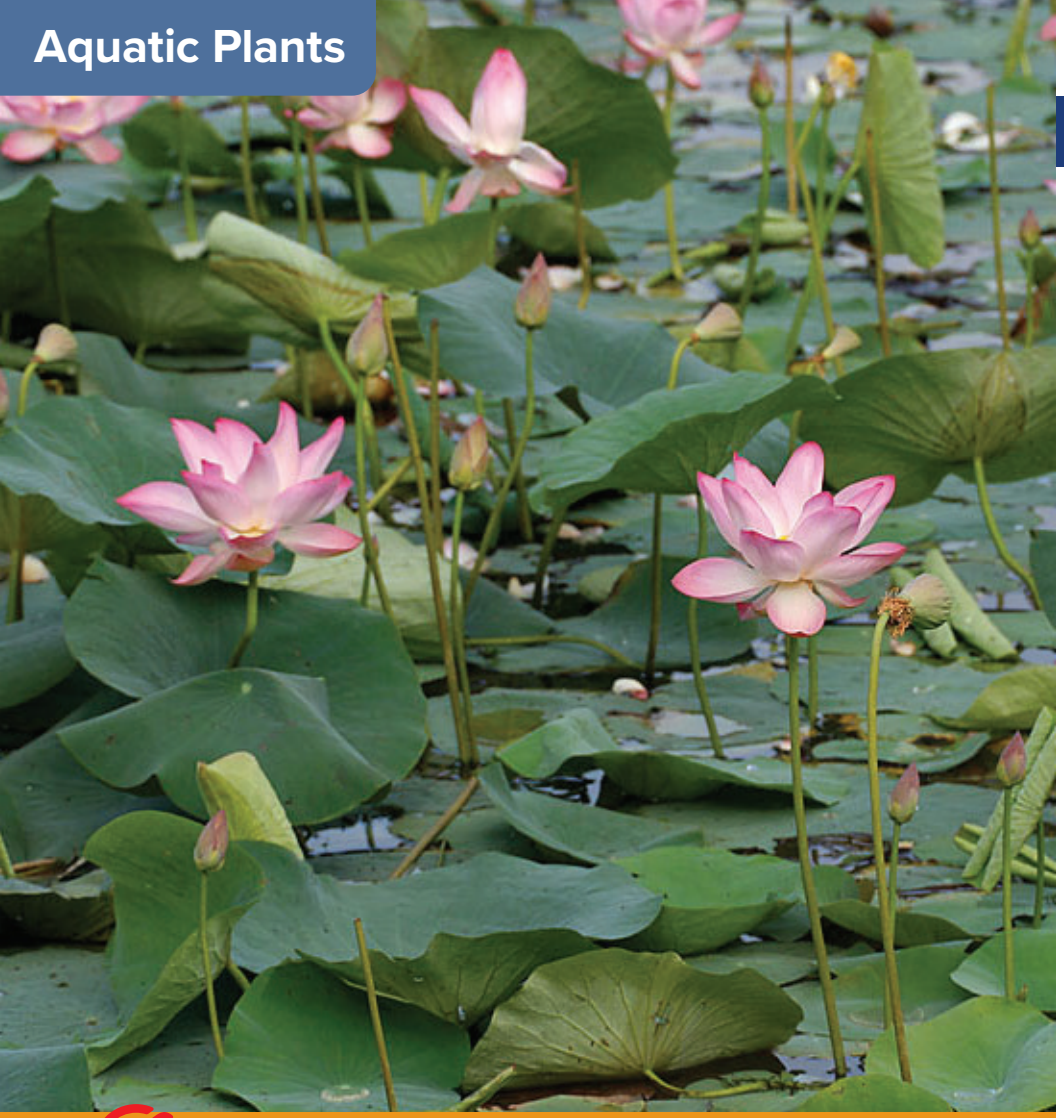
- **Plant Type:** shallow marginal
- **Max Height (ft):** 4
- **Flower Color:** blue, purple
- **Bloom Time:** March - November
- **Water Body Type:** shallow water marshes, water gardens, bogs, ponds
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay, mud
- **Hardiness Zones:** 3 to 10

**More Information:** attracts bees, butterflies, and birds; flowers are showy and bloom throughout summer; can be divided regularly to keep from outgrowing desired space.

### Swamp Loosestrife (*Decodon verticillatus*)

- **Plant Type:** shallow marginal
- **Max Height (ft):** 10
- **Flower Color:** pink, purple
- **Bloom Time:** July - September
- **Water Body Type:** swamps, pond edges
- **Light Requirements:** sun
- **Soil Type:** moist
- **Hardiness Zones:** 3 to 9

**More Information:** excellent for pond and swamp edges; self-rooting branches arch and intertwine, forming new stems when they touch the water; can grow very shrub-like and overtake habitats; should be monitored and pruned regularly to maintain within desired space.



## Non-native

**Sacred Lotus, Asian Lotus, Indian Lotus**
**(*Nelumbo nucifera, Nelumbium speciosum, Nelumbo speciosa, Nelumbium nelumbo*)**

Native to Asia, sacred lotus is a showy aquatic emergent perennial that produces large, dense colonies in natural areas. The showy flowers and floating leaves make this a popular water garden plant. Dense floating mats inhibit growth of native aquatic vegetation and decrease biodiversity. This plant is listed as invasive in several Great Lakes states.



## Native Alternatives

### Fragrant Water Lily (*Nymphaea odorata*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 5
- **Flower Color:** white, pink
- **Bloom Time:** March - October
- **Water Body Type:** bog, pond bottom, shallow water, water garden
- **Water Quality Needs:** somewhat acidic
- **Light Requirements:** sun, part shade, shade
- **Soil Type:** pond bottom with shallow water
- **Hardiness Zones:** 4 to 8

**More Information:** leaves provide shelter for fish and aquatic insects; muskrats may snack on stems; large, fragrant, showy flowers and flat, round leaves with long stems; reproduces via rhizome roots barely covered by soil.

### Pickerelweed, Pickerel Rush (*Pontederia cordata*)

- **Plant Type:** shallow marginal
- **Max Height (ft):** 4
- **Flower Color:** blue, purple
- **Bloom Time:** March - November
- **Water Body Type:** shallow water marshes, water gardens, bogs, ponds
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay, mud
- **Hardiness Zones:** 3 to 10

**More Information:** attracts bees, butterflies, and birds; flowers are showy and bloom throughout summer; can be divided regularly to keep from outgrowing desired space.

## Non-native

**Water Chestnut, Water Caltrop (*Trapa natans*)**

Water chestnut is a rooted annual aquatic plant that grows in thick colonies. Its attractive leaf rosettes and edible nuts make this a popular choice for water gardens. Each plant can produce up to 15 nuts per season, each containing a single seed. It can also spread through fragmentation where rosettes of floating leaves break apart and hitchhike or float to new locations. The sharp spines of the nut can also get caught on other objects, birds, and animals.



## Native Alternatives

### Broad-leaved Pond Weed; Floating Leaf Pondweed (*Potamogeton natans*)

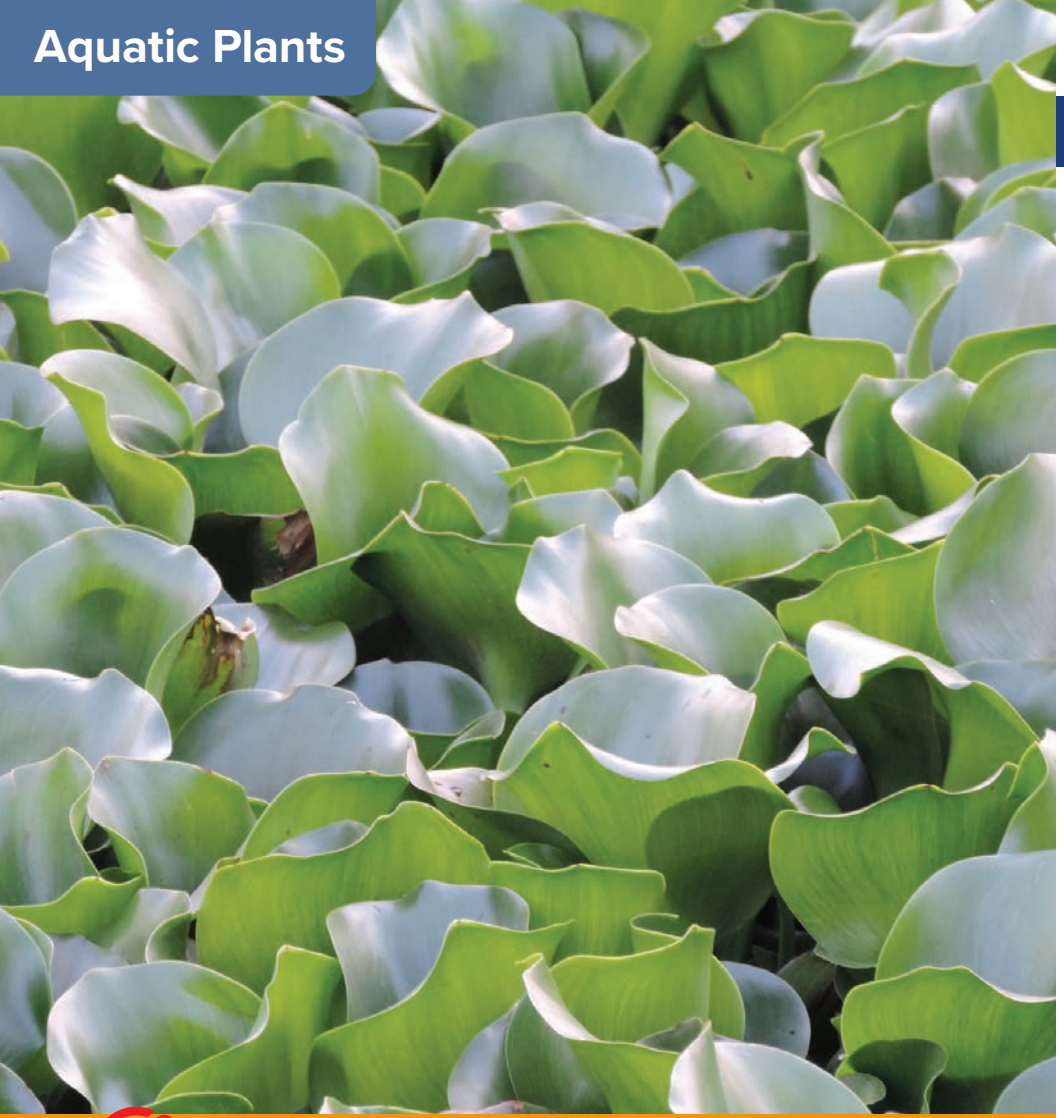
- **Plant Type:** partially submerged
- **Max Height (ft):** 1
- **Flower Color:** green
- **Bloom Time:** June - November
- **Water Body Type:** lakes, ponds, and ditches, highly organic substrate
- **Water Quality Needs:** mildly acidic, neutral, and basic
- **Light Requirements:** sun; does not tolerate shade
- **Soil Type:** sandy, loamy, and clay
- **Hardiness Zones:** 7 to 11

**More Information:** creates habitat for fish spawning; can be used as an oxygenator; fast growing, requires consistent monitoring to ensure remains in desired area.

### Watershield (*Brasenia schreberi*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 3
- **Flower Color:** blue, purple
- **Bloom Time:** March - November
- **Water Body Type:** still waters, marshes, shallow water
- **Water Quality Needs:** lime-free
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay soils, mildly acidic, neutral
- **Hardiness Zones:** 3 to 10

**More Information:** food source for waterfowl; floating leaves provide shelter for fish and aquatic insects; small lily pad-like leaves float on the water's surface; long single root attaches to the bottom; submerged plant parts are coated in jelly-like substance that prevents it from drying out; can become weedy; emits chemical that can deter growth of nearby aquatic plants.



## Non-native

**Water Hyacinth (*Pontederia crissipes*, formerly *Eichhornia crassipes*)**

Water hyacinth is a free-floating perennial that forms dense "rafts" of plant material in the water that can cover a water surface. Its beauty makes it a popular ornamental plant for ponds; however, its fast growth makes it one of the worst aquatic weeds in the world, as it can double its population in as little as six days. It reproduces by fragmentation and by forming plantlets at the end of a shoot that grow from the base of the stem.



## Native Alternatives

**Pickerelweed, Pickerel Rush (*Pontederia cordata*)**

- **Plant Type:** shallow marginal
- **Max Height (ft):** 4
- **Flower Color:** blue, purple
- **Bloom Time:** March - November
- **Water Body Type:** shallow water marshes, water gardens, bogs, ponds
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay, mud
- **Hardiness Zones:** 3 to 10

**More Information:** attracts bees, butterflies, and birds; flowers are showy and bloom throughout summer; can be divided regularly to keep from outgrowing desired space.

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**Spatterdock, Yellow Pond Lily, Yellow Cow Lily (*Nuphar advena*)**

- **Plant Type:** partially submerged
- **Max Height (ft):** 1
- **Flower Color:** green-yellow
- **Bloom Time:** March - October
- **Water Body Type:** shallow lakes, ponds, bayous, bogs, streams
- **Light Requirements:** part shade
- **Soil Type:** sandy, loamy, and clay
- **Hardiness Zones:** 4 to 10

**More Information:** has small flowers; can survive shaded, deep waters; used in large ponds and water gardens; slowly establishes colonies with flat, leathery, heart-shaped leaves that float; produces underwater stems; reproduces via rhizome roots and seeds; best grown in containers for water gardens.

## Non-native

**Water Lettuce (*Pistia stratiotes*)**

Water lettuce is a floating perennial that resembles an open head of lettuce. It forms colonies of rosettes that link together blanketing the water's surface, blocking waterways, and disrupting natural ecosystems. This plant can spread by fragmentation, stolons, and seeds.



## Native Alternatives

### Broad-leaved Pond Weed; Floating Leaf Pondweed (*Potamogeton natans*)

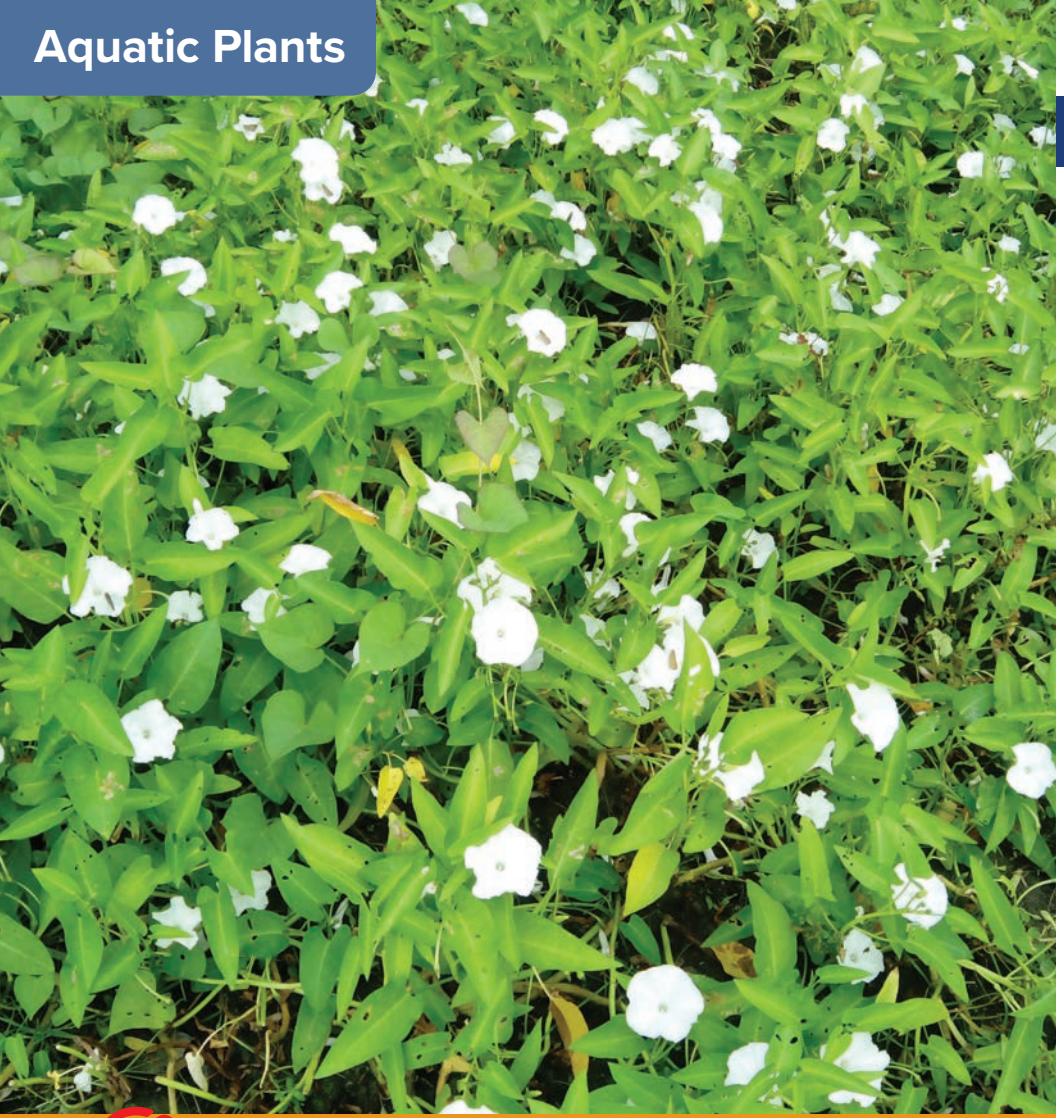
- **Plant Type:** partially submerged
- **Max Height (ft):** 1
- **Flower Color:** green
- **Bloom Time:** June - November
- **Water Body Type:** lakes, ponds, and ditches, highly organic substrate
- **Water Quality Needs:** mildly acidic, neutral, and basic
- **Light Requirements:** sun; does not tolerate shade
- **Soil Type:** sandy, loamy, and clay
- **Hardiness Zones:** 7 to 11

**More Information:** creates habitat for fish spawning; can be used as an oxygenator; fast growing, requires consistent monitoring to ensure remains in desired area.

### Fragrant Water Lily (*Nymphaea odorata*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 5
- **Flower Color:** white, pink
- **Bloom Time:** March - October
- **Water Body Type:** bog, pond bottom, shallow water, water garden
- **Water Quality Needs:** somewhat acidic
- **Light Requirements:** sun, part shade, shade
- **Soil Type:** pond bottom with shallow water
- **Hardiness Zones:** 4 to 8

**More Information:** leaves provide shelter for fish and aquatic insects; muskrats may snack on stems; large, fragrant, showy flowers and flat, round leaves with long stems; reproduces via rhizome roots barely covered by soil.



## Non-native

**Water Spinach (*Ipomoea aquatica*)**

Water spinach is a freshwater, semiaquatic herbaceous plant that floats on the water surface. Adventitious roots hang freely from stem nodes, which can break off and disperse creating new infestations. It grows in ponds, marshes, swamps, very moist soils, ditches, and stream banks. Water spinach sometimes produces dense, impenetrable masses of vegetation that obstruct the flow of water and shade out competing plants. This plant is recognized as a Federal Noxious Weed.



## Native Alternatives

### Fragrant Water Lily (*Nymphaea odorata*)

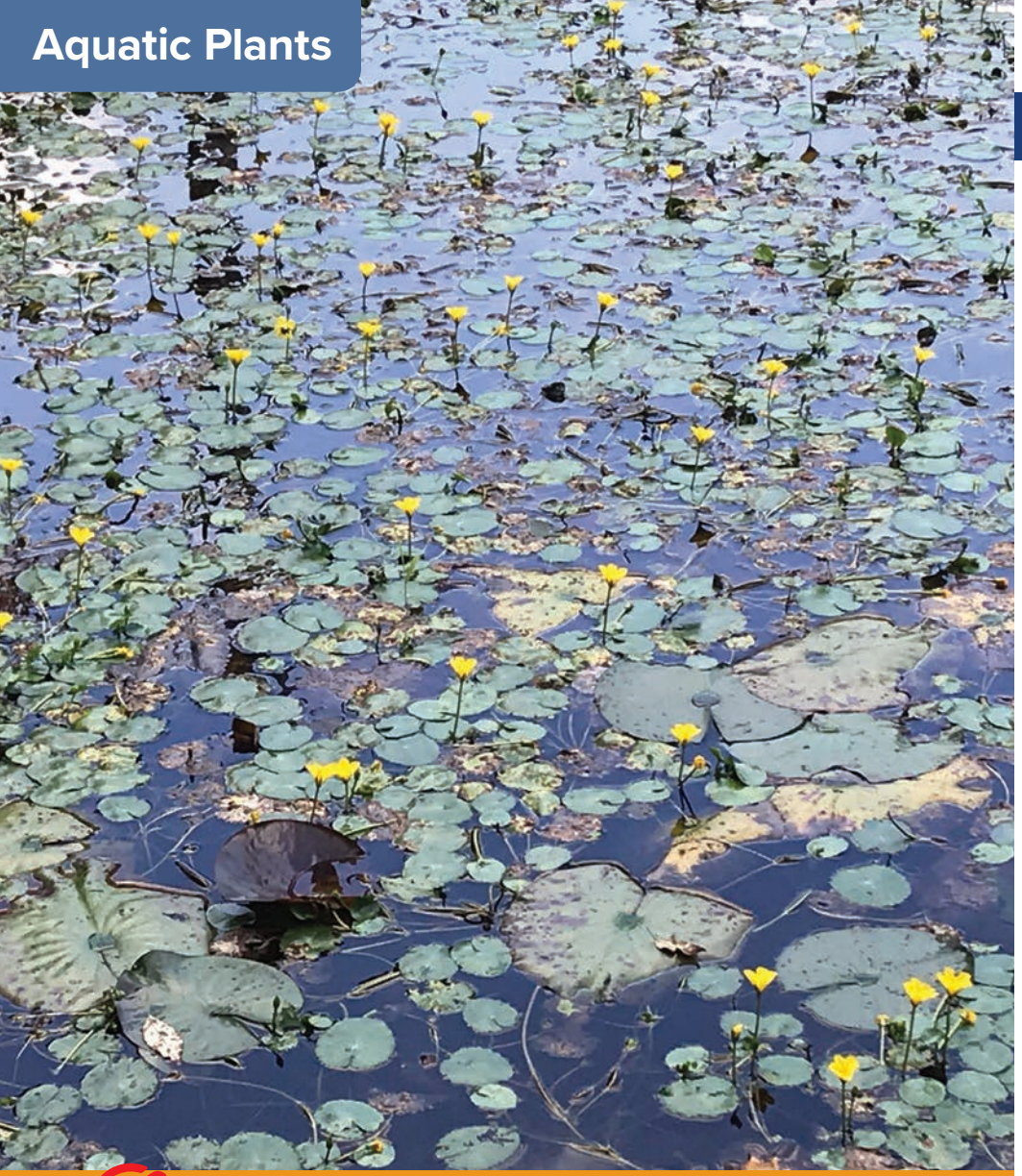
- **Plant Type:** partially submerged
- **Max Height (ft):** 5
- **Flower Color:** white, pink
- **Bloom Time:** March - October
- **Water Body Type:** bog, pond bottom, shallow water, water garden
- **Water Quality Needs:** somewhat acidic
- **Light Requirements:** sun, part shade, shade
- **Soil Type:** pond bottom with shallow water
- **Hardiness Zones:** 4 to 8

**More Information:** leaves provide shelter for fish and aquatic insects; muskrats may snack on stems; large, fragrant, showy flowers and flat, round leaves with long stems; reproduces via rhizome roots barely covered by soil.

### Watershield (*Brasenia schreberi*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 3
- **Flower Color:** blue, purple
- **Bloom Time:** March - November
- **Water Body Type:** still waters, marshes, shallow water
- **Water Quality Needs:** lime-free
- **Light Requirements:** sun, part shade
- **Soil Type:** sandy, loamy, clay soils, mildly acidic, neutral
- **Hardiness Zones:** 3 to 10

**More Information:** food source for waterfowl; floating leaves provide shelter for fish and aquatic insects; small lily pad-like leaves float on the water's surface; long single root attaches to the bottom; submerged plant parts are coated in jelly-like substance that prevents it from drying out; can become weedy; emits chemical that can deter growth of nearby aquatic plants.



## Non-native

**Yellow Floating Heart (*Nymphoides peltata*)**

Yellow floating heart is an aggressive aquatic perennial which forms dense mats. It can be easily purchased in water garden specialty stores and online. It reproduces by seed and fragmentation. This rooted aquatic plant creates star shaped yellow flowers and thrives in slow moving waters.



## Native Alternatives

### Fragrant Water Lily (*Nymphaea odorata*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 5
- **Flower Color:** white, pink
- **Bloom Time:** March - October
- **Water Body Type:** bog, pond bottom, shallow water, water garden
- **Water Quality Needs:** somewhat acidic
- **Light Requirements:** sun, part shade, shade
- **Soil Type:** pond bottom with shallow water
- **Hardiness Zones:** 4 to 8

**More Information:** leaves provide shelter for fish and aquatic insects; muskrats may snack on stems; large, fragrant, showy flowers and flat, round leaves with long stems; reproduces via rhizome roots barely covered by soil.

### Spatterdock, Yellow Pond Lily, Yellow Cow Lily (*Nuphar advena*)

- **Plant Type:** partially submerged
- **Max Height (ft):** 1
- **Flower Color:** green-yellow
- **Bloom Time:** March - October
- **Water Body Type:** shallow lakes, ponds, bayous, bogs, streams
- **Light Requirements:** part shade
- **Soil Type:** sandy, loamy, and clay
- **Hardiness Zones:** 4 to 10

**More Information:** has small flowers; can survive shaded, deep waters; used in large ponds and water gardens; slowly establishes colonies with flat, leathery, heart-shaped leaves that float; produces underwater stems; reproduces via rhizome roots and seeds; best grown in containers for water gardens.

## Non-native

**Yellow Iris, Yellow Flag (*Iris pseudacorus*)**

This exotic iris is an emergent aquatic perennial with showy yellow flowers that grow 1-3 ft tall, although some can reach up to 7 ft. Yellow iris reproduces vegetatively through rhizome roots, and it is a popular water garden plant for marginal areas by adding visual interest and showy blooms.



## Native Alternatives

### Blue Flag Iris (*Iris versicolor*)

- **Plant Type:** shallow marginal
- **Max Height (ft):** 3
- **Flower Color:** green, brown
- **Bloom Time:** May - August
- **Water Body Type:** stream banks, marshes, swamps
- **Water Quality Needs:** acidic
- **Light Requirements:** sun, part shade
- **Soil Type:** moist, rich, acidic
- **Hardiness Zones:** 3 to 9

**More Information:** attracts birds and beneficial insects; produces showy flowers; tolerates complete submergence but prefers riparian locations; spreads by self-seeding and through rhizome roots.

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### Cardinal Flower (*Lobelia cardinalis*)

- **Plant Type:** shallow marginal
- **Max Height (ft):** 6
- **Flower Color:** red
- **Bloom Time:** May - October
- **Water Body Type:** streams, roadsides, ponds, swamps
- **Light Requirements:** sun, part shade, shade
- **Soil Type:** moist to wet, humus-rich soil, medium loam, clay loam, limestone-based, sandy, sandy loam, clay
- **Hardiness Zones:** 3 to 9

**More Information:** attracts hummingbirds and butterflies; produces vibrant red flowers, grows in a clumping habit; attractive as an edge plant in water and woodland gardens; prefers moist to wet soils; will tolerate occasional flooding but not permanent standing water.

Bluegill (*Lepomis macrochirus*)

# Aquatic Animals

**Aquatic animals can make popular additions to water gardens because their varied colors and movement build upon the existing visual elements. Aquatic animals should be chosen carefully due to their ability to move beyond the water garden and into natural waterways.**



Pointed Campeloma (*Campeloma decisum*)

### Snails and fish:

Non-native snails, like the popular Chinese and Japanese mystery snails, may seem like a harmless addition to a water garden, but there are several reasons to avoid them. Snails are generally easily moved, or will move themselves under moist conditions. Birds can easily move snails on plant material, and some snails can survive digestion by fish. They are often intermediate hosts for parasites, and they have a large appetite for desirable vegetation, like the native plants found in a water garden. For these reasons, only native snails, which are adapted to their environment and the species in it, should be used in water gardens.

Koi Fish (*Cyprinus rubrofuscus "koi"*)

Fish are often added to water gardens for visual interest, however, they can be a menace to a small water garden. The fish commonly used in water gardens are goldfish and koi, both of which are carp species from Asia, and are considered invasive in Pennsylvania. These fish consume aquatic plants at a high rate and uproot native plants while foraging, making the water cloudy. They also add nutrients to the system that must be removed using filters or balanced using plants. Goldfish, Koi, and Carp will also grow quite large, oftentimes outgrowing their space. Despite this, they should never be released or allowed to escape into local waters.

Additional reasons to reconsider adding fish to your water garden refers to the saying, "if you build it, they will come." Native amphibians such as frogs, toads, or salamanders may decide your water garden is a good place to reproduce or hang out. However, fish are predators that will eat their eggs. Other native animals that may move into a water feature include turtles, and birds and butterflies may come for a drink. One last consideration is the expense. Koi and goldfish are an expensive feature to add to a water garden, and they may attract birds, like the Great Blue heron, that consider expensive Koi a tasty snack. Rather than investing in exotic animals, rely on native species. Soon, you will have a thriving aquatic ecosystem in your backyard while maintaining the beauty and serenity of a water garden.

Fragrant Water Lily *(Nymphaea odorata)*

## Moving and Releasing Aquatic Animals

There are many ways that aquatic animals are moved between water bodies, such as recreational activities, swapping and sharing of species between water gardeners, and through accidental release. These activities should be avoided to prevent the introduction of non-native species to water bodies. This can be dangerous for the animal being moved as well as the new ecosystem. While a species may be native to one ecosystem, it may be invasive to another ecosystem just a few miles away. Non-native species can disrupt native ecosystems and bring new pathogens and diseases with them. These microscopic dangers create new and unseen threats to the ecosystem.

Aquatic animals should never be released from captivity. It is illegal to release any animals into waters of the Commonwealth without authorization, including turtles, fish, crayfish, and snails. Instead of releasing animals, pet owners should contact a local pet shop or adoption center or discuss euthanasia with a veterinarian. Trading plants and animals is a common practice, but this should only be done if water gardens are well maintained to prevent escape or flooding.

**These tips are for water gardeners who have already added tropical or non-native species to their water gardens**

- Check on the animal regularly to be sure it's safe and still within its enclosure.
- Check and maintain the water garden or enclosure regularly to ensure there are no potential points of release or escape.
- Ensure the animal will not wash into a natural waterway during flooding or heavy rain.

## Non-native

**Chinese & Japanese Mystery Snails, often sold as Japanese Trapdoor Snails (*Cipangopaludina chinensis, Cipangopaludina japonica*)**

Mystery snails (*Cipangopaludina* spp) are large freshwater snails commonly sold for use in freshwater aquariums and garden ponds. Their popularity in the aquarium industry has contributed highly to their spread across the United States.



## Native Alternatives

**Brown Mystery Snail or Pointed Campeloma (*Campeloma decisum*)**

- **Max growth length:** 4 cm
- **Primary Colors:** light yellowish olive, tan, brown, rust
- **Reproduction Rate:** mate once a year
- **Water Body Type:** flowing water, lentic environments, lakes
- **Water Quality Needs:** limited by salinity
- **Food Sources:** detritivore, feeds on particles in sediment and through filtration
- **Overwinter in PA? (Y/N):** Y

**More Information:** small freshwater snail, generally found in rivers and lakes with sandy substrate; the shell spire is elongated, and the body is rounded; has an operculum that allows the shell to seal off; food source for fish, diving waterfowl, turtles, and crayfish.

Pointed Campeloma (*Campeloma decisum*)

## Non-native

**Goldfish (*Carassius auratus*)**

The Goldfish is a member of the carp and minnow family. It was one of the first aquatic invasive species to reach North America, arriving in the 1600s as an ornamental fish for aquariums and water gardens. It is now one of the world's most widespread invasive species. Goldfish have been intentionally introduced for ornamental purposes to ponds, fountains, and small lakes from which they may escape through connecting waters. Many introductions of goldfish were also due to their use as live bait. In addition, goldfish are often released into the wild by pet owners not realizing the environmental repercussions of setting the fish free.



## Native Alternatives

**Golden Shiner (*Notemigonus crysoleucas*)**

- **Max growth length:** 30 cm
- **Primary Colors:** silver to gold sides, dark stripe along midline
- **Reproduction Rate:** 4-5 spawning times per year, 200,000 maximum eggs
- **Water Body Type:** lakes, rivers, bays; slow moving or stagnant water
- **Water Quality Needs:** 0-35°C, salinity of 0-14, reproductive temp of 20-27°C
- **Food Sources:** zooplankton and phytoplankton
- **Overwinter in PA? (Y/N):** Y

**More Information:** small to mid-sized freshwater fish from the carp and minnow family; adults vary from silver to brassy gold with clear to yellowish fins; juveniles have brownish back, dusky stripe on the sides from the eye to the snout, and silver belly; prefer relatively warm, still waters with dense vegetation; can tolerate low oxygen levels; feeds on aquatic and flying insects and algae; common bait fish in Eastern U.S., but considered invasive in several western states.

Golden Shiner (*Notemigonus crysoleucas*)

## Non-native:

**Koi Fish, Common Carp, and other carp species (*Cyprinus rubrofuscus "koi", Cyprinus carpio, Cyprinus* spp.)**

Varieties of common carp include Koi which are popular in small ponds and water gardens. Introduction of common carp causes dramatic ecological disruptions at both the community and ecosystem level. The common carp is omnivorous, feeding on benthic aquatic organisms such as insect larvae, worms, mollusks, and zooplankton as well as the stalks, seeds, and leaves of aquatic plants. This foraging behavior increases the turbidity of the water, which releases phosphorus, increases algae growth, and prevents the growth of native aquatic plants.



## Native Alternatives:

### Pumpkinseed (*Lepomis gibbosus*)

- **Max growth length:** 40 cm
- **Primary Colors:** back is olive, iridescent blue lines and golden flecks
- **Reproduction Rate:** females carry 600-3,000 eggs
- **Water Body Type:** lakes, ponds, and streams
- **Water Quality Needs:** 4-32°C, salinity of 10, reproductive temp of 13-28°C
- **Food Sources:** zooplankton and phytoplankton, worms, insects, crustaceans
- **Overwinter in PA? (Y/N):** Y

**More Information:** medium-sized freshwater sunfish; earflap is black with a bright red or orange spot near the center; feeds on mussels, clams, snails, insects, and crustaceans.

### Bluegill (*Lepomis macrochirus*)

- **Max growth length:** 18 cm
- **Primary Colors:** olive with yellow and green flecks, dark vertical bands
- **Reproduction Rate:** females carry 2,540-64,000 eggs
- **Water Body Type:** lakes, ponds, and streams
- **Water Quality Needs:** 5-33.5°C, salinity of 10-12, reproductive temp 18.5-28°C
- **Food Sources:** planktivores, zooplankton, insects, crustaceans, small fish
- **Overwinter in PA? (Y/N):** Y

**More Information:** medium-sized, freshwater sunfish; earflap is black; a dusky spot on the anal fin is often present; the gill-cover has two blue streaks from chin to edge; feeds on zooplankton, plants, insects, and invertebrates.

**Other Native Alternatives:** Largemouth Bass (*Micropterus salmoides*)

**Red Eared Slider (*Trachemys scripta elegans*)**
The Red Eared slider is a hardy freshwater turtle that is popular as an aquarium pet in the United States. It gets its name from the broad red stripes present behind each eye. Its popularity in the pet trade has helped account for its numerous introductions worldwide. It is now designated as one of the "100 World's Worst Invaders". Adult sliders can reach lengths of up to 12 in, and unsuspecting owners are rarely prepared to continue maintaining them in captivity at this size. The owners then dispose of them by releasing them into local waterways and impoundments, which has led to their introduction and spread into the natural environment.

**Yellow-bellied Slider (*Trachemys scripta scripta*)**
The Yellow-bellied slider is a large, semi-aquatic, basking turtle that can be found resting on logs, stumps, or rocks when the weather is mild and the sun is out. It can live for more than 25 years, with no signs of old age. This species can mate with the red-eared slider (*Trachemys scripta elegans*), producing hybrids that are often sold as pets. Because the Yellow-bellied slider is popular in the pet industry, intentional pet releases, as well as escapes into the natural environment are the most likely vectors for its spread. Because of their longevity and large size, unprepared pet owners may release them into local waterways and impoundments, which has led to their introduction and spread into the natural environment.



Other Non-native Aquatic Animals

**Pond Loach (*Misgurnus anguillicaudatus*)**
This small eel-like fish gets its name from its ability to forecast the weather. It is sensitive to changes in barometric pressure, therefore increases in activity and swimming in fast circles can indicate that major weather changes are imminent. This species is also popular in the aquarium trade because it is hardy and has a voracious appetite that can help keep tanks clean. Unfortunately, the release of this species into water bodies has caused negative impacts to water quality, native species, and the food web.

Pond Loach (*Misgurnus anguillicaudatus*)

# Glossary and Credits

# Glossary

**Adventitious Roots:** Plant roots that form from any non-root tissue and are produced both during normal development and in response to stress conditions.

**Aerial Rootlets:** Roots that grow above the surface of the surrounding soil or water.

**Anal Fin:** A single fin located on the lower back part of the body of a fish behind the excretory opening.

**Annual:** Plants that complete their life cycles within one growing season.

**Aperture:** The opening of a snail shell from which the snail's soft body emerges.

**Aquatic:** Grows or lives in water for all or most of its lifetime.

**Axil:** Location where a leaf meets the stem.

**Banned Species List:** Species that are banned in Pennsylvania for sale, barter, possession or transportation. See the introduction section of this guide for more information.

**Black Walnut Juglone:** Black walnut trees (*Juglans nigra*) produce a toxic substance called juglone that prevents many plants from growing under or near them.

**Calcareous:** A type of soil that is rich in calcium carbonate.

**Caliche:** A whitish-gray or cream-colored soil layer that has been cemented by carbonates of calcium and magnesium.

**Class A Noxious Weed:** A plant species that is established in Pennsylvania, but is geographically limited. Species is intended for eradication, as designated by the Pennsylvania Department of Agriculture.



**Class B Noxious Weed:** A plant that is widely established in Pennsylvania and cannot feasibly be eradicated, as designated by the Pennsylvania Department of Agriculture.

**Class C Noxious Weed:** A plant that is not known to exist in Pennsylvania, but poses a potential threat if introduced to Pennsylvania. Is listed on the Federal Noxious Weeds list.

**Clinging Vine:** A vine that possess specialized adventitious roots called aerial rootlets that grow along the stems of the vine, and attach to any touchable surface.

**Clumping Habit:** Plant that grows in a mound that gradually increases in diameter.

**Conservation Biological Control:** A plant that attracts predatory or parasitic insects, which can protect the surrounding garden from pest insects.

**Cultivar:** A plant variety that has been produced in cultivation by selective breeding.

**Deciduous:** Trees and shrubs that seasonally shed leaves, usually in the fall.

**Earflap:** Fleshy or bony extension on the rear edge of the opercle.

**Emergent:** Aquatic plant that has plant parts growing above the surface of the water.

**Ephemeral:** Any short-lived plant, usually one that has one or more generations per year, growing only during favorable periods.

**Federal Noxious Weeds List:** A list of plant species that are banned in the United States for sale, barter, possession or transportation.

# Glossary

**Floating:** Aquatic plant that floats on the water's surface and survives with little to no soil.

**Forb:** Herbaceous (not woody), broadleaf plants that are not grass-like.

**Fragmentation:** A form of asexual reproduction where an organism is split into fragments that develop into mature, fully grown individuals that are clones of the original organism.

**Free-Floating:** An aquatic plant that has plant parts growing above the surface of the water and is unattached to the bottom of the waterbody.

**Gill-Cover:** Also known as an operculum, a bone series found in bony fish that serves as a facial support structure and a protective covering for the gills.

**Grass:** A plant that has jointed stems sheathed by long narrow leaves, flowers in spikes, and seedlike fruits.

**Herbaceous:** Vascular plants that have no persistent woody stems above ground.

**High Organic Matter:** Soil that contains high amounts of decomposing plant and/or animal tissues.

**Humusy:** A type of soil, rich in organic matter and nutrients, which retains moisture.

**Introduced:** A non-native species that does not cause ecologic, economic, or health related impacts to its new environment.

**Invasive:** A non-native or introduced species that cause ecologic, economic, or health related impacts to its new environment.

**Limey:** Alkaline soil with pH above 8.0 and contains calcium carbonate.



**Marginal:** Species found growing around the edges, or margins.

**Monoculture:** A single variety of one species.

**Nativar:** A cultivar derived from native parents and bred for a particular trait.

**Mesic:** Soil with a moderate, balanced moisture content that's not saturated and drains well, but doesn't completely dry out.

**Mucky:** A wet, organic soil material that is high in humus and is composed of almost completely decomposed organic matter.

**Native:** Indigenous to a given region or ecosystem if its presence in that region is the result of only local natural evolution.

**New Wood Growth:** Flower buds form on current year's growth and blossom in the same year.

**Node:** A knob or joint of a stem from which leaves, roots, shoots, or flowers may arise.

**Noxious Weeds:** Plant species that are banned in Pennsylvania for sale, barter, possession, or transportation; are determined to be injurious to public health, crops, livestock, agricultural land or other property.

**Old Wood Growth:** Flower buds form or next year's blooms on the current year's growth that overwinter and blossom typically in early spring.

**Operculum:** (snails) A calcareous structure created by many snails that serves as a "trapdoor" to safely close them inside their shell; (fish) a bone series found in bony fish that serves as a facial support structure and a protective covering for the gills.

# Glossary

**Perennial:** Above-ground portion of the plant that dies back in freezing weather, but re-grows from the base and rootstock the following spring to bloom.

**Prickles:** Thorn-like structures.

**Rhizome Roots:** Creeping, underground stems (refer to terrestrial forbs section for additional information).

**Spire:** The whole series of whorls of a spiral shell except the last one.

**Sprawling Vine:** Does not have natural supports for attaching themselves to structures.

**Spreading Habit:** Plants that have fibrous root systems that spread out from the original planting site.

**Sterile Cultivar:** A plant variety that has been produced in cultivation by selective breeding; cannot cross-pollinate with native relatives.

**Stolon:** A horizontally creeping stem on the surface of the soil.

**Submerged:** Aquatic plant that grows entirely under the surface of the water.

**Substrate:** The surface or material on or from which an organism lives, grows, or obtains its nourishment.

**Tendril:** Slim, flexible, structures that may be branched or unbranched.

**Terrestrial:** A species that grows on, in, or from land.

**Tuber:** The short, thickened, fleshy, food-storing portion of an underground stem with many surface buds; shaped like a tiny potato.



**Turion:** A young scaly shoot budded off from underground stems; detachable winter bud used for survival when conditions are unfavorable.

**Twining Vine:** Does not possess natural supports for climbing or attaching to structures, but these vines twine throughout a trellis or arbor more naturally than sprawling vines.

**Vining Stem:** Grows from the main plant and creeps along the ground or climbs by tendrils.

**Whorl:** A pattern of spirals of concentric circles; in plants, an arrangement of three or more leaves, flowers, or bracts radiating from a common node, spread at intervals along the stem.

# Common Name Index

**Trees and Shrubs**



**Vines**



*indicates non-native



*indicates non-native

# Common Name Index



*indicates non-native





*indicates non-native

# Common Name Index



**Grasses**



*indicates non-native



**Aquatic Plants**



*indicates non-native

# Common Name Index



*indicates non-native



**Aquatic Animals**



*indicates non-native

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Page 169: Pond Loach: Gourami Watcher, *Dojo loach (Misgurnus anguillicaudatus) in aquarium* (2011), Retouched picture,digitally altered by author; modifications: darkened and cropped, WikiMedia Commons, Licensing: CC BY 3.0 Deed | Attribution 3.0 Unported | Creative Commons

## Glossary and Credits

Pages 170 & 171: Native & beneficial garden: Kelly Donaldson


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