Mistaken Identity?

Invasive Plants and their Native Look-Alikes

an Identification Guide for the Mid-Atlantic

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Cover Photos:

Front: Aralia elata leaf (Inset, l-r: Aralia elata habit; Aralia spinosa infloresence, Aralia elata stem)
Back: Aralia spinosa habit

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About This Guide

Purpose:

While some invasive plants are distinctive and easily recognized, many others are difficult to distinguish from one or more species of our native flora. For landowners, managers, and the general public, identifying confusing invasive plants can be extremely difficult. While many existing publications include identification tips, none present a complete side-by-side, illustrated comparison of the key characters needed to confirm identification. This guide fills a need for a regional photographic guide to a broad selection of invasive plants that are often confused with similar native look-alikes.

An invasion of Porcelain-berry (*Ampelopsis brevipedunculata*). Because of its climbing habit, similar leaf shape, and clusters of bluish fruit, this species is often confused with our native grapes (*Vitis* spp.)

Scope:

This guide covers the Mid-Atlantic region, defined here as Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia, and the District of Columbia.

The species included represent some of the most significant invasive plant identification challenges in the region, as well as the corresponding native species with which they are most likely to be confused. Many invasive plant species are not included, either because their identification is considered relatively straightforward, or because their impacts or distributions are somewhat limited. Invasive plant species included in this publication are those that (1) are generally widespread throughout the Mid-Atlantic region, or are currently expanding their ranges, and (2) are known to invade undisturbed natural habitats.

While detailed control recommendations for each plant species are beyond the scope of this publication, a general discussion of control methods, and a brief summary of methods for each species is included. More detailed control prescriptions are readily available from many published and online resources, the best of which are included in the Resources section of this guide.

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Introduction

What Exactly is an Invasive Plant?

The term "weed" is a familiar word to farmers and gardeners. In common usage, a weed is simply any plant that is growing in a place where it is unwanted. In this context, virtually any plant species could be considered a weed, depending on the perspective of the person applying the term. However, in regulatory and scientific terminology, a weed is typically defined more narrowly as a plant species that has the potential to interfere with agricultural production or cause damage to natural ecosystems.

The plants we consider invasive species are a subset of those species usually categorized as weeds using the narrow definition of the term. Invasive plants have the potential to be even more damaging than agricultural weeds, because the former are typically species that can compete with native plants in undisturbed natural areas, thus damaging the balance of native plant communities and adversely impacting ecosystems.

While most of our invasive plant species have been imported from overseas, some species that originated in North America have sometimes been regarded as invasive. These native species often dominate human-altered habitats, and are not as problematic in natural areas. We choose to limit our definition of invasive to include only plants not native to the continent, and to regard native species that can dominate certain habitats as aggressive, rather than invasive.

Definitions

What is the Plant's Origin?

Native:

A plant species that is indigenous to North America, or to a particular region within North America, known to have occurred there historically.

Alien (or Non-native):

A plant species that is not indigenous to North America. The term reflects only the origin of the plant, and not its ecology. Therefore not all alien, or non-native plants are invasive (in fact, only a small fraction of them are).

What is the Plant's Ecology?

Invasive:

An alien plant species that is capable of rapid spread into relatively undisturbed natural communities and that, once established, causes adverse ecological impacts within the invaded community.

Aggressive:

A species of any origin (including native) that has the potential to dominate under certain conditions within its preferred habitat.

What Impacts do Invasives Have?

Annual estimated economic losses due to invasive species in general are in the hundreds of billions. These estimated losses include damage to agricultural crops, funds spent on control, etc. The ecological impacts of invasive species are more difficult to quantify, but are nevertheless critically important. Invasive plants can impact native ecosystems in a variety of ways. They may reduce native plant diversity by competition for resources, such as light, water, or minerals. They may also alter the nearby soil conditions by secreting chemicals that inhibit the germination of seeds or the growth of other plants (an effect known as allelopathy). They may alter nutrient cycling and soil characteristics in invaded areas by changing the amount, composition, or rate of decay of leaf litter. Invasive plants that are closely related to native species may hybridize with (and ultimately genetically "swamp") their native relatives.

Along with a change in plant communities comes a complex web of impacts on other organisms. Some invasives cause changes in habitat structure that can reduce the breeding success of bird species. Invasive wetland plants can replace natives, thus reducing or eliminating submerged habitat structure for aquatic organisms. Some invasives displace native plants that provide food for specialized organisms (such as butterfly caterpillars). The possibilities for disruption of interactions within natural communities are numerous and interconnected.

Despite their negative impacts, some invasives do provide food and cover for native wildlife. In areas that are already highly disturbed and lacking in native plant diversity, the contribution of invasives as habitat or food for some native organisms can be important. For this reason, when planning an invasive plant control scheme, care must be taken to evaluate the potential benefits that the invasive is currently providing for other organisms, and to replace that benefit by restoring the area with appropriate native plant species.

Introduction

The Mid-Atlantic Invasive Flora

Demographics

The Mid-Atlantic, situated at a zone of transition between southern and northern floras, and encompassing many physiographic provinces and soil types, hosts a diverse group of native plant species. A long history of European settlement in the eastern part of the region, followed by extensive urbanization, has led to the establishment of a number of alien and invasive plant species. In Delaware, for example, alien species account for 43% of the total flora, with about 6% of the flora considered invasive. In Pennsylvania an estimated one third of the flora is considered alien, and around 2% is considered invasive. As these figures indicate, while alien species are well-represented in our region's flora, a relatively small proportion of aliens are likely to become invasive. Thus, the significant ecological and economic impacts of invasive plant species are disproportionate to their representation in the flora.

Origins and Introduction

The vast majority of invasive plant species established in the Mid-Atlantic are native to Asia or Eurasia. Since the climates of Europe and temperate Asia are similar to that of the northern United States, these species are well-suited for life in our region. Interestingly, while most of our invasive trees, shrubs and vines originated in Asia, many of our herbaceous invasive plants originated in Europe.

Many of our invasives were first introduced as ornamental plants, usually by arboreta, botanical gardens, or less often, individuals. Woody invasive plants in particular were primarily the result of horticultural introductions. Other invasives, particularly grasses and vines, were introduced and spread by agronomists as potential livestock forage (Johnson Grass, Kudzu). Likewise, many shrubs and vines (Honeysuckles, Multiflora Rose) were widely promoted by state and federal wildlife agencies as cover and food sources for wildlife, thus spreading much more rapidly than they would have by natural dispersal alone. A few introductions represent other miscellaneous attempts at economic stimulus (e.g. the introduction of White Mulberry as a host tree for silkworm moth caterpillars, in an attempt by the British to establish a silk industry in the colonies).

The second group of invasive plant introductions is those that were truly accidental in nature. Most of these involve herbaceous plants introduced as seed. An example cited in this guide is the introduction of Japanese Stiltgrass via plant material used as packing for porcelain shipments.

As this summary suggests, invasive species introduction has historically been a somewhat preventable occurrence. The horticulture industry has grown more interested in stopping the importation and sale of invasive plants, although many are still widely available. In addition, state and federal agencies are now focused on invasive plant eradication, rather than introduction, reversing the past trend of searching for novel wildlife plants, and opting rather for a largely native approach. Increasing globalization, however, will undoubtedly lead to further spread of plant species worldwide, making an understanding of their ecology and control of utmost importance.

Introduction

Identification of Invasives

There are adverse ecological consequences of mistakenly controlling a native plant species. While an occasional case of mistaken identity may result in the removal of only a small proportion of the population of a given native plant, widespread misidentification and "control" of certain native species that are already rare or declining has the potential to result in significant local and population-level impacts. The declines of some native plant species appear to be caused by the spread of closely related invasives. Examples of native species that are declining throughout their ranges include American Bittersweet and Red Mulberry. Extra care should be taken in distinguishing such native plant species from their invasive counterparts. In addition to the impacts on declining native species themselves, the removal of any native plant is sure to have complex and potentially negative impacts on the community from which it was eradicated. Finally, herbicides and labor are expensive, and these resources should not be wasted on the control of a misidentified plant species.

Identification in the Field

When attempting to identify an unknown plant species, it is useful to carry a few basic items to help you record accurate information. Some of these tools include: a small plastic metric ruler, a small hand lens or magnifier, a notebook and pencil, a couple of large, plastic zipper bags for collecting plant specimens, a small pair of pruners for collecting branches of woody plants, and a compact digital camera with macro setting for photographing various parts of the plant and the habitat in which it was found. While field guides and botany manuals are helpful to have on hand, if you record detailed notes and sketch, photograph, or collect a specimen of the plant in question, you will be prepared to identify the plant at a later time. Note that it is illegal to collect specimens without first obtaining the proper permission (permits from the appropriate agency on public land, or permission of the landowner on private land).

A properly collected specimen includes the entire plant, even the roots (which are often important for identification), and any flowers or fruit (if present). If the plant is large, such as a tree or shrub, snip off a piece of a branch, and take notes or photos describing the bark. In order to avoid damage to populations of native plants, do not collect a specimen if there appears to be only one or a few plants in the area.

When you return home, remove any dirt or debris from the plants, and place each collected specimen inside of a few sheets of newsprint with the date and location marked on them. Take care to spread out the leaves and turn some face-up and others face-down so that both sides are visible. Sandwich the newsprint between two pieces of corrugated cardboard (you can cut the cardboard to the size of the newsprint) and top the cardboard with several heavy books, or place it inside a plant press. Store the specimen indoors in a dry area for several days to a week or two, depending on the thickness of the specimen and the ambient humidity. Once completely dry, the books can be removed, and the cardboard can be taped together to protect the specimen until it can be examined by a botanist.

Whether or not you choose to collect a specimen, it is important to record the exact location of the plant. Record GPS coordinates, if available, and mark the location on a detailed map. Take notes on all parts of the plant, noting colors, presence or absence of hairs, manner of leaf attachment (opposite, alternate, whorled), the presence or absence of teeth, the number of petals and sepals of a flower, etc. Note any distinctive odor, the color of sap, and other unique features. Be sure to note what the surrounding habitat is like (woods, fields, wetlands, etc.) and what other plants are growing nearby (if you know them). Note that some plants can cause dermatitis when handled, so use caution and try to avoid touching sap when examining and collecting unknown plants.

A careful set of notes, especially when combined with a series of photos or a specimen, should help you to identify the plant in question.

Introduction

How to Use This Guide

This guide is not intended as a key or a comprehensive manual to plants of the region. Rather, if you suspect that the plant you are trying to identify is one of the invasive species covered here, the species account will help you to rule out other similar species. In order to use this guide effectively, if you have no idea of the identity of the plant in question, you should first consult other basic references in order to narrow the possibilities. Keep in mind that no guide can cover ALL of the other species that might resemble a particular invasive. This is especially true for difficult groups like grasses.

Botanical terminology is complex and extensive. We have tried to limit the number of unfamiliar terms used in this guide, and have provided a glossary to define the terms we do use. Whenever possible, we describe the character more fully rather than using a technical term. One area of potential difficulty is grass identification, which uses specialized terminology to describe the tiny structures associated with grass flowers and fruits. We have simplified the identification process, but if you are not familiar with the reproductive structures of grasses, it will be helpful to have your identification confirmed by someone familiar with grass morphology.

Always be absolutely certain of your identification before eradicating a suspected invasive plant. If you are still unsure, please consult a professional botanist or invasive species biologist. Often, your local extension office or your local NRCS office can assist you with identification of possible invasive species.

Numerous printed and online resources are available to aid in plant identification. Some of the best are listed in the Resources section at the end of this publication.

You Can Make a Difference

Many battles in the war against invasive plants are being won by small organizations, volunteer "weed warrior" groups, local land managers, and private conservation landowners. The success of your control efforts depends largely upon your knowledge of the invasive species with which you are working, including their natural history and impacts on the ecosystem. If you take the time to carefully identify an invasive plant and learn about its native look-alikes, you will find that not only will you avoid identification mistakes, but you will become much more familiar with the biology of the invasive you are trying to control. This guide should help get you started, and the many invaluable references available in the Resources section will assist you in your efforts to restore the health of a plant community near you.

Financial and technical assistance for invasive plant control may be available through various NRCS cost-share programs, including the Environmental Quality Incentives Program (EQIP) and the Wildlife Habitat Incentives Program (WHIP). In addition, many agencies and private foundations offer grants for invasive species removal projects. For more information, please consult the Financial and Technical Assistance section of the Resources page at the end of this guide, or contact your local NRCS office.

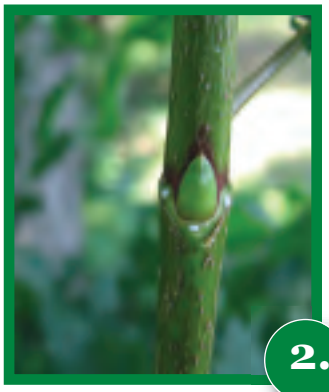
NORWAY MAPLE

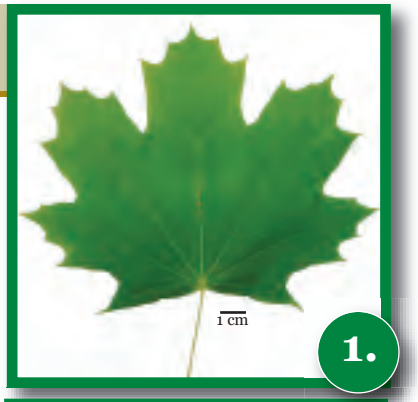
Acer platanoides

Maple Family (Aceraceae)

Broadleaf Deciduous Tree

Flowers: Apr–May
Fruits: Jun–Oct
Native Range: Eurasia





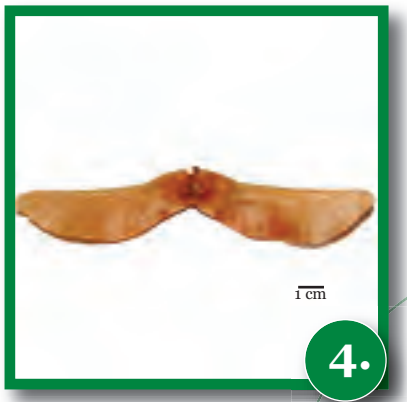
Introduction: 1756 to Philadelphia by the botanist John Bartram. Extensively planted as a street tree, perhaps the most common street tree in the country. Planted heavily in the mid-1900s in response to mortality of elms from Dutch Elm Disease.

Mid-Atlantic Range & Habitats: Widespread throughout the region on city streets, in suburban yards, and naturalized in forests, particularly in urban and suburban areas.

Ecological Impacts:
Norway Maple is tolerant of a wide range of light and soil conditions, and seedlings can invade and persist within the interior of intact forest. The species is capable of outcompeting native maples in invaded forests. Mature trees cast deep shade, reducing light availability to forest understory plants. In addition, the tree can cause dramatic changes in nutrient availability that can alter the surrounding plant community structure.

Quick ID:

1. Leaf veins	(5)–7 major veins (greater than 3.5 cm long) radiating from the base of the leaf blade
2. Leaf sap	Milky sap where leaf petiole is detached from stem (Squeeze petiole to make sap more evident, though sap can be difficult to observe late in the season)
3. Leaf teeth	Teeth on leaves very sharp pointed, hair-like at the tip.
4. Fruit (samara)	Wings of samara widely spreading to nearly 180°, width 3.5–4.5 cm



More ID Tips:

When mature, Norway Maple has gray-brown bark with shallow intertwining furrows or grooves, whereas the bark of Sugar Maple is gray and slightly shaggy or plated. The dark green leaves of Norway Maple are large and wider (15 cm) than they are long. Sugar Maple leaves tend to be smaller with a pale underside that becomes more evident when rubbed. Norway Maple leaves typically have 5–7 lobes and sugar maple has 3–5. Both species have greenish-yellow flowers in stalked clusters, but the flowering clusters of Norway Maple are erect and those of Sugar Maple are drooping.

Native

SUGAR MAPLE

Acer saccharum

Maple Family (Aceraceae)

Broadleaf Deciduous Tree

Flowers: Apr–May

Fruits: Jun–Oct

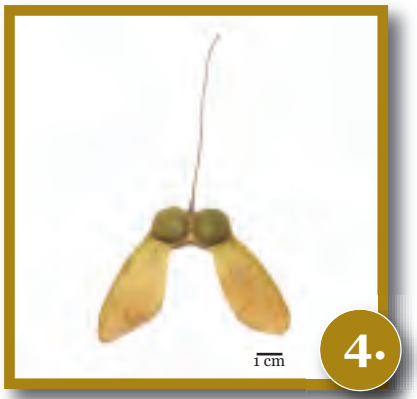
Mid-Atlantic Range & Habitats: Moist forests, ravines, and floodplains throughout the region, but generally absent from the Coastal Plain.

Ecological Value:

Famous for its sap and brilliant fall color, Sugar Maple is a major component of deciduous forest ecosystems throughout the Northeast. The tree is used for nesting by many songbirds and is especially favored by Red-eyed Vireos. The seeds are a food source for goldfinches, purple finches, and other songbirds, as well as for game birds such as grouse, turkey and bobwhite quail.

Quick ID:

1. Leaf veins	(3)–5 major veins (greater than 3.5 cm long) radiating from base of leaf blade
2. Leaf sap	Clear sap or no sap visible where leaf petiole is detached from stem
3. Leaf teeth	Teeth on leaves less sharp, rounded
4. Fruit (samara)	Wings of samara bent downwards, width 2.5–4.0 cm



Other Similar Species:

Black Maple (*Acer nigrum*) is a native species that is nearly identical to Sugar Maple, but with stipules present at the base of the leaf petioles. The large, strongly spreading wings of the Norway Maple samara separate it from all native maple species in the Mid-Atlantic.

JAPANESE ANGELICA TREE

Aralia elata
Ginseng Family (Araliaceae)

Broadleaf Deciduous Tree

Flowers: Jul–Aug
Fruits: Aug–Sep
Native Range: Russia, China, Korea, Japan
Introduction: as an ornamental plant

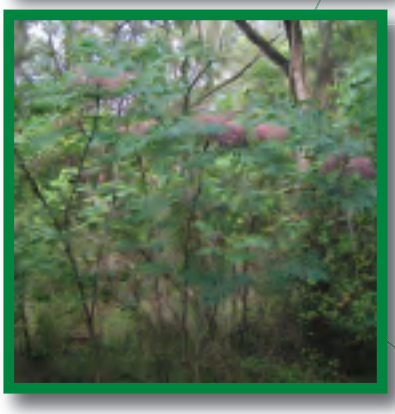
Mid-Atlantic Range & Habitats: Wood edges, open areas, and thickets, especially around urban areas. Common in the Philadelphia area, and found elsewhere in southeastern PA, in the vicinity of New York City and on Long Island. Becoming increasingly frequent in the Piedmont of northern Delaware.

Ecological Impacts:

In the past, many records of *Aralia* north of Delaware and Maryland were attributed to introductions of the native *A. spinosa* from further south. Recently, however, the possibility has been raised that many of these records actually represent *A. elata*. In Philadelphia, it appears that *A. elata* is displacing *Aralia spinosan* in the forest understory of urban parkland along the Wissahickon Creek. The extent of this impact and the potential for hybridization between the two species are still unknown.

Quick ID:

1. Leaf veins	Main lateral veins running all the way to the tips of teeth at the leaf margin
2. Inflorescence	Inflorescence shorter, typically 30–60 cm long, and WITHOUT a distinct central axis (often wider than long, with base usually surrounded by and even overtopped by foliage)



More ID Tips:

Japanese Angelica Tree and Devil's Walkingstick can be very difficult to distinguish in the field. Both species have spines covering most of the plant, compound leaves made up of many leaflets, white flowers, black berries, and grow to a height of up to 10 m. The structure of the inflorescence is the most obvious distinguishing character. The individual leaflets of *A. elata* tend to be larger (5–12 cm long) than those of *A. spinosa* (5–7 cm long), but there is considerable overlap. The leaflets of *A. elata* are mostly sessile or with a very short petiole, whereas the leaflets of *A. spinosa* usually have a distinct petiole, but this character is also variable.

DEVIL'S WALKINGSTICK

Aralia spinosa
Ginseng Family (Araliaceae)

Broadleaf Deciduous Tree

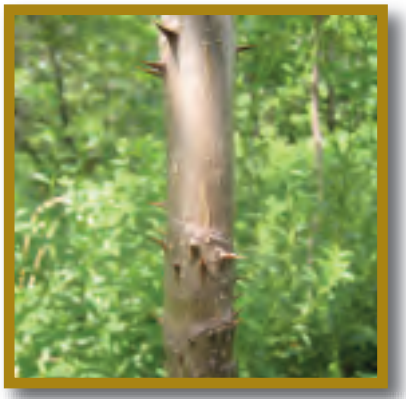
Flowers: Jul–Aug
Fruits:Aug–Sep
Mid-Atlantic Range & Habitats: Moist soils of forests, streambanks, roadsides. A southern species, with the northern limit of the original range apparently extending north to Delaware and Pennsylvania, possibly introduced further north.

Ecological Value:

Devil's Walkingstick provides good wildlife cover. The fruits are eaten by a variety of birds, including cardinals, mockingbirds, sparrows, robins, thrushes, orioles, bluebirds, towhees, and rusty blackbirds. Mammalian consumers include: foxes, skunks, raccoons, opossums, chipmunks and mice. The flowers are highly attractive to native bees (especially bumble bees and sweat bees), flies, wasps, and numerous butterflies.

Quick ID:

1. Leaf veins	Main lateral veins branching and diminishing in size before reaching the leaf margin (smaller branching veins may run to the tips of teeth)
2. Inflorescence	Inflorescence longer, often 1–1.2 m long, WITH a distinct central axis (typically longer than wide, base usually elevated above foliage)



Other Similar Species:

Toothache Tree (*Zanthoxylum americanum*) is another shrub or small tree with prickles and toothed, compound leaves. However, the thorns of *Zanthoxylum* are paired, whereas those of *Aralia* are not. The axillary flower clusters of *Zanthoxylum* appear in spring, before the leaves, and the foliage has a strong aromatic odor. Other trees with compound leaves and thorny stems, such as the Locusts (*Robinia* and *Gleditsia*) have entire, rather than toothed, leaflets.

Invasive

WHITE MULBERRY

Morus alba
Mulberry Family (Moraceae)

Broadleaf Deciduous Tree

Flowers: May
Fruits: Jun–Jul
Native Range: China
Introduction: 1700s by the British in an attempt to establish a silk industry in America (it is the hostplant for the silkworm moth).

Mid-Atlantic Range & Habitats: Disturbed forests and woodlands, hedgerows, yards, and old fields, throughout the region.

Ecological Impacts:

A favored bird food, this species is dispersed widely by bird consumption of the fruits. Where it grows alongside the native Red Mulberry, the two species readily hybridize. In Ontario, at the northern limit of the native range, hybrids are always found where the two species co-occur. Both pure White individuals and White x Red hybrids show greater fitness than pure Red individuals in studies. In the presence of White Mulberry, Red Mulberry trees produce very few pure Red offspring. For these reasons, White Mulberry threatens to genetically swamp populations the native species.

Quick ID:

1. Mature leaf blades, upper surfaces	Usually shiny
2. Leaf blades, undersides	Underside of leaves not hairy, except on the veins
3. Fruit size	Fruit 1–2 cm long
4. Winter buds	Winter buds 3–4 mm long

More ID Tips:

Red Mulberry has larger leaves than White Mulberry, but there is significant overlap. The ripe fruits of red mulberry are purplish black and 2–3 cm long. The ripe fruits of white mulberry range from white to black and are 1–2 cm long.

Native

RED MULBERRY

Morus rubra

Mulberry Family (Moraceae)

Broadleaf Deciduous Tree

Flowers: May
Fruits: Jun–Jul

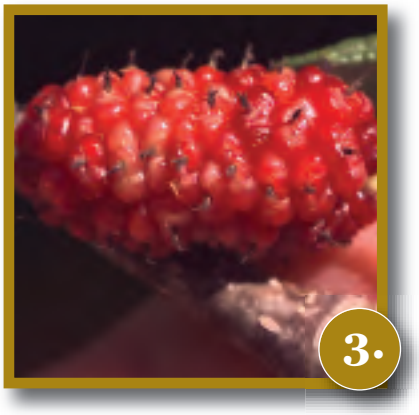
Mid-Atlantic Range & Habitats: Moist soils of floodplains, thickets, and streambanks, uncommon throughout the region.

Ecological Value:

Both Mulberry species are favored by birds, and no study of relative preference has been published. Songbirds and gamebirds relish the fruit, and cardinals, mockingbirds, orioles, thrashers, thrushes, waxwings, and woodpeckers are frequent visitors. Several mammals also eat the fruits, including foxes, opossums, raccoons, skunks, and squirrels.

Quick ID:

1. Mature leaf blades, upper surfaces	Usually dull
2. Leaf blades, undersides	Underside of leaves hairy
3. Fruit size	Fruit 2–3 cm long
4. Winter buds	Winter buds 5–8 mm long



Other Similar Species:

Paper Mulberry (*Broussonetia papyrifera*) is another introduced tree in the mulberry family. Its leaves are highly variable in shape, grayish-green, and velvety. The fruit is small, red, and inedible. Though sometimes aggressive, this species is usually not invasive. Basswood (*Tilia americana*) is a native tree of rich forests that has leaves that are very similar to mulberry leaves, but are never lobed. Basswood also has clear sap, whereas the sap of the mulberries is milky.

TREE-OF-HEAVEN

Ailanthus altissima
Quassia Family (Simaroubaceae)

Broadleaf Deciduous Tree

Flowers: Jun–Aug
Fruits: Jul–winter
Native Range: China
Introduction: to Philadelphia in 1748 by a gardener.

Mid-Atlantic Range & Habitats: Disturbed forests, forest edges, old fields, roadsides, urban areas, widespread, in a wide range of soils.

Ecological Impacts:

Tree-of-heaven releases chemicals into the soil that inhibit the growth of other plants. At the same time, the rapidly growing tree quickly reduces light availability to plants growing beneath it. *Ailanthus* has also been shown to change nutrient cycling and availability in invaded forests. Female trees produce huge numbers of windborne seeds.

Quick ID:

1. Leaves	Leaflets entire except for one to several broad, rounded teeth at base; underside of leaflet with a round, thickened spot (a gland) near the base of each tooth
2. Fruit	Large cluster of winged samaras
3. Odor	Leaves and stems of plant with a strong, unpleasant odor when crushed or bruised

More ID Tips:

Ailanthus has clear sap, whereas the *Rhus* species have milky, sticky sap. The young stems and petioles of *Ailanthus* are hairless. Smooth Sumac has hairless but glaucous stems and petioles and those of Staghorn Sumac are covered in dense hairs. The undersides of the leaflets of both species of sumac are whitish, compared to the green or light green of *Ailanthus*. The thin gray bark of Tree-of-heaven is distinctive, with diamond-shaped markings on younger trees, and pale vertical lines on older trees. The bark of the sumacs is very smooth with narrow horizontal markings. Sumacs do not grow more than 10 m tall, whereas Tree-of-heaven grows to a height of 25 m.

Native

STAGHORN SUMAC and SMOOTH SUMAC

Rhus typhina, R. glabra
Cashew Family (Anacardiaceae)

Broadleaf Deciduous Trees

Flowers: Jun–Jul
Fruits: Jul–winter

Mid-Atlantic Range & Habitats: Dry soils of forest edges, hedgerows, roadsides, old fields. Both species are widespread in the region, but generally less common on the Coastal Plain where the distinctive Winged Sumac (*Rhus copallinum*) is the more common species.

Ecological Value:

Sumacs are important winter food for grouse, turkey and other game birds, as well as many species of songbirds, especially robins and bluebirds. Rabbits and deer browse the foliage, while the fruits are readily consumed by squirrels. Sumacs are also important species for bees and other insects, providing pollen and nectar in the flowers and nesting sites in the stems.

Quick ID:

1. Leaves	Leaflets with small, sharp teeth along their edges; no gland on underside of leaflet
2. Fruit	Cluster of red, hairy fruits
3. Odor	No strong unpleasant odor

Other Similar Species:

Tree-of-heaven resembles Ashes (*Fraxinus spp.*), Black Walnut (*Juglans nigra*), and Butternut (*Juglans cinerea*). The simplest character that distinguishes Tree-of-heaven from these species is its distinctive strong odor. In addition, the *Juglans* species have toothed leaflets and the fruit is a hard nut. The *Fraxinus* species have compound leaves that are opposite, rather than alternate, on the stem.

ASIAN BUSH HONEYSUCKLES

Lonicera maackii, L. morrowii, L. tatarica
Honeysuckle Family (Caprifoliaceae)

Deciduous Shrubs

Flowers: May–Jun
Fruits: Jun–Jul, Oct–Nov (*L. maackii*)
Native Range: China, Manchuria, Korea
Introduction: Tartarian in 1700s, Amur and Morrow's in late 1890s. Promoted by USDA for wildlife habitat and shelterbelts.

Mid-Atlantic Range & Habitats: Open woodlands, old fields, forest edges, hedgerows, throughout the region.

Ecological Impacts:

Several similar species of bush honeysuckles of Asian origin occur in our region. These shrubs leaf out early in the season and hold their leaves longer than most native deciduous shrubs, thus reducing light availability to other plants for a long period of the growing season. Recent studies have shown that chemicals in *L. maackii* are capable of inhibiting germination of other plants. The nesting success of birds nesting in Asian bush honeysuckles may be reduced because the plants provide less protection from nest predators. In addition, foraging birds choose honeysuckle fruit as readily as some native species with greater caloric content. Honeysuckle seeds may be dispersed over long distances by birds and deer.

Quick ID:

1. Leaf Margins	Leaf margins entire
2. Fruits	Fruit a red (usually) to yellowish round berry
3. Stem	Hollow pith (the hollow in the center of the pith is often quite small)

More ID Tips:

The yellow flowers of our native Bush-honeysuckle (*Diervilla lonicera*) are in groups of 3–7 and turn reddish with age. The invasive honeysuckle species all have white to yellow flowers, with the exception of Tartarian Honeysuckle (*Lonicera tatarica*) that can have white to pink flowers.

Native

NATIVE BUSH HONEYSUCKLES

Diervilla lonicera, Lonicera canadensis
Honeysuckle Family (Caprifoliaceae)

Deciduous Shrubs

Flowers: Apr–Jun
Fruits: Jun–Aug

Mid-Atlantic Range & Habitats: Fly-honeysuckle (*L. canadensis*) reaches the southern limit of its distribution in our region, but is found in New York and Pennsylvania, and sporadically in Maryland and New Jersey, in the understory of moist, rich forests. Bush-honeysuckle (*Diervilla lonicera*) is much more common throughout the region in dry woods.

Ecological Value:
Fly-honeysuckle fruits are eaten by grouse, quail, and songbirds, while the twigs and foliage are browsed by deer and rabbits. Bush-honeysuckle provides cover for grouse and other small wildlife, as well as browse for white-tailed deer. Its flowers attract bumblebees and other pollinators; and it is a hostplant for the spectacular snowberry clearwing moth (*Hemaris diffinis*) and Kalm's sphinx moth (*Sphinx kalmiae*).

Quick ID:

	Bush-honeysuckle	Fly Honeysuckle
1. Leaf Margins	Leaf margins toothed, sometimes ciliate	Leaf margins entire, ciliate
2. Fruits	Fruit an elongated capsule	Fruit a red berry
3. Stem	Solid pith	Solid pith

Other Similar Species:

Another less common native honeysuckle species, Swamp Fly-honeysuckle (*L. oblongifolia*) has yellow flowers in the leaf axils. Coralberry (*Symphoricarpos orbiculatus*) has similar opposite, entire leaves, but has solid pith and coral to purple berries. Snowberry (*Symphoricarpos albus*) has hollow pith like the Asian *Lonicera* species, but can be distinguished by its white fruits. Privets (*Ligustrum* sp.) are invasive shrubs with opposite, entire leaves, but with the flowers in terminal cone-shaped clusters, and greenish berries that turn black at maturity.

BURNING BUSH, WINTERCREEPER

Euonymus alatus, Euonymus fortunei
Bittersweet Family (Celastraceae)

Deciduous Shrub / Woody Vine

Flowers: Apr–Jun
Fruits: Sep–winter
Native Range: China, Korea, Japan
Introduction: 1860s as ornamental (*E. alatus*) 1907 as ground cover (*E. fortunei*)

Mid-Atlantic Range & Habitats: Burning Bush is found in forests, streambanks and hedgerows, mostly near heavily populated areas. Wintercreeper grows in disturbed forests, thickets, and floodplains, scattered in our region from NY and southeastern PA to VA.

Ecological Impacts:
Long planted as ornamentals, these species are relatively new invaders. The first populations of of Burning Bush (*Euonymus alatus*) invading natural areas were found in the 1960s and 1970s. This species tolerates heavy shade and forms dense shrub thickets in both disturbed and intact forest. The prolific fruit is eaten by birds, which disperse the seed to new locations. Wintercreeper (*Euonymus fortunei*) restricts native plant establishment due to dense ground cover, and its vines reach 12–21 m high and can kill shrubs and trees supporting them.

Quick ID:

	Burning Bush	Wintercreeper
1. Habit	Deciduous upright shrub	Evergreen sprawling or climbing vine with aerial rootlets
2. Stems	Stems winged	Stems not winged
3. Ripe Fruit	Capsule purplish	Capsule pale, whitish, becoming brownish with age

More ID Tips:

Strawberry Bush (*E. americanus*) can be distinguished by the combination of four-angled, wingless, green stems, five-parted flowers, pink fruits with bumpy surfaces, and orange arils. Wahoo (*E. atropurpureus*) has wingless stems, four-parted flowers and fruits, a smooth pink capsule, and red arils. Burning Bush (*E. alatus*) has winged stems, four-parted flowers and fruits, and distinctive purplish capsule segments that curl back on themselves after opening, leaving the red arils exposed. Wintercreeper (*E. fortunei*) has four-parted flowers and fruits, while Running Strawberry-bush (*Euonymus obovatus*) has five-parted flowers and fruits.

NATIVE EUONYMUS

Euonymus americanus, E. atropurpureus, E. obovatus
Bittersweet Family (Celastraceae)

Deciduous Shrubs

Flowers: May–Jul
Fruits: Aug–Oct

Mid-Atlantic Range & Habitats: Moist soils in forests, floodplains, and thickets. *E. americanus* and *E. atropurpureus* are widespread, but not common. *E. obovatus* is found in western NY and western PA.

Ecological Value:

Native *Euonymus* species bear unusual fruits consisting of an outer capsule that splits open to reveal fleshy, red or orange arils. These arils are eaten by songbirds, which then disperse the seeds. *Euonymus atropurpureus* flowers attract sweat bees and a number of species of flies. At least four species of moth caterpillars feed on the plants. These shrubs are browsed extensively by deer, and appear to be threatened by deer overpopulation. *E. americanus* is listed as Endangered in New York state, *E. obovatus* is listed as Exploitably Vulnerable in New York state, and *E. atropurpureus* is considered rare in Delaware.

Quick ID:

	Native Shrub Euonymus	Running Strawberry-bush
1. Habit	Deciduous upright shrub	Deciduous trailing or sprawling shrub, sometimes rooting along the stem
2. Stems	Stems not winged	Stems not winged
3. Ripe Fruit	Capsule bright pink or crimson	Capsule pink or crimson

Other Similar Species:

Young saplings of Sweet Gum (*Liquidambar styraciflua*) have corky wings on the stems and branches, and could be confused with *Euonymus alatus* in winter.

MULTIFLORA ROSE

Rosa multiflora
Rose Family (Rosaceae)

Deciduous Shrub

Flowers: May–Jun
Fruits: Aug–winter
Native Range: Japan, Korea
Introduction: as a rootstock for rose cultivation in 1866. In the 1930s, it was widely promoted for erosion control and as a living fence. State agencies continued to promote it for wildlife for decades.

Mid-Atlantic Range & Habitats: Open woodlands, forest edges, old fields, and thickets, throughout. Tolerates shade but does not flower heavily when shaded.

Ecological Impacts:

Multiflora Rose provides winter cover and food for songbirds and is an important food source for some overwintering fruit-eating species such as Northern Mockingbird. Despite these benefits, the species displaces native vegetation, especially in old fields and open riparian areas, where impenetrable thickets of Multiflora Rose often develop. In many areas, this species is afflicted with a mite-vectored viral disease, which may help slow its spread in areas of marginal habitat suitability.

Quick ID:

1. Stipules	Stipules fringed with long, thin projections on the margin
2. Flowers	Flowers white (occasionally pinkish)
3. Flowers	Clusters of many flowers, found only at the end of branches (terminal)

More ID Tips:

Multiflora Rose tends to form larger, taller, more extensive shrubs than the native rose species. The hips or fruits of Multiflora Rose are approximately 5 mm in diameter, smaller than most native rose species.

NATIVE ROSES

Rosa carolina, R. palustris, R. virginiana
Rose Family (Rosaceae)

Deciduous Shrubs

Flowers: May–Jul
Fruits: Aug–winter

Mid-Atlantic Range & Habitats: *R. palustris*: wet soils of swamps, marshes. *R. carolina*: dry soils of fields, infrequent on the Coastal Plain. *R. virginiana*: moist soils of fields, thickets, and roadsides.

Ecological Value:

Native roses provide wildlife food and cover benefits similar to those of Multiflora Rose, without the invasive tendencies. They are less abundant, however, and are more specialized in habitat requirements. The plants are preferred browse for deer, rodents, beaver, rabbits, and other mammals. Native rose blossoms are very attractive to a wide variety of pollinating bees and flies.

Quick ID:

1. Stipules	Stipules entire
2. Flowers	Flowers pink
3. Flowers	Clusters of only a few flowers, found in the leaf axils and the ends of branches (axillary and terminal)

Other Similar Species:

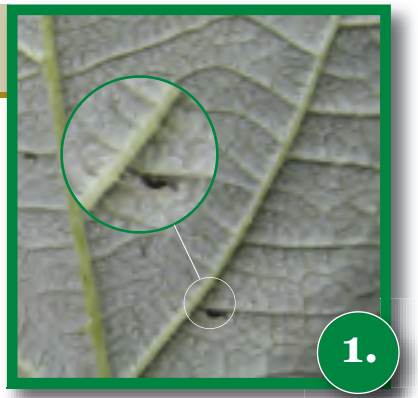
Prairie Rose *(Rosa setigera)* and Meadow Rose *(Rosa blanda)* are two other native rose species that occur in our area. Prairie Rose, like Multiflora Rose, has terminal clusters of small flowers, but its flowers are pink, rather than white, and it has 3–5 leaflets per leaf (versus 5–11 leaflets of Multiflora Rose). Meadow Rose has the prickles few or absent, and large, pink flowers. Many non-native roses occasionally escape from cultivation. The combination of fringed stipules and white flowers will separate *Rosa multiflora* from all of these species.

WINEBERRY

Rubus phoenicolasius
Rose Family (Rosaceae)

Deciduous Shrub

Flowers: Jun
Fruits: Jul–Aug
Native Range: China, Korea, Japan
Introduction: in the 1890s to improve breeding stock of commercial berries.



Mid-Atlantic Range & Habitats: Widespread throughout the region in moist to mesic soil in open forests, forest edges, wetland edges, thickets, grasslands, roadsides and shale banks.

Ecological Impacts:

Wineberry fruit appears to be eaten by many of the same wildlife species that consume native brambles. Birds feeding on the fruit are capable of spreading it to new sites. Wineberry can grow under a wide variety of light conditions, including shade, and will readily invade mid-successional forest. The dense thickets it forms exclude native vegetation. In one study, Wineberry had higher rates of self-pollination and fruiting (and greater fruit set) than the native bramble *Rubus argutus* growing at the same site.

Quick ID:

1. Leaves	Underside covered in dense matted, WHITE, wooly hairs
2.Branches	Branches, petioles, and sepals densely shaggy with long, glandular, purplish-red hairs
3. Fruits	Orange-red fruits

More ID Tips:

Two common native bramble species that are frequently found growing with Wineberry are Black Raspberry (*Rubus occidentalis*) and Common Blackberry (*Rubus allegheniensis*). In addition to the characters above, the large egg-shaped terminal leaflet with a short, tapering, pointed tip differentiates Wineberry from these two native species. Black Raspberry leaflets are strongly whitened beneath, but the stems are also whitened or glaucous, while the stems of Wineberry are covered in red hairs. The fruits of Wineberry remain enveloped by the sepals until it has ripening, unlike the fruits of black raspberry, which are never enclosed by the sepals.

NATIVE BLACKBERRIES and RASPBERRIES

Rubus spp.
Rose Family (Rosaceae)

Deciduous Shrub

Flowers: May–Aug
Fruits: Jul–Sep

Mid-Atlantic Range & Habitats: Thickets, open forests, forest edges, hedgerows, old fields, swamps, banks. There are a number of species throughout the region.

Ecological Value:

Besides being a source of food for man, native berries in the genus *Rubus* are extremely important summer food for wildlife. More than 40 species of birds in our area eat the fruits, including grouse, quail, turkey, and woodcock. Among the principal songbird consumers are: cardinals, chats, catbirds, orioles, robins, sparrows, tanagers, thrushes, and towhees. In addition to numerous species of mammals, box turtles favor the fruit. The plants are also of high value to insects, providing pollen and nectar for numerous species, as well as nest sites for stem-nesting bees.

Quick ID:

1. Leaves	Underside usually GREEN, whitish in a few species
2.Branches	Long, glandular, purplish-red hairs not present on the branches, petioles and sepals
3. Fruits	Red or black fruits

Other Similar Species:

Red Raspberry (*Rubus idaeus*) is a native species with reddish fruits and leaflets that are gray-hairy beneath. The hairs on the stems of Red Raspberry are not red or purplish, and the leaflets are narrower and more pointed than those of Wineberry. Some species of small, creeping brambles, such as *Rubus hispidus* and *R. trivialis*, have reddish glandular hairs on the stems, but these hairs are generally shorter than the prickles, and the plants can be readily distinguished by their creeping habit.

JAPANESE HONEYSUCKLE

Lonicera japonica
Honeysuckle Family (Caprifoliaceae)

Woody Vine

Flowers: May–Jul
Fruits: Sep–Oct
Native Range: Japan, Korea, Eastern China
Introduction: to Long Island in 1806, spread via the nursery trade and promoted for wildlife value.

Mid-Atlantic Range & Habitats: Wood edges, old fields, ditch banks, thickets, roadsides, throughout the region.

1.

2.

Ecological Impacts:

Japanese Honeysuckle forms dense sprawling mats that can clamber over brush and debris, excluding virtually all other vegetation, and often inhibiting forest regeneration. The vines climb high into shrubs and trees. The resulting tangles provide wildlife cover and the berries are occasionally eaten by birds and other wildlife. However, the reduction of biodiversity in invaded areas outweighs the benefits of the plant. On the Coastal Plain, where it is most abundant, ditch banks and edges that would otherwise host a diversity of native wildflowers are typically completely overtaken by this vine.

Quick ID:

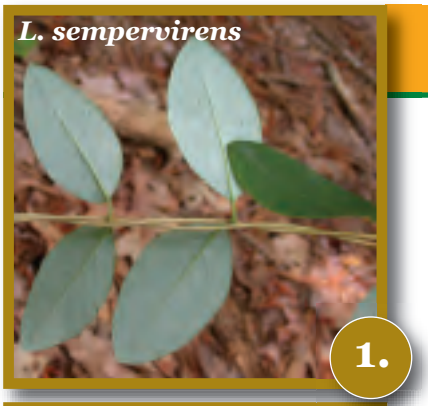
1. Leaf surface	Leaves with underside paler green, but not strongly whitened, sometimes hairy
2. Leaves	All leaves opposite and distinct from each other
3. Flower arrangement	Flower clusters axillary, produced in the axils of leaf pairs along the length of the stem
4. Ripe fruit color	Black

3.

4.

More ID Tips:

Japanese Honeysuckle leaves are entire to sometimes lobed, whereas the leaves of the native species are always entire. The young stems of the invasive are finely hairy, while the young stems of the natives are glaucous and hairless. Japanese Honeysuckle flowers are typically white, turning to yellow. Trumpet Honeysuckle flowers are reddish-pink or yellow, while those of Twining Honeysuckle are yellow to purplish.



Native

NATIVE TWINING HONEYSUCKLES

Lonicera dioica, L. sempervirens
Honeysuckle Family (Caprifoliaceae)

Woody Vines

Flowers: May–Jul
Fruits: Jun–Oct

Mid-Atlantic Range & Habitats: *L. sempervirens* is widespread in thickets and fencerows, while *L. dioica,* not found on the Coastal Plain, is a species of moist cliffs, banks, forests and thickets.

Ecological Value:

Twining Honeysuckle (*Lonicera dioica*) and Trumpet Honeysuckle (*Lonicera sempervirens*) are native vine-like, trailing or twining honeysuckles. Trumpet Honeysuckle is a favorite nectar source for Ruby-throated Hummingbirds. Butterflies and moths nectar at the flowers of both species, and each plant hosts a few species of caterpillars, including those of the spring azure butterfly. Twining Honeysuckle holds fruit into late summer and early fall, providing food for migrant songbirds, as well as grouse and small mammals.

Quick ID:

1. Leaf surface	Leaves strongly whitened on underside
2. Leaves	Upper most pair of leaves fused.
3. Flower arrangement	Flower clusters terminal, produced only at the end of each vine
4. Ripe fruit color	Red

Other Similar Species:

There are various cultivars of Japanese Honeysuckle including one ('*superba*') that has reddish stems and reddish/pinkish flowers. An additional native species that is rare in our region, Hairy Honeysuckle (*L. hirsuta*) has yellow-orange, hairy flowers and leaves with hairs on both sides. Compare the vine honeysuckles on this page to the shrubby honeysuckles on page 14-15. Young bush honeysuckles could be confused with the twining species above.

Invasive

ORIENTAL BITTERSWEET

Celastrus orbiculatus
Bittersweet Family (Celastraceae)

Woody Vine

Flowers: May–Jun
Fruits: Sep–Nov
Native Range: China, Korea, Japan
Introduction: 1860 as an ornamental.

Mid-Atlantic Range & Habitats: Forests, woodlands, forest edges, riparian areas, and fields, throughout the region.

1.

2.

Ecological Impacts:

Oriental and American Bittersweet can hybridize, but the extent of hybridization that occurs in wild populations is not known. The viability of pollen produced by hybrid plants is low. Oriental Bittersweet is spread primarily by fruit-eating birds. Lower levels of seed dormancy and the ability of the seedlings to tolerate shading give Oriental Bittersweet a competitive advantage over American Bittersweet. Deer browsing may be a limiting factor of Oriental Bittersweet density in invaded forests.

Quick ID:

1. Leaves	Leaves broader, less than 2x as long as wide
2.Flower/fruit Location	Flowers/fruits in the axils of leaves
3. Fruits	Yellow capsule
4. Flower/fruit Clusters	2 or 3 flowers/fruits per cluster

3.

4.

More ID Tips:

A reliable vegetative character for American and Oriental Bittersweet vines is the way the leaves are folded during leaf-out. The leaves of Oriental Bittersweet are folded in half along the midvein, or conduplicate. The leaves of American Bittersweet are involute; each half of the leaf is rolled towards the midvein. Oriental Bittersweet typically produces white pollen while American Bittersweet has yellow pollen. American Bittersweet usually produces one or no seeds in each of its fruits, while Oriental Bittersweet usually produces 5 or more seeds, but the number of seeds per fruit can be variable.

AMERICAN BITTERSWEET

Celastrus scandens

Bittersweet Family (Celastraceae)

Woody Vine

Flowers: May–Jul
Fruits: Sep–Nov

Mid-Atlantic Range & Habitats: Dry fields, thickets, and hedgerows. Widespread but not common throughout the region; generally less common on the coastal plain.

Ecological Value:

American Bittersweet provides food for some 15 bird species and a number of small mammals. The fruit remains on the vine through the winter, providing essential food in that season. The vines provide good nesting cover for songbirds. The flowers attract bees, and the plants hosts at least five species of moth caterpillars. This species is listed as Exploitably Vulnerable in New York and is considered to be rare and historical in Delaware (not seen in more than 20 years).

Quick ID:

1. Leaves	Leaves narrower, mostly 2x as long as wide
2.Flower/fruit Location	Flowers/fruits in clusters at the end of the stem
3. Fruits	Orange capsule
4. Flower/fruit Clusters	6 or more flowers/fruits per cluster

Other Similar Species:

The two species of Bittersweet are distinctive in summer (fast-growing woody vines with finely-toothed, simple leaves) and winter (colorful orange or yellow capsules opening to reveal orange fruits).

JAPANESE VIRGIN'S BOWER

Clematis terniflora
Buttercup Family (Ranunculaceae)

Herbaceous Vine

Flowers: Aug–Sep
Fruits: Oct
Native Range: China, Japan
Introduction: 1864 as an ornamental, found in natural areas since the 1950s.

Mid-Atlantic Range & Habitats: Moist woods, thickets, hedgerows, streambanks and riverbanks. Most common in the southern Mid-Atlantic.

Ecological Impacts:

Japanese Virgin's Bower vines can climb up to 10 meters and can kill the trees and shrubs supporting them. The species tolerates a wide range of soil pH and soil type. It is a prolific seed-producer and occurs at high densities in invaded habitats.

Quick ID:

1. Leaf Arrangement	Leaves usually with 5 leaflets (3 in a terminal cluster, plus 2 lateral)
2.Leaflet Margin	Leaflet usually entire
3. Fruit	Fruit 3+ mm wide

More ID Tips:

Both of these species have opposite, compound leaves on a climbing vine. Japanese Virgin's Bower has perfect flowers, meaning that each flower has both male (stamens) and female (pistils) parts; whereas native Virgin's Bower has mostly unisexual flowers, with male and female parts on separate flowers. In addition, the fragrant flowers of Japanese Virgin's Bower have anthers greater than 1.5 mm long. The unscented white flowers of native Virgin's Bower have anthers that are less 1.5 mm long.

1.

2.

VIRGIN'S BOWER

Clematis virginiana
Buttercup Family (Ranunculaceae)

Herbaceous Vine

Flowers: Jul–Aug
Fruits: Sep

Mid-Atlantic Range & Habitats: Moist wood edges, thickets, roadsides, riverbanks, throughout the region.

Ecological Value:

Wild Virgin's Bower is used as a nectar and pollen source by bees, wasps, and a wide variety of pollinating flies, including hover flies and tachinid flies. In total, more than 50 species of insects are attracted to the flowers. Caterpillars feeding on the plant include a species of pug moth as well as the remarkable Clematis clearwing moth (*Alcathoe caudata*). The vine tangles provide summer cover, but the extent to which they are used by wildlife is not well documented.

Quick ID:

1. Leaf Arrangement	Leaves with only 3 leaflets (3 in a terminal cluster)
2.Leaflet Margin	Leaflet toothed and/or lobed
3. Fruit	Fruit 1–2 mm wide

3.

Other Similar Species:

A wide variety of cultivated *Clematis* species and hybrids are available in many colors. While some of these species may occasionally escape the garden, none are very likely to be encountered as naturalized plants in wild areas. However, several other species of native *Clematis* are found in our region. Purple Clematis (*Clematis occidentalis*), an uncommon native of rocky woods and cliffs, has reddish-purple flowers. *Clematis catesbyana* is a southern, white-flowered, native species that may be found as far north as Virginia. It often has 5 leaflets, but like *C. virginiana*, it has short anthers and mostly unisexual flowers. Most other native *Clematis* species flower in spring or early summer and can be distinguished from those mentioned here by the urn-shaped flower formed by fusion of the thick sepals.

PORCELAIN-BERRY

Ampelopsis brevipedunculata
Grape Family (Vitaceae)

Woody Vine

Flowers: May–Aug
Fruits: Sep–Oct
Native Range: Russia, China, Korea, Japan
Introduction: 1870s as an ornamental / bedding plant.

2.

1.

2.

Mid-Atlantic Range & Habitats: Moist woods, thickets and floodplains, in the southern part of our region, north to Long Island, the Hudson Valley, and southern PA.

Ecological Impacts:

Porcelain-berry vines form dense mats, climbing over other vegetation, and reducing light availability to other plants. The seeds are dispersed by birds and small mammals that eat the fruit, as well as by water when the species is growing in riparian areas. Porcelain-berry appears to be most invasive in disturbed edges, gaps and riparian areas, while it is usually not found in closed canopy mature forest.

Quick ID:

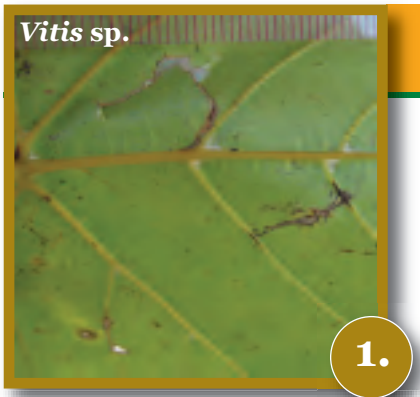
1. Leaf Undersides	Hairs present ONLY on the veins, NOT ON THE LEAF SURFACE
2. Fruit Color	White, turning blue or purple, with white flesh
3. Bark	Bark of mature vines NOT peeling in narrow, papery strips
4. Pith	Pith white

3.

4.

More ID Tips:

The eight or so species of native grapes in our region resemble Porcelain-berry in their climbing habit, the presence of tendrils, similar leaf shape, and small yellow-green flowers. The leaves of native grapes have varying degrees of hairiness, from densely woolly on the underside to small tufts of hair where the veins diverge. The flowers and fruits of the native grapes are arranged in an elongate inflorescence, whereas the inflorescence of Porcelain-berry is flat or round-topped. Porcelain-berry fruits have a characteristic white, starchy flesh with an odor similar to that of fresh sweet corn.



NATIVE GRAPES

Vitis spp.
Grape Family (Vitaceae)

Woody Vine

Flowers: May–Jun
Fruits: Aug–Nov

Mid-Atlantic Range & Habitats: Several species are found in a variety of forest, thicket and streambank habitats throughout the region.

Ecological Value:

One of the most important summer wildlife foods, wild grapes are eaten by at least 45 species of birds in our region. Bears, raccoons, opossums, skunks, and even box turtles relish the fruit. The vine tangles provide nesting cover for many birds, and the strips of bark are frequently used in nest construction.

Quick ID:

1. Leaf Undersides	If hairy, then hairs usually present ON THE LEAF SURFACE (may be ALONG the veins) and sometimes also on the veins
2. Fruit Color	Green, black, or purple, flesh watery, not white
3. Bark	Bark of mature vines peeling or shredding in narrow, papery strips
4. Pith	Pith brown

Other Similar Species:

Neither native grapes nor Porcelain-berry have adhesive disks on their tendrils like those found on the native woodbines (*Parthenocissus* spp.) of the same family.

JAPANESE STILT-GRASS

Microstegium vimineum
Grass Family (Poaceae)

Annual Grass

Flowers: Sep–Nov
Native Range: Tropical Asia
Introduction: 1919 in Tennessee as a packing material for porcelain.

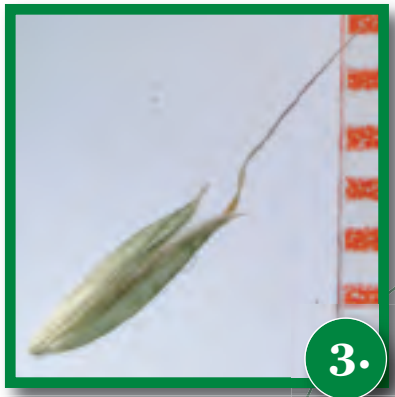
Mid-Atlantic Range & Habitats: Widespread throughout the region in moist forests, riparian areas and roadsides.

Ecological Impacts:

Especially invasive in shaded forests without a dense midstory, this grass forms dense, monotypic stands that exclude most other vegetation. The structural alteration of forest floor vegetation in *Microstegium* invasions may be detrimental to ground-nesting birds, and synergistic effects with deer browsing may act to prevent shrub establishment, thus maintaining degraded forest understories.

Quick ID:

1. Leaf	Leaf with pale shiny midrib on upper surface
2. Stem	Nodes of stems without hairy ring
3. Fruit	Fruit with awn

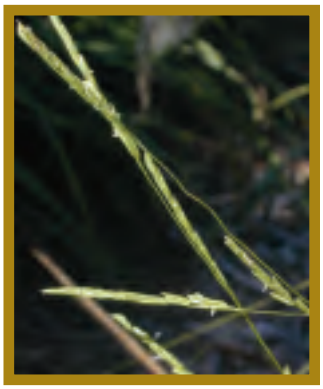


More ID Tips:

Japanese Stiltgrass and Whitegrass are both small (up to 15 dm tall), weak-stemmed grasses that sprawl along the ground, with the growing tips ascending. Whitegrass occasionally roots at the nodes. The leaves of Whitegrass are about 3–8 mm wide by 5–10 cm long with scabrous edges that give them a slightly rough feel. The leaves of stiltgrass are 5–20 mm wide by 3–8 cm long without scabrous edges. Whitegrass and Japanese Stiltgrass may be found growing together, and care must be taken to confirm the identification. The invasive generally blooms later in the fall than the native, but there is a significant period of overlap in early autumn. By mid-autumn, the stems of Whitegrass are often green or tan and are already bare of fruits, while the stems of Japanese Stiltgrass are turning bright red and the plant often has most of its fruits intact.

WHITEGRASS

Leersia virginica
Grass Family (Poaceae)



Perennial Grass

Flowers: : Jul–Sep

Mid-Atlantic Range & Habitats: Widespread throughout the region in swamps and moist woods.

Ecological Value:

The wildlife value of Whitegrass, also called Virginia Cutgrass, has not been well-studied. It is host to caterpillars of the northern pearly-eye butterfly. Wild Turkey are known to eat the foliage in spring, and the plant is generally regarded as highly palatable browse. Some songbirds probably eat the small seeds. The grass provides ground-level cover in low forests and floodplains.

Quick ID:

1. Leaf	Leaf without shiny midrib on upper surface
2. Stem	Nodes of stems with hairy ring
3. Fruit	Fruit with no awn

Other Similar Species:

The leaves of Japanese Stiltgrass look superficially similar to those of some of the Smartweeds (*Polygonum sp.*). Smartweeds can be identified their usually swollen stem nodes that are surrounded by a distinctive membranous sheath, called an ochrea, which is derived from a fusion of the stipules. Grasses can be difficult to identify for the beginner. If in doubt, it is best to have a specimen of the plant in question examined by a professional botanist.

REED CANARYGRASS

Phalaris arundinacea
Grass Family (Poaceae)

Perennial Grass

Flowers: May–Jul
Native Range: North American and Eurasia. Invasive types are thought to possibly represent hybrids with agricultural cultivars.
Introduction: Cultivars introduced starting in the 1830s by agronomists for forage; still promoted by some agronomists.

Mid-Atlantic Range & Habitats: Swamps, marshes, roadsides, ditch banks, moist fields. Disturbed wetlands are more susceptible to invasion.

Ecological Impacts:
Reed Canarygrass often invades wetlands, moist fields, and other natural areas as a result of disturbance such as ditching and sedimentation.
Once established, the species forms dense, monotypic stands, depositing a heavy layer of thatch that suppresses other vegetation. It spreads vegetatively by rhizomes, as well as by production of large amounts of seed. Reed Canarygrass stands have significantly reduced herbaceous plant diversity and soil insect diversity. Carbon and nitrogen sequestration levels in invaded sites are altered. There are indications that a high degree of morphological plasticity in invasive ecotypes contributes to the invasiveness of the species.

Quick ID:

1. Leaves	Leaf blades 1–3 dm long, 10–20 mm wide
2. Ligules	Ligules large, thin and membranous
3. Fruits	No long silky hairs present on the fruits

More ID Tips:

Reed Canary-grass can grow to more than 2 m, while its native look-alikes grow up to 1.5 m tall. Both have dense, compact inflorescences. Reed Canarygrass has a slightly more prominent midvein on the upper side of the leaf than the native reed grasses.

Native

NATIVE REEDGRASSES

Calamagrostis canadensis, C. coarctata
Grass Family (Poaceae)

Perennial Grass

Flowers: Jun–Aug

Mid-Atlantic Range & Habitats: Swamps and wet meadows, widespread, with *C. canadensis* extending further north in the region.

Ecological Value:

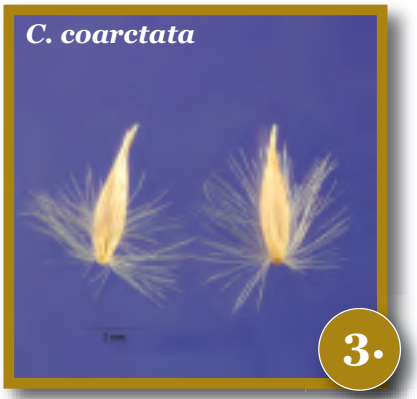
Bluejoint Reedgrass (*C. canadensis*) and Rhizomatous Reedgrass (*C. coarctata*) are native wetland grasses found in similar habitats similar to those occupied by Reed Canarygrass. Comparative studies have shown that wetland plots containing Bluejoint Reedgrass harbored twice the number of coexisting herbaceous plant species as plots containing Reed Canarygrass. The native reedgrasses provide cover for birds and small mammals.

Quick ID:

1. Leaves	Leaf blades 4–10 mm wide
2. Ligules	Ligules not thin and membranous
3. Fruits	Long silky hairs on mature fruit bracts

Other Similar Species:

Phalaris caroliniana occurs in the southern part of our region. This native species shares the large membranous ligule of *Phalaris arundinacea,* but has narrow leaves (4–8 mm wide) and a shorter (< 6 cm) inflorescence than Reed Canarygrass (7–25+ cm). Orchard Grass (*Dactylis glomerata*) is an alien grass that is superficially similar to Reed Canarygrass. This species has long ligules (3–11 mm long), long spreading stiff branches on the lower portion of the inflorescence, no long silky hairs on the fruit bracts, and narrow leaves (2–8 mm wide). Grasses can be difficult to identify for the beginner. If in doubt, it is best to have a specimen of the plant in question examined by a professional botanist.



INVASIVE PHRAGMITES

Phragmites australis ssp. *australis*
Grass Family (Poaceae)

Perennial Grass

Flowers: Jun–Sep
Native Range: Cosmopolitan (our genotypes originating in Europe)
Introduction: to the Atlantic coast in the late 1700s or early 1800s, possibly in ship ballast.

Mid-Atlantic Range & Habitats: Tidal and non-tidal wetlands (brackish and freshwater), marshes, river edges, disturbed ground, roadsides.

1.

2.

Ecological Impacts:

The highly aggressive subspecies of *Phragmites* invading wetlands along the Atlantic coast is of Old World origin. This invasive lineage has displaced the native subspecies in many locations and has spread beyond the original native range of the species, invading habitats that never harbored native *Phragmites*. The invasive subspecies typically forms dense, monotypic stands that completely exclude other wetland vegetation. This loss of structural and floristic diversity can adversely affect wildlife, including waterfowl and many marsh bird species, fish, and invertebrates.

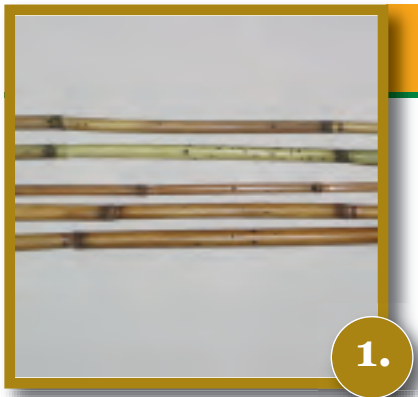
Quick ID:

1. Stem color during the growing season	Typically all green with yellowish nodes (but some lower nodes may be maroon). Stem texture is slightly ridged and color is dull (not shiny)
2. Leaf sheaths of overwintering plants	Sheaths do not easily fall off the stem when pulled (most still present on plant)
3. Ligule height	Ligule 0.4–0.9 mm
4. Glume length	Upper (distal) glumes mostly <6.0 mm (4.5–7.5) Lower (proximal) glumes mostly <4.0 mm (2.5–5.0)

3.

More ID Tips:

Invasive Phragmites typically has somewhat glaucous, blue-green leaves, while the leaves of Native Phragmites are often lighter yellow-green. This color difference may be noticeable when the two species are growing together, but keep in mind that color can be variable and a closer examination is needed to confirm the identification. The native subspecies sometimes has small black spots on the stem internodes caused by a fungal infection. The invasive does not seem to be affected by the fungus, so if these dots are present, they are a good indication that the plant is of the native subspecies. Absence of fungal dots is inconclusive.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NATIVE PHRAGMITES

Phragmites australis ssp. *americanus*
Grass Family (Poaceae)

Perennial Grass

Flowers: Jun–Sep

Mid-Atlantic Range & Habitats: The native subspecies still occurs in scattered populations throughout our region, with most found in fresh to brackish tidal wetlands. It is considered to be rare in most states in the region.

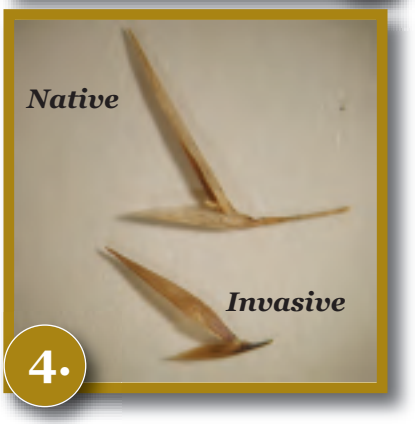
Ecological Value:

Native *Phragmites* has been present for thousands of years in coastal wetlands, but seems to have typically occurred in mixed plant communities along with other wetland vegetation, rather than in dense, monotypic stands. Because native *Phragmites* communities have only recently been found to be morphologically distinguishable from invasive stands, information on wildlife use of the native subspecies is still sparse.

Quick ID:

1. Stem color during the growing season	Green to maroon, may have maroon color at the nodes only. Typically bright maroon or yellowish on lower exposed portion of culm (where sheaths are absent). Stem is shiny and very smooth
2. Sheaths of Overwintering Plants	Sheaths easily pulled from the stem with little effort (most have fallen away).
3. Ligule height	Ligule 1.0–1.7 mm
4. Glume length	Upper (distal) glumes mostly >6.0 mm (5.5–11.0) Lower (proximal) Glumes mostly >4.0 mm ((3.0–6.5)

3.



4.

Other Similar Species:

Giant Reed, *Arundo donax*, is a non-native reed that is uncommon in the southern part of our region but is a problematic invasive in the southern and western U.S. It is a larger plant, capable of growing taller than *Phragmites*, with thicker stems, longer leaves, and a larger, often more compact flower head. The leaf blades of *Arundo* have a wedge-shaped brown area at the base that is absent in *Phragmites*.

GOLDEN BAMBOO

Phyllostachys aurea
Grass Family (Poaceae)

Perennial Grass

Flowers: flowers irregularly, rarely in North America
Native Range: Asia
Introduction: as an ornamental in the late 1800s

Mid-Atlantic Range & Habitats: Open woods, roadsides, and yards, in the southern part of the region.

Ecological Impacts:

This massive, woody grass has been widely planted throughout the region, often as a living fence. It reaches 10 m or more in height and up to 15 cm in stem diameter. Bamboo spreads by a dense system of rhizomes that may be as long as the stem height. Reproduction by flowering is unusual in our populations. The dense shade and thick leaf litter in the interior of a stand prohibits the growth of other plant species. Other species of *Phyllostachys* bamboo may be found in our region, but are not as invasive as Golden Bamboo.

Quick ID:

1. Stem Leaf Sheaths	Stem leaf sheaths deciduous, not remaining attached to stem
2. Mid-stem Primary Branches	Mid-stem branches consistently 2 per node, sometimes with a third, much smaller branch between the two larger ones
3. Primary Branch Bases	Usually no compressed basal internodes at the base of primary branches
4. Height	To 10 m or more

More ID Tips:

Golden Bamboo, like others in the genus *Phyllostachys*, has a recessed groove (sulcus) on each stem internode. The sulcus is often a differnet color than the rest of the internode, and may be less prominent on lower stem internodes.

1.

2.

SWITCH CANE

Arundinaria tecta
Grass Family (Poaceae)

Perennial Grass

Flowers: Apr–Jul (flowers irregularly, perhaps every 3–4 years)

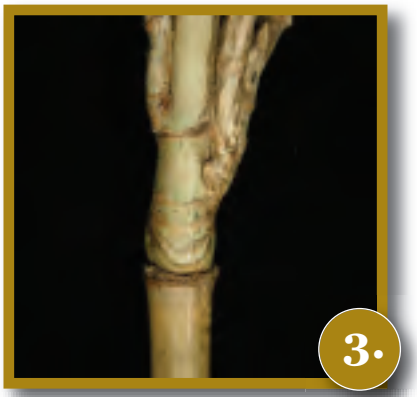
Mid-Atlantic Range & Habitats: Moist woods and swamps in the southern part or our region, from the lower Delmarva Peninsula south and west through Maryland and Virginia.

Ecological Value:

Switch Cane provides important wildlife cover, especially in areas where it still forms "canebrakes", large stands of cane in the understory of wet hardwood forest. The once extensive canebrakes of the southeast have drastically diminished from their historical extent due to fire suppression and grazing. These canebrakes were once home to the extinct Bachman's Warbler. Cane still provides a preferred nesting site for songbirds like the Hooded Warbler and is the hostplant for five species of uncommon specialist butterflies that are restricted to southern canebrakes.

Quick ID:

1. Stem Leaf Sheaths	Stem leaf sheaths persistent, remaining attached to stem
2. Mid-stem Primary Branches	Mid-stem branches usually 1 per node, often with a dense cluster of secondary side branches attached to the primary branch near its base
3. Primary Branch Bases	2–4 compressed internodes at the base of primary branches
4. Height	To 4 m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Other Similar Species:

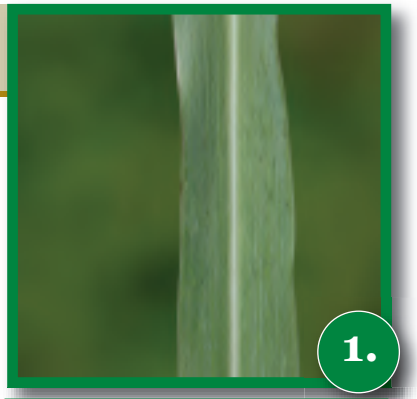
Giant Cane or River Cane (*Arundinaria gigantea*) occurs in the extreme western part of our region and can reach 10 m in height. Because of its large size, deciduous stem leaf sheaths, and lack of compressed internodes on the primary branches, Giant Cane is more easily mistaken for *Phyllostachys* species. Giant Cane can be still be distinguished from invasive Bamboos using the mid-stem branch character described above. *Pseudosasa japonica* is a cultivated alien bamboo that is similar in appearance to Switch Cane, but it is not known to occur in natural areas. The combination of smooth (not hairy) blades and long inner ligules (2–4 mm) of the foliage leaves will separate *Pseudosasa japonica* from Switch Cane. Giant Reed (*Arundo donax*) is superficially similar to the species listed here, but it flowers annually.

JOHNSON GRASS

Sorghum halepense
Grass Family (Poaceae)

Annual Grass

Flowers: Aug–Sep
Native Range: Mediterranean Europe, North Africa
Introduction: 1830s and 1840s in South Carolina and Alabama for forage.



Mid-Atlantic Range & Habitats: Wet to moist soils in open disturbed habitats, including ditch banks, roadsides, and old fields, throughout the region, but more widespread southward.

Ecological Impacts:

Johnson Grass is considered one of the most problematic invasive plants in the world. Its massive rhizome system allows it to compete for nutrients, while the size of the plant itself (up to 3 m high) shades surrounding vegetation. Chemicals produced by the plant inhibit germination of other vegetation. Even though the rhizomes are typically killed by cold winter temperatures, recently evolved cold-resistant ecotypes and prolific seed production have allowed the species to spread northward in our region.

Quick ID:

1. Leaf width	Leaves 1–2 cm wide, with a prominent white midvein
2. Fruit bract	Most fruits covered in short, fine, silky hairs

More ID Tips:

Johnson grass and Indian Grass are both large, rhizomatous grasses that can reach heights of two meters. Johnson Grass is colonial from long, thick rhizomes, whereas Indian Grass grows in loose tufts from short rhizomes. The inflorescences of Johnson Grass are open and narrowly pyramidal, typically with a reddish tinge, while those of Indian Grass are more compact and typically golden in color.

INDIAN GRASS

Sorghastrum nutans
Grass Family (Poaceae)

Perennial Grass

Flowers: Aug–Sep
Mid-Atlantic Range & Habitats: Fields, roadsides, and barrens, throughout the region.

Ecological Value:

Indian Grass provides excellent cover for game birds, grassland songbirds, and other wildlife. The seeds are eaten by small mammals and some birds, while the foliage is grazed by wildlife throughout the summer. This grass is a standard component of native warm-season grass mixes used for habitat restoration and wildlife benefit.

Quick ID:

1. Leaf width	Leaves 0.5–1 cm wide, usually without a prominent white midvein
2. Fruit bract	Bracts of fruit with long feathery hairs

Other Similar Species:

Switchgrass (*Panicum virgatum*) is another large grass that could be confused with Johnson Grass. Switchgrass has no hairs on the fruits, narrow leaves (3–15 mm wide), and tends to have glaucous foliage. The cultivated *Sorghum bicolor* is a more robust species that lacks the rhizomes of *S. halepense*. Grasses can be difficult to identify for the beginner. If in doubt, it is best to have a specimen of the plant in question examined by a professional botanist.

GIANT HOGWEED

Heracleum mantegazzianum
Carrot Family (Apiaceae)

Perennial Herb

Flowers: Jun–Jul
Native Range: Caucasus Mountain region
Introduction: as an ornamental in the early 1900s.
Mid-Atlantic Range & Habitats: Moist soils of roadsides, wood edges, streambanks, and floodplains. Reaches the southern limit of distribution in Maryland, New Jersey.

Ecological Impacts:

The massive plant can outcompete nearby vegetation, especially along streambanks, where growing conditions are ideal. **The sap causes chemical burns after exposure of the affected skin to sunlight.** Seed is dispersed primarily by water; the winged seeds thought to be able to float as far as 10 km before sinking. There is the potential for this species to hybridize with the native *H. maximum*, but no hybrids have been reported.

Quick ID:

1. Leaf form	Leaves coarsely toothed and deeply lobed, divided into 1–3 large leaflets
2. Leaf hairs	Leaves hairy
3. Flowering Heads	Flowering head 30–50 cm across, flat-topped
4. Stem	Stem purple-spotted, hairy
5. Fruit size	Fruits 9–11 mm long and 6–8 mm wide

More ID Tips:

With an astounding height range of 2–5 m, Giant Hogweed towers above most similar-looking native species. Cow-parsnip can reach 3 m in height, and Angelica species typically only reach 2 m or less. The flowering heads of giant hogweed contain 50 or more rays while the flowering heads of Cow-parsnip have 15–30 rays.

Native

ANGELICA, COW-PARSNIP

Angelica spp., *Heracleum maximum*
Carrot Family (Apiaceae)

Perennial Herb

Flowers: May–Jun
Mid-Atlantic Range & Habitats: Floodplains, moist woods, ditches, roadsides, widespread. Less common on the Coastal Plain.

Ecological Value:

Cow-parsnip is a highly important pollen and nectar source for sweat bees, mining bees, wasps, and dozens or perhaps hundreds of species of flies. *Angelica* species are also attractive to insects. *Angelica atropurpurea* attracts mining bees, as well as a variety of parasitic wasps and other natural enemies of crop pests to its early summer flowers.

Quick ID:

	Angelica spp.	Cow-parsnip
1. Leaf form	Leaves divided into 5–11 toothed and sometimes lobed leaflets	Leaves divided into 3–5 coarsely toothed, lobed leaflets
2. Leaf hairs	Leaves smooth	Leaves hairy
3. Flowering Heads	Flowering head 5–20 cm across, often globe-like, always rounded on top	Flowering head 10–20 cm across, flat-topped
4. Stem	Stem not purple spotted (may be entirely purple), smooth (or softly hairy only on the upper part)	Stem not purple spotted, hairy
5. Fruit size	Fruits 4–7 mm long	Fruits 10 mm long and 10 mm wide

Other Similar Species:

Wild Parsnip (*Pastinaca sativa*) is a widely naturalized alien wildflower with leaves similar to these species, but the flower is yellow, rather than white. The winged fruits of the species on this page will separate them from many other potential look-alikes in the carrot family, including Water Hemlock (*Cicuta maculata*).

Invasive

YELLOW FLAG

Iris pseudacorus
Iris Family (Iridaceae)

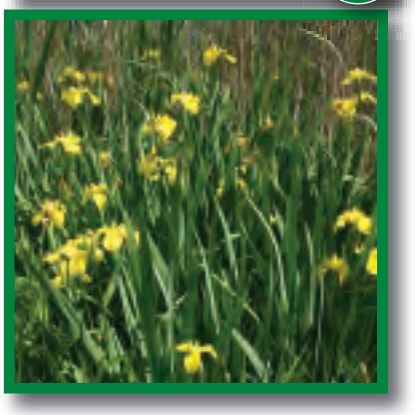
Perennial Herb

Flowers: May–Jul
Native Range: Europe, North and West Africa
Introduction: as an ornamental in the mid 1800s.

Mid-Atlantic Range & Habitats: Marshes, wet meadows, shores.

Ecological Impacts:

Yellow Flag invades shallow water areas, excluding other wetland plants and altering habitat by trapping sediment, which then leads to tree and shrub establishment. It is tolerant of salt, drought, and poor water quality, making it a good competitor in disturbed wetlands. The plant spreads rapidly by rhizomes and seed.



Quick ID:

1. Flower color	Yellow
2. Fruit	Capsule 6-angled
3. Fruit	Capsule opening at maturity into 3 widely spreading segments

More ID Tips:

Yellow Flag is the only naturalized yellow-flowered *Iris* in our region. Nevertheless, it is difficult to separate from the native Northern Blue Flag when the flowers are not present. Yellow Flag flowering stems tend to be shorter than or equal to the height of the leaves, while the stems of the Northern Blue Flag usually equal or exceed the length of the leaves. Yellow Flag may have slightly narrower leaves than Northern Blue Flag, but there is much overlap, so identification of flowering or fruiting plants is recommended.

Native

NORTHERN BLUE FLAG

Iris versicolor
Iris Family (Iridaceae)

Perennial Herb

Flowers: May–Jul

Mid-Atlantic Range & Habitats: Wet meadows, bogs, and marshes, throughout the region.

Ecological Value:

Northern Blue Flag does not form large, dense stands like Yellow Flag. While its wildlife value is limited, it hosts a diverse suite of pollinators, including mason bees, sweat bees, and hover flies.

Quick ID:

1. Flower color	Blue
2. Fruit	Capsule 3-angled
3. Fruit	Capsule remains closed at maturity

Other Similar Species:

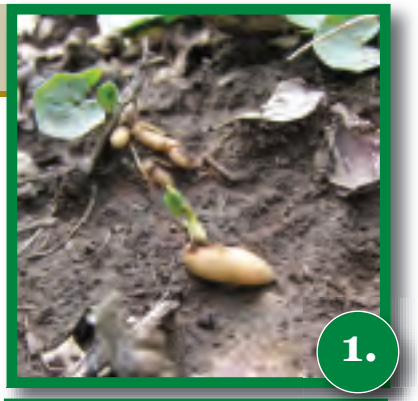
The commonly cultivated and occasionally escaped Bearded Iris (*Iris germanica*) can have yellow flowers, but the sepals are always bearded. Native *Iris* species other than *I. versicolor* are generally uncommon to rare in our region and all have blue flowers. The native blue-flowered species are either dwarf irises (nearly stemless and less than 20 cm tall at maturity), or, if they are taller than 20 cm, they have 3-angled capsules.

LESSER CELANDINE

Ranunculus ficaria
Buttercup Family (Ranunculaceae)

Perennial Herb

Flowers: Mar–May
Native Range: Northern Europe
Introduction: as an ornamental



Mid-Atlantic Range & Habitats: Floodplains, open forests, and meadows, mostly in the Piedmont, and widely scattered farther west.

Ecological Impacts:

Dense stands of early spring foliage inhibit growth of other spring ephemeral plants by competing for light, nutrients, and space. Acres of ground in floodplain forests may be carpeted entirely by this species. Spring wildflowers such as Virginia Bluebells, Toothworts, Dutchman's Breeches, Trout Lily and Bloodroot are threatened by Lesser Celandine invasion.

Quick ID:

1. Roots	Roots with many tubers
2. Stems	Bulblets forming at the nodes of stems
3. Flowers	With 3 green sepals and 7–12 yellow- white petals

More ID Tips:

Lesser Celandine and Marsh-marigold are spring ephemerals with similar yellow flowers and shiny green, cordate leaves. Other species of *Ranunculus* seldom have cordate leaves. The flowers of Marsh-marigold are uniformly yellow in color, but those of Lesser Celandine can be variable with white blotches and stripes across the petals and various doubled-flowered forms. The leaves of Lesser Celandine also have various color forms.

Native

MARSH-MARIGOLD

Caltha palustris

Buttercup Family (Ranunculaceae)

Perennial Herb

Flowers: Apr–Jun

Mid-Atlantic Range & Habitats: Wet forests, wet meadows, swamps, and bogs, throughout the region.

Ecological Value:

Marsh-marigold provides nectar and pollen for bees, hover flies, and beetles. The related buttercups (*Ranunculus* spp.) are also important for insects and their seeds are eaten in small amounts by game birds, songbirds, squirrels, chipmunks and mice.

Quick ID:

1. Roots	No tubers on roots, roots fleshy
2. Stems	No bulblets on stems
3. Flowers	With 5–9 yellow petal-like sepals

Other Similar Species:

Other Buttercups (*Ranunculus* spp.) lack the stem node bulblets and root tubers of Lesser Celandine. All of the terrestrial Buttercups in the Mid-Atlantic have 5 green sepals, as opposed to the 3 sepals of Lesser Celandine.

Controlling Invasives

Because invasive plants are often found growing together with natives, the ability to accurately separate invasives from their native look-alikes provides valuable insight into appropriate control techniques. Highly specific, targeted control measures can then be applied in order to minimize damage to native plant communities. Invasives can be managed in ways that will encourage natives and take advantage of natural regeneration and colonization to reconnect corridors and patches of native vegetation.

Integrated pest management, known as IPM, is an environmentally sensitive treatment approach that incorporates an awareness of the growth cycles of invasive plants and their interaction with the environment. This knowledge, in combination with available invasive plant control methods, will help to determine the most economical management techniques best suited for the location with the least hazard to people, property and the environment.

Manual and mechanical control methods should be the first option for most invasive species control regimes. Unfortunately, mechanical methods are not always able to achieve the desired results, or are not practical due to the size of the infestation, the nature of the invasive species, or the nature of the site. Invasive plants growing amidst desirable vegetation pose a significant challenge, and the best management practices may include the coordination of both mechanical and chemical methods. It is important to consider non-chemical alternatives and to take every measure possible to reduce the amount of chemical used when chemical control is necessary.

Scouting for weeds on a regular basis and catching invaders before they have spread extensively can prevent major infestations from occurring. Quick responses to plant invasions reduce the time and cost of control. Containment and eradication of small invasions is often much more easily accomplished than elimination of large populations of established invasives. Even if an invasion cannot be eradicated immediately, practices that slow or stop the spread (removal of flower heads before seeds mature, repeated cutting to weaken plants) can be a useful first step in the control of many invasive plants.

If you are managing a number of invasive species, a written invasive species control plan can help you document your work, standardize your methods, and track your success. An ecologically-based invasive plant management plan that incorporates an understanding of ecosystem processes and natural succession when determining the best management approach should be the goal. Since timing of control is important, it is also helpful to create a calendar to keep track of the seasonal windows during which various types of control measures are most effective on your plants of interest. Such a calendar greatly simplifies the planning process when many different invasives are part of a control plan for a given site. If there is the opportunity to monitor your results, data on the efficacy of various methods can be very useful to others and should be recorded. At a minimum, always record the dates and locations of treatments, along with a description of the treatment.

Herbicides

It is essential for anyone wishing to apply pesticides to be aware of the state laws and regulations that govern pesticide applicator licensing and pesticide use. All applicators should keep abreast of changes to the law and changes in chemical formulations. More significantly, it is important to understand the ecological impacts of pesticides and their long-term effects on public health and safety. County Extension agents are available to recommend the best management practices for your site.

There is a pesticide environmental risk screening tool that NRCS field office conservationists, extension agents, crop consultants, pesticide dealers, and producers can use to evaluate the potential use of chemicals and their environmental risk factors in natural and cultivated areas. See their website in the back of this booklet.

USE PESTICIDES WISELY: ALWAYS READ THE ENTIRE PESTICIDE LABEL CAREFULLY, FOLLOW ALL MIXING AND APPLICATION INSTRUCTIONS, AND WEAR ALL RECOMMENDED PERSONAL PROTECTIVE GEAR AND CLOTHING. CONTACT YOUR STATE DEPARTMENT OF AGRICULTURE FOR ANY ADDITIONAL PESTICIDE USE REQUIREMENTS, RESTRICTIONS, OR RECOMMENDATIONS.

Methods

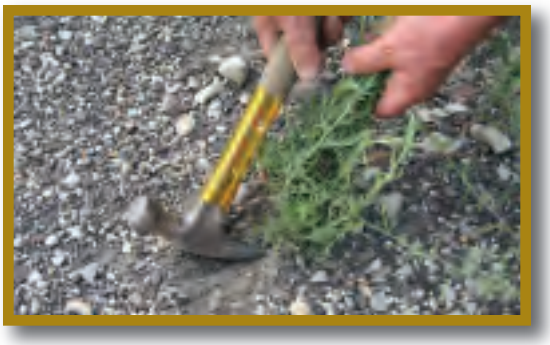
Choosing a Method:

It is important to remember than not all methods will work for all invasive plants. In fact, in certain cases, some methods may be counter-productive to effective control. Often a carefully chosen combination of methods applied simultaneously or sequentially will provide the best control. For instance, while repeated mowing of Reed Canary Grass will weaken the plant and aid in control, the same repeated mowing of Spotted Knapweed will merely encourage the plant to flower at much lower height, making control more difficult. It is essential to thoroughly research the recommended methods for the invasive species you wish to control.

A leverage-operated weed pulling tool like this Weed Wrench™ is very effective for uprooting small-diameter shrubs.

Hand Pulling:

Hand pulling or digging is applicable for small infestations of annual and biennial weeds and young woody saplings with a shallow root system. This selective treatment is preferred in order to retain native vegetation and control erosion. Best results are obtained while the soil is moist and before plants have gone to seed (pulling after seeds are mature can cause unintentional seed dispersal). There are some specialty tools (Weed Wrench™, Root Jack, etc.) that are designed to remove small woody plants with a lever action by pinching/clamping the plant at its base and uprooting it.



Pulling plants by hand, with or without the assistance of a small digging tool, is an effective, though labor-intensive mode of non-chemical control for many species.

Cutting:

Some tall herbaceous weeds and woody plants can be controlled by cutting the above-ground growth before the plants go to flower and set seed. Hand cutting tools such as pruners, loppers, brush blades, machetes, and linoleum knives are useful for this purpose. Mowing with a rotary mower (brush hog) or flail mower is often used on large infestations. Retreatment of target species is usually needed to control resprouting. In many cases, repeated cutting or mowing will gradually weaken the plant, leading to less vigorous growth.

Mowing with a tractor-mounted rotary mower ("brush hog") can help control many species, but the timing of mowing is critical.

Girdling:

Girdling is the process of cutting away or scoring the cambium (bark) around the circumference of undesirable woody plants to weaken or kill the plant. This technique may cause certain trees like cherries or maples to resprout from the base, so follow-up monitoring is necessary for thorough control.

Cutting is often very effective when combined with various forms of chemical control. Here, a large Tree-of-heaven trunk is being felled a few months after treatment with a basal bark application.

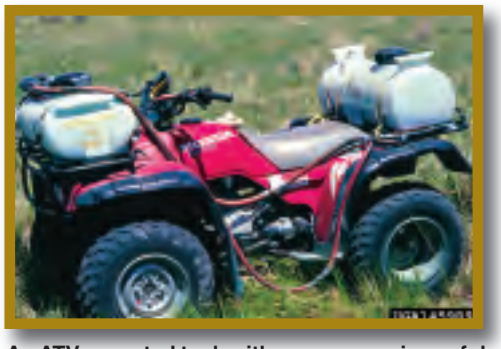
Reduced Tilling and Discing:

These practices cut plant roots below ground level and improve soil quality by breaking up soil and leaving organics on top. Not recommended for invasive plants with vigorous rhizomes, such as Yellow Flag. It is important to clean discs before moving to other locations to prevent spread of invasive seed or root parts in soil.

Burning:

Smaller infestations and individual selective spot treatments can be burned using a flame thrower or weed burning device. Prescribed burning in fields or open areas is a non-selective method and should be conducted only by properly-trained individuals the supervision of local fire departments.

Foliar Spray:



An ATV-mounted tank with a spray gun is useful for spot-spraying scattered plants across large areas of land. ATVs can also be outfitted with boom sprayers for spraying patches of herbaceous vegetation.

A backpack sprayer is essential for basal bark applications, spot spraying in difficult terrain, and other tasks. It offers excellent selectivity and maneuverability.

Foliar spraying is a rapid and efficient technique using a direct spray of herbicide onto the leaves of target plants using a hand-held sprayer, backpack sprayer or boom sprayer. To minimize damage to non-target plants, be cautious of winds (spray drift) and high temperatures (chemical volatility). A low pressure tank with a controlled spray works well.

Cut Stump Method:

Herbicide (water- or oil-based) is applied to the cut stumps and branches of trees, shrubs, or woody vines. This control method should be considered when treating individual plants or in locations where the presence of desirable species eliminates the option of foliar application. This treatment remains effective at low temperatures as long as the ground is not frozen.

Wiper Application:

Wiper applicators consist of rope wicks or fabric- or sponge-covered tubes that deliver a targeted application of herbicide directly onto plants with less drift and drip than foliar sprays. New models include a blade that peels off bark to expose cambium to the chemical. Particularly effective on woody plant infestations on roadside edges, embankments and forested buffers where it is important to leave a layer of herbaceous plant growth.

Various types of wiper devices can be purchased or built to mount to ATVs, tractors, or other vehicles. These wipers allow herbicide to wick out onto the surface, where it is applied directly to target vegetation at a set height.

A truck-mounted or tractor-towed boom sprayer is useful for spraying large invasions in open fields and meadows.

Hack and Squirt:

When using this method, a water-based herbicide is applied with a spray bottle to downward incision cuts made with a machete, axe, or hatchet and spaced out along woody stems. For larger trunks and difficult-to-control species such as Ailanthus, connecting the incisions (frilling) around entire circumference may be required.

Basal Bark Method:

A band of oil-based herbicide is sprayed onto the smooth bark of young trees around the entire trunk using a backpack sprayer. This method can be used throughout the year as long as the ground is not frozen, but is often most effective in late summer and early fall. Thorough wetting is necessary for good control. Efficacy is reduced on older trees with thick bark.

Species Control Recommendations

Norway Maple
Acer platanoides

Mechanical: Remove young seedlings by hand or with a Weed Wrench™ when soil is moist. Larger plants can be dug out, including root systems. Cut down large trees and grind the stump or clip off suckering growth if it reoccurs. Alternatively, girdle tree at three feet from the ground in spring.

Chemical: Apply triclopyr to cut stems and trunk. For trees up to 4" in diameter, apply a triclopyr ester formulation as a basal bark spray.

Japanese Angelica Tree
Aralia elata

Mechanical: Pull or dig young seedlings when soil is moist. All parts of plant including roots and fragments should be removed from soil and site to prevent regrowth. Cutting multi-stemmed trees at ground level with a manual/power saw or loppers is effective but will require follow-up treatment because of sprouting.

Chemical: Foliar application with a glyphosate herbicide is effective but will require diligent follow-up applications to eradicate plants. Application of triclopyr to cut stems is also successful. A combination of treatment methods is likely the best control solution.

White Mulberry
Morus alba

Mechanical: Remove young seedlings by hand or with a Weed Wrench™ when soil is moist. Larger plants can be dug out, including root systems. Cut down large trees and grind the stump or clip off suckering growth if it reoccurs. Alternatively, girdle tree at three feet from the ground in spring.

Chemical: Apply triclopyr or glyphosate to cut stems and trunk. For trees up to 0.1016 m in diameter, apply a triclopyr ester formulation as a basal bark spray.

Tree-of-heaven
Ailanthus altissima

Mechanical: Pull young seedlings when soil is moist. All parts of plant including roots and fragments should be removed from soil and site to prevent regrowth. Saplings may be cut with a brush hog but this method may affect desirable species and will require additional follow-up treatments.

Chemical: A combination of chemical and mechanical methods provides the best control. Foliar application of various herbicides can be used on plants that can be reached with a sprayer. For small to medium-sized trees, basal bark application of triclopyr ester is highly effective, especially in late summer and early fall. For very large trees, hack-and-squirt application of triclopyr may be used. Follow-up foliar spray may be necessary the following year.

Asian Bush Honeysuckles
Lonicera maackii, L. morrowii, L. tatarica

Mechanical: Pull or dig young seedlings when soil is moist. All parts of plant including roots and fragments should be removed from soil and site to prevent regrowth. Fruiting branches should be bagged and disposed of responsibly. Cutting multi-stemmed shrubs at ground level with a manual/power saw or loppers is effective but will require follow-up treatment because of sprouting.

Chemical: Foliar application with a glyphosate herbicide is effective but will require diligent follow-up applications to eradicate plants. Application of triclopyr to cut stems is also successful. A combination of treatment methods is likely the best control solution.

Burning Bush, Wintercreeper
Euonymus alatus, E. fortunei

Mechanical: Pull or dig young when soil is moist. All parts of plant including roots and fragments should be removed from soil and site to prevent regrowth. Saplings may be cut back with a brush hog but this method may affect desirable species and will require additional follow-up treatments.

Chemical: A combination of treatment with mechanical and chemical methods provides the best control. Foliar application with glyphosate is successful on small seedlings but larger plants will require diligent follow-up treatments to completely eradicate plants. Application of triclopyr to cut stems is also successful.

Multiflora rose
Rosa multiflora

Mechanical: Remove smaller plants by hand pulling when soil is moist, larger plants by digging out root system. Repeated mowing or cutting with brush hog will control the spread but will not eradicate it. Branches with berries should be bagged and disposed of responsibly to prevent spread.

Chemical: A combination of mechanical and chemical methods provides the best control. Application of glyphosate to cut stems or leaves is effective. For larger infestations, brush cutting in spring followed by a wiper application later in the season will reduce need for cutting in ensuing years.

Wineberry
Rubus phoenicolasius

Mechanical: Removal of plants by hand pulling or use of a spading fork can be effective especially if the soil is moist and the roots and any cane fragments are removed. Branches with berries should be bagged and disposed of responsibly.

Chemical: A combination of mechanical and chemical methods provides the best control. Application of glyphosate to cut stems or leaves is effective.

Japanese Honeysuckle
Lonicera japonica

Mechanical: Pull or dig young seedlings when soil is moist. All parts of plant including roots and shoots should be removed from soil and site to prevent regrowth. Fruiting branches should be bagged and disposed of responsibly. Cutting vines at ground level with a manual/power saw or loppers is effective but will require follow-up treatment because of sprouting.

Chemical: Because the plant retains its foliage in the fall when most native species are dormant, a foliar application of glyphosate shortly after the first frost appears to be the most effective treatment. Treated plants should be monitored at the end of the second growing season.

Japanese Virgin's Bower
Clematis terniflora

Mechanical: Remove young seedlings and their roots by hand when the soil is moist to prevent flower buds from forming. If plants are pulled after plant has gone to seed, the seed heads should be bagged and disposed of accordingly. Repeat treatment each growing season.

Chemical: Foliar application with a glyphosate is effective late in season but be careful to avoid non-target plants. Spot application when new growth emerges in spring is ideal. Vines too large for hand pulling can be cut off near the ground and the cut surface treated with a triclopyr solution.

Oriental Bittersweet
Celastrus orbiculatus

Mechanical: Remove young seedlings and their roots by hand when the soil is moist before flower buds form. If plants are pulled while in fruit the berries should be bagged and disposed of responsibly. Repeat treatment each growing season. Larger vines can be cut at ground level repeatedly throughout the growing season to exhaust root stores.

Chemical: Foliar application with glyphosate is effective but be careful to avoid non-target plants. Repeat application after re-growth appears or as needed. Vines too large for hand pulling can be cut off near the ground and the cut surface treated with a triclopyr solution.

Porcelain-berry
Ampelopsis brevipedunculata

Mechanical: Remove young seedlings and their roots by hand when the soil is moist before they flower. If plants are pulled while in fruit the berries should be bagged and disposed of responsibly. Repeat this treatment each growing season.

Chemical: Foliar application with a glyphosate herbicide is effective but be careful to avoid non-target plants. Repeat application after regrowth appears or as needed. Vines too large for hand pulling can be cut off near the ground and the cut surface treated with a triclopyr solution.

Japanese Stiltgrass
Microstegium vimineum

Mechanical: Hand pull when the soil is moist and entire plants with roots can be removed Plants can be cut with a lawn mower or weed trimmer in late summer when the plants are flowering and before seed is produced but this method is non-selective. Because stilt grass is primarily an annual plant, cutting late in the season before the plants would die back naturally avoids the possibility of regrowth. Early summer cutting is undesirable because it stimulates early flowering.

Chemical: Foliar application with a glyphosate is effective but be careful to avoid non-target plants. Repeated applications of herbicide most likely will be necessary deplete reemerging seedlings.

Reed Canarygrass
Phalaris arundinacea

Mechanical: Hand pulling or digging may work on small patches. Cutting twice a year may reduce seed development and promote desirable species. Cutting in combination with discing or chemical application will weaken root systems.

Chemical: Foliar application of glyphosate formulated for use in wetlands is effective. Two applications (spring and fall) may be necessary to increase effectiveness. Follow-up treatments may be necessary to control seed bank germination. Wiper application can be used on taller plants to avoid harm to lower-growing native vegetation.

Species Control Recommendations

Invasive Phragmites
Phragmites australis ssp. *australis*

Mechanical: May be controlled by digging out the entire plant, but this approach is often impractical in large wetland infestations. Cutting, pulling or mowing can be done in late July and can be repeated for several years to help manage the spread of the infestation. All cut shoots should be carefully removed to prevent re-sprouting. Prescribed burning is effective for large areas. Be aware of riparian stability and sensitive areas when considering operating machinery.

Chemical: Herbicide use in combination with burning has proven to be the most effective means of control, and results in minimal disturbance to wetlands. Foliar application with glyphosate herbicide formulations approved for aquatic use is most effective in the early fall, followed by burning off dead material in late fall. Repeat the treatment two years in a row for best results.

Bamboo
Phyllostachys spp.

Mechanical: All parts of the plant including roots and fragments should be removed from soil and site to prevent regrowth. Cutting multi-stemmed branches at ground level by hand or with a power saw is effective but will require follow-up treatment because the plants will re-sprout aggressively.

Chemical: A combination of mechanical and chemical methods is effective. Cut to the ground in late spring and follow with foliar application of glyphosate to new tender growth three weeks later. Repeat application as necessary.

Johnson Grass
Sorghum halepense

Mechanical: Hand pull individual plants immediately upon discovery. All plant parts, including rhizomes, must be removed. It may be necessary to repeat treatment several times to obtain control and prevent reinvasion. Close mowing kills grass seedlings and repeated tillage prevents rhizome development and reduces Johnson Grass populations.

Chemical: Foliage application of glyphosate using a backpack or boom sprayer provides effective control. Monitor frequently for new seedling germination.

Giant Hogweed
Heracleum mantegazzianum

Mechanical: Sever root system just below ground level using a spade or digging tool. All seeds and seed heads should be bagged and disposed of responsibly to prevent spread. Repeated mowing with a brush cutter or flail mower is effective if performed before the plant sets seed. Follow-up monitoring is necessary to ensure seeds in the soil do not germinate and become established. **Warning: Do not touch any part of this plant, since the sap can cause severe chemical burns.**

Chemical: Painting stems with glyphosate solution is effective. Repeat until the seed bank is depleted. Aerial foliar application is not recommended due to size of leaves and potential damage to non-target species. Remove existing seed heads to prevent germination.

Yellow Flag
Iris pseudacorus

Mechanical: Remove entire plant by digging to eradicate. All parts of root system (rhizomes) should be removed to prevent reinfestation. Be aware of riparian stability and sensitive habitats.

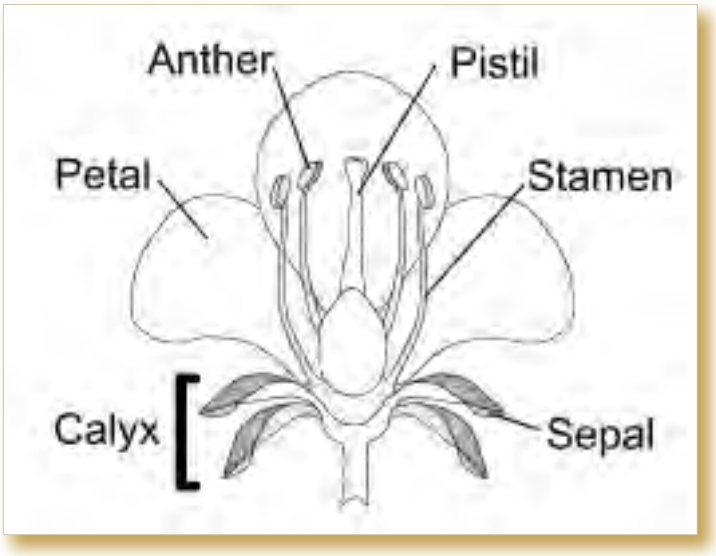
Chemical: A combination of treatment with mechanical and chemical methods provides the best control. Foliar application of an aquatic formulation of glyphosate may be used in wetland areas. Extreme caution must be exercised when using herbicides and mechanized equipment to minimize damage to natural habitats.

Lesser Celandine
Ranunculus ficaria

Mechanical: Hand pulling and digging with small trowel in early spring is most effective with small infestations before and during flowering. It is very important to remove all bulblets and tubers. Annual monitoring is necessary to control spread and new seed germination.

Chemical: Foliar spot spray application of glyphosate (use a formulation labeled for aquatic use for streambanks and wetland areas) is effective in late winter before flowering. Later applications of herbicides are ineffective because the plant goes dormant after flowering and setting seed. Earlier applications are also less likely to harm amphibians that are active in early spring.

GLOSSARY OF BOTANICAL TERMS



Alternate
With leaves or branches each attached singly to the main stem or **Axis** at each **Node** without a second on the opposite side of the stem.

Anther
The part of the **Stamen** that contains the pollen, usually located at the **Distal** end of the **Stamen**.

Ascending
Growing obliquely upward.

Awn
A slender bristle, typically at the **Distal** end of a structure such as a **Bract**.

Aril
The fleshy covering of some **Seeds**, often red or orange in color at maturity.

Axil
The angle or area between the stem or (**Axis)** and an attached leaf or other structure.

Axillary
Arising from an **Axil**.

Axis
The central stem to which lateral organs (e.g. **Leaflets** in a **Compound Leaf**) are attached.

Berry
A fleshy, pulpy **Fruit** containing several seeds.

Blade
The flat, expanded part of a leaf (or leaflet). Compare **Sheath**.

Bract
A modified leaf-like structure associated with a flower. See **Lemmas** and **Paleas**, **Glumes**, and **Spikelet**.

Bulblet
A bulb-like structure, sometimes found in leaf **Axils**.

Calyx
The collective term for the **Sepals** of a flower, which sometimes may be partially fused.

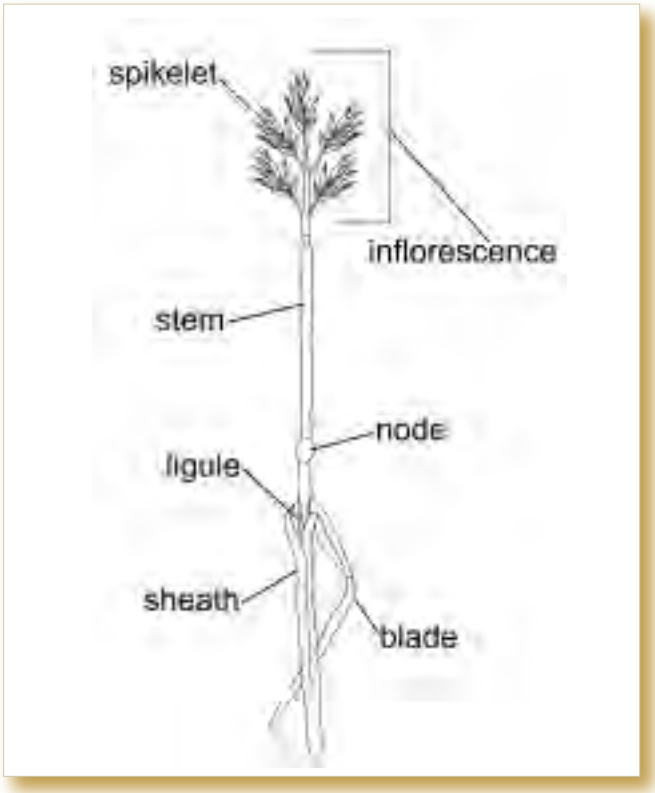
Capsule
A dry, non-fleshy fruit that splits open when mature.

Ciliate
Having a fringe or hairs at the margin. Usually referring to the edge of a leaf or **Leaflet.**

Compound Leaf
A leaf composed of two or more (usually 3 or more) distinct and separate Blades, referred to as **Leaflets**. Compare **Simple Leaf.**

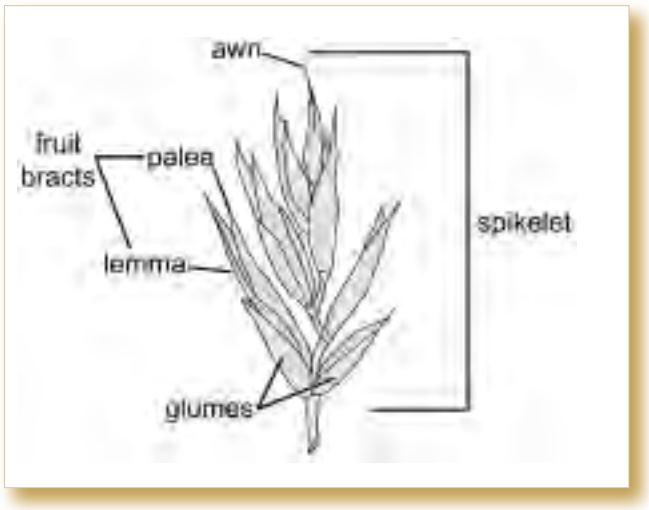
Conduplicate
Folded together lengthwise, usually in two equal halves. Compare **Involute**.

Distal
The more (or most) distant of two (or more) things. Toward or at the far end of a structure. Compare **Proximal**.



GLOSSARY OF BOTANICAL TERMS

Drupe
A fleshy **Fruit** with one or two seeds surrounded by a hard coating in the middle of the flesh.



Entire
With the margins smooth and continuous, lacking teeth.

Fruit
The ripened ovary of a plant; the structure bearing the seeds. May be a **Berry, Capsule, Drupe, Samara** or other type.

Glaucous
Covered in a waxy coating that imparts a bluish or whitish cast.

Glumes
The pair of Bracts at the base of a grass **Spikelet**

Imperfect (Flower)
Individual flowers having only male (stamens) or only female (pistils) reproductive structures, not both. Compare **Perfect**

Inflorescence
A cluster of individual flowers on a plant.

Infructescence
A cluster of individual fruits on a plant. The fruiting equivalent to **Inflorescence**.

Internode
The section of stem between two adjacent **Nodes**.

Involute
Rolled inward (as opposed to folded). Compare **Conduplicate**.

Lateral
Situated on, directed toward, or coming from the side. Lateral structures usually arise from the **Axils**. Compare **Terminal**.

Leaflet
The individual unit of a **Compound** Leaf. Each distinct **Blade** is a **Leaflet**.

Lemmas and Paleas (Fruit Bracts)
The **Bracts** surrounding each individual flower or fruit of a grass. They are often difficult to distinguish from one another, and are collectively referred to here as Fruit Bracts.

Ligule
In grasses, the small appendage at the base of the leaf, where the leaf Blade meets the Sheath.

Midvein
The main vein of a leaf or Leaflet, running down the center and typically dividing the Blade into two halves.

Node
The place on a stem where a leaf is (or has been) attached. G&C See Internode.

Opposite
With leaves or branches attached to the main stem or Axis in pairs, each member of the pair attached on opposing sides of the stem or axis. Compare Alternate, Whorled.

Peduncle
The stalk of a flower or **Inflorescence**.

Perfect (Flower)
Individual flowers with both male (stamens) and female (pistils) reproductive structures. Compare **Imperfect.**

Petal
One of the inner set of floral structures, usually colored and forming the showy part of a flower. Compare Sepal.

Petiole
The stalk of a leaf.

Pistil
The female reproductive organ of a flower. Compare **Stamen**.

Pith
The central tissue in a stem, often softer than the outer tissue and differently colored, sometimes hollow or chambered.

Prickle
A small, sharply-pointed outgrowth of the stem that is often more slender and less woody than a thorn. Roses and briers are well-known plants that have prickles. Compare **Thorn**

GLOSSARY OF BOTANICAL TERMS

Proximal
Toward the beginning, the nearer of two (or more) items. Toward or at the near end of a structure. Compare **Distal**.

Rhizome
A creeping, underground stem. Compare **Taproot**.

Samara
A specialized, winged **Fruit** that effectively disperses wind-borne seeds. Maple fruits are the most familiar samaras in our area.

Scabrous
Rough to the touch.

Seed
The fertilized ripened ovule of a plant; one or many may be borne within the Fruit.

Sepal
One of the outer floral structures, usually green and leaf-like. The sepals collectively form the **Calyx**. Compare **Petal**.

Sessile
Attached directly at the base (as of a leaf) without a stalk (**Petiole or Peduncle**).

Simple Leaf
A leaf made up of a single **Blade** (which may be deeply lobed, but it is not divided into separate **Leaflets**). Compare **Compound Leaf**.

Sheath
In grasses, the basal part of the leaf that wraps around the stem. Compare **Blade**.

Spikelet
The smallest unit within a grass inflorescence, consisting of an Axis (called the rachilla), a pair of empty basal **Bracts** (**Glumes**), and one to many distal flowers or fruits (surrounded by their associated pairs of **Bracts** (**Lemmas and Paleas**).

Stamen
The male reproductive organ of a flower, including the pollen-bearing **Anther**. Compare **Pistil**.

Stipule
A basal appendage (one of a pair) located at either side of the point of attachment of a leaf Petiole to the stem or **Axis**.

Taproot
A single, main, central root. Compare **Rhizome**.

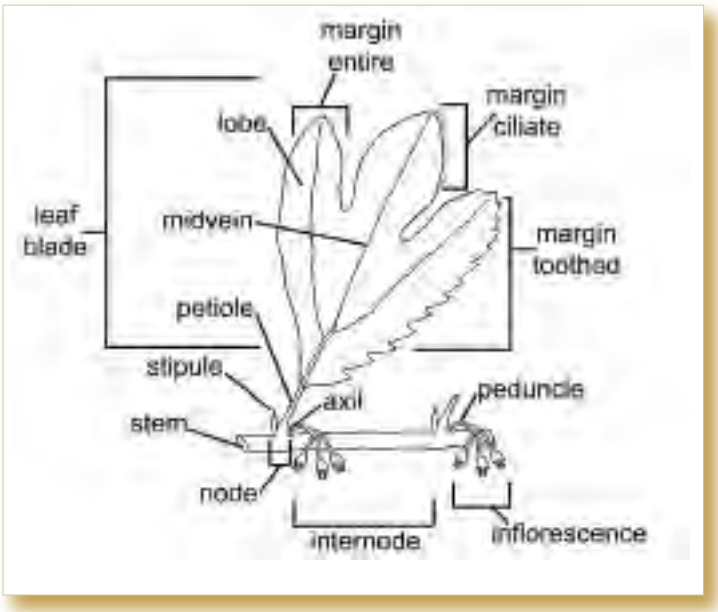
Tendril
A thin, fleshy organ that coils around objects (often other plants) to provide support to climbing vines (e.g. grapes). Like leaves, tendrils arise from **Nodes**.

Terminal
Arising from the end of a branch or branchlet. Compare **Lateral** and **Axillary**.

Thorn
A stiff, woody structure with a sharp point, representing a modified stem. Locusts and hawthorns are examples of common plants with thorns. Compare **Prickle**.

Tuber
A thickened part of a **Rhizome**, serving as a carbohydrate storage organ.

Whorled
With three or more leaves, branches, or other structures radiating from a common point or **Node**. Compare **Alternate, Opposite**.



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Invasive.org
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RESOURCES

Financial and Technical Assistance:

USDA NRCS Home Page.
www.nrcs.usda.gov

Pulling Together Initiative. National Fish and Wildlife Foundation (NFWF)
www.nfwf.org/pti/

Economics of Invasive Species. NBII Invasive Species Information Node.
http://invasivespecies.nbii.gov/economics.html

Grants and Funding for Invasive Species. USDA National Invasive Species Information Center.
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New York

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http://atlas.nyflora.org

RESOURCES

Pennsylvania

Pennsylvania DCNR. Invasive Plants In Pennsylvania.
www.dcnr.state.pa.us/forestry/wildplant/invasive.aspx

Invasive Exotic Plants In Pennsylvania List and Fact Sheets
www.dcnr.state.pa.us/forestry/invasivetutorial/List.htm

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www.paflora.org

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Virginia

Virginia DCR Natural Heritage Program. Invasive Alien Plant Species of Virginia
http://www.dcr.virginia.gov/natural_heritage/invspinfo.shtml

Native Plant Restoration

Choosing Native Plants:

USDA Plants Database
http://plants.usda.gov

Lady Bird Johnson Wildflower Center Native Plant Database
www.wildflower.org/plants

Missouri Botanical Garden's Kemper Center For Home Gardening Plantfinder
www.mobot.org/gardeninghelp/plantfinder/

Regional Resources:

Delaware Native Plant Society (DNPS)
www.delawarenativeplants.org

Maryland Native Plant Society (MNPS)
www.mdflora.org

Native Plant Society of New Jersey
www.npsnj.org

Pennsylvania Native Plant Society (PNPS)
www.pawildflower.org

Virginia Native Plant Society (VNPS)
http://vnps.org

Adkins Arboretum
www.adkinsarboretum.org

Bowman's Hill Wildflower Preserve
www.bhwp.org

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US Fish and Wildlife Service Bayscapes Program
www.fws.gov/chesapeakebay/Bayscapes.htm

University of Delaware Cooperative Extension Native Plant Publications
http://ag.udel.edu/extension/horticulture/index.htm

Virginia Natural Heritage Program Native Plant Lists
www.dcr.virginia.gov/natural_heritage/nativeplants.shtml

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Front Cover: *Aralia elata* leaf AT; (Inset, l-r:) *Aralia elata* habit MS; *Aralia spinosa* infloresence David G. Smith; *Aralia elata* stem MS

Back Cover: *Aralia spinosa* habit CB

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1. *Ampelopsis brevipedunculata* habit CB

6. *Acer platanoides* leaf AT; *Acer platanoides* leaf detail AT; *Acer platanoides* sap MS; *Acer platanoides* samara AT; *Acer platanoides* bark AT

7. *Acer saccharum* leaf AT; *Acer saccharum* leaf detail AT; *Acer saccharum* samara AT; *Acer saccharum* bark AT

8. *Aralia elata* leaf detail AT; *Aralia elata* inflorescence David G. Smith; *Aralia elata* infructescence MS; *Aralia elata* bark MS; *Aralia elata* habit MS

9. *Aralia spinosa* leaf detail MS; *Aralia spinosa* inflorescence David G. Smith; *Aralia spinosa* fruit MS; *Aralia spinosa* bark MS; *Aralia spinosa* habit CB

10. *Morus alba* leaf CB; *Morus alba* leaf detail MS; *Morus alba* fruit Chris Evans, River to River CWMA, Bugwood.org (CC by-nc 3.0); *Morus alba* fruit Will Cook

11. *Morus rubra* leaf Chris Evans, River to River CWMA, Bugwood.org (CC by-nc 3.0); *Morus rubra* leaf detail CB; *Morus rubra* fruit Hugh Wilson, Texas A&M University Herbarium, Digital Flora of Texas Vascular Plant Image Library

12. *Ailanthus altissima* leaflet MS; *Ailanthus altissima* leaflet detail MS; *Ailanthus altissima* leaf CB; *Ailanthus altissima* samara CB; *Ailanthus altissima* bark MS

13. *Rhus glabra* leaflet MS; *Rhus typhina* habit MS; *Rhus typhina* sap MS; *Rhus typhina* fruit MS; *Rhus typhina* bark MS

14. *Lonicera maackii* leaf MS; *Lonicera morrowii* fruit Will Cook; *Lonicera maackii* pith MS; *Lonicera maackii* flower CB

15. *Diervilla lonicera* leaves Thomas Parker; *Diervilla lonicera* fruit Thomas Parker; *Diervilla lonicera* pith AT; *Lonicera canadensis* flower Katie Savalchak

16. *Euonymus alatus* habit Richard Webb, self-employed horticulturalist, Bugwood.org (CC by 3.0); *Euonymus alatus* stem CB; *Euonymus alatus* fruit CB; *Euonymus fortunei* habit CB

17. *Euonymus americanus* leaves CB; *Euonymus americanus* stem CB; *Euonymus americanus* fruit CB; *Euonymus obovatus* flower Will Cook

18. *Rosa multiflora* stipule AT; *Rosa multiflora* flower CB; *Rosa multiflora* inflorescence Chris Evans, River to River CWMA, Bugwood.org (CC by-nc 3.0); *Rosa multiflora* fruit CB

19. *Rosa palustris* stipule MS; *Rosa palustris* flower David G. Smith; *Rosa palustris* inflorescence CB; *Rosa palustris* fruit MS

20. *Rubus phoenicolasius* leaf detail MS; *Rubus phoenicolasius* stem MS; *Rubus phoenicolasius* fruit Rhoda Treher; *Rubus phoenicolasius* habit MS

21. *Rubus allegheniensis* leaf detail MS; *Rubus allegheniensis* stem MS; *Rubus allegheniensis* fruit CB; *Rubus occidentalis* habit AT

22. *Lonicera japonica* leaves MS; *Lonicera japonica* leaves Ted Bodner, Southern Weed Science Society, Bugwood.org (CC by 3.0); *Lonicera japonica* flowers CB; *Lonicera japonica* fruit CB

23. *Lonicera sempervirens* leaves Will Cook; *Lonicera sempervirens* terminal leaves AT; *Lonicera sempervirens* inflorescence Will Cook; *Lonicera sempervirens* fruit CB

24. Celastrus orbiculatus leaves CB; *Celastrus orbiculatus* inflorescence CB; *Celastrus orbiculatus* fruit CB; *Celastrus orbiculatus* fruit Patricia McAdie

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25. *Celastrus scandens* leaf John Seiler, Virginia Tech Department of Forestry; *Celastrus scandens* Laura Amey; *Celastrus scandens* fruit John Seiler, Virginia Tech Department of Forestry; *Celastrus scandens* leaves Will Cook

26. *Clematis terniflora* leaf AT; *Clematis terniflora* fruit AT; *Clematis terniflora* fruit Will Cook; *Clematis terniflora* inflorescence CB

27. *Clematis virginiana* habit MS; *Clematis virginiana* leaf MS; *Clematis virginiana* fruit AT; *Clematis virginiana* inflorescence MS

28. *Ampelopsis brevipedunculata* leaf detail AT; *Ampelopsis brevipedunculata* fruit CB; *Ampelopsis brevipedunculata* fruit detail MS; *Ampelopsis brevipedunculata* bark MS; *Ampelopsis brevipedunculata* pith MS

29. *Vitis* sp. leaf detail MS; *Vitis* sp. fruit MS; *Vitis* sp. fruit detail MS; *Vitis* aestivalis bark James H. Miller, USDA Forest Service, www.forestryimages.org (CC by 3.0); *Vitis* sp. pith MS

30. *Microstegium vimineum* leaf MS; *Microstegium vimineum* and *Leersia virginica* nodes MS; *Microstegium vimineum* inflorescence MS; *Microstegium vimineum* fruit AT; *Microstegium vimineum* habit AT

31. *Leersia virginica* leaf CB; *Leersia virginica* node CB; *Leersia virginica* inflorescence John Hilty; *Leersia virginica* fruit AT; *Leersia virginica* habit CB

32. *Phalaris arundinacea* leaf MS; *Phalaris arundinacea* ligule, Richard Old, XID Services, Inc., Bugwood.org (CC by-nc 3.0); *Phalaris arundinacea* habit MS; *Phalaris arundinacea* fruit AT; *Phalaris arundinacea* inflorescence MS

33. *Calamagrostis canadensis* leaf Robert H. Mohlenbrock @ USDA-NRCS PLANTS Database / USDA SCS. 1989. Midwest wetland flora: Field office illustrated guide to plant species. Midwest National Technical Center, Lincoln; *Calamagrostis canadensis* habit Dave Powell, USDA Forest Service, Bugwood.org (CC by 3.0); *Calamagrostis coarctata* fruit Jose Hernandez @ USDA-NRCS PLANTS Database; *Calamagrostis coarctata* inflorescence Jose Hernandez @ USDA-NRCS PLANTS Database

34. *Phragmites australis* ssp. australis stems Kristin Saltonstall; *Phragmites australis* ssp. australis sheaths Robert Meadows; *Phragmites australis* ssp. *australis* ligule Kristin Saltonstall; *Phragmites australis* ssp. *australis* habit CB

35. *Phragmites australis* ssp. *americanus* stems Kristin Saltonstall; *Phragmites australis* ssp. americanus sheaths Robert Meadows; *Phragmites australis* ssp. *americanus* ligule Kristin Saltonstall; *Phragmites australis* ssp. *americanus* and *Phragmites australis* ssp. *australis* glumes Kristin Saltonstall

36. *Phyllostachys aurea* stem MS; *Phyllostachys aurea* branching pattern MS; *Phyllostachys aurea* basal internodes Jimmy Triplett; *Phyllostachys aurea* habit MS

37. *Arundinaria tecta* stem leaf Jimmy Triplett; *Arundinaria tecta* branching pattern Jimmy Triplett; *Arundinaria tecta* basal internodes Jimmy Triplett; *Arundinaria* sp. habit Ted Bodner, Southern Weed Science Society, Bugwood.org (CC by 3.0)

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39. *Sorghastrum nutans* leaf blade John Hilty; *Sorghastrum nutans* fruit Steve Hurst @ USDA-NRCS Plants Database; *Sorghastrum nutans* inflorescence Jennifer Anderson @ USDA-NRCS PLANTS Database; *Sorghastrum nutans* habit Ted Bodner, Sothern Weed Science Society, Bugwood.org (CC by 3.0)

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41. *Angelica atropurpurea* specimen AT; *Angelica atropurpurea* stem AT; *Angelica atropurpurea* inflorescence AT; *Heracleum maximum* leaf James Gaither; Heracleum maximum inflorescence David G. Smith

42. *Iris pseudacorus* flower CB; *Iris pseudacorus* habit CB; *Iris pseudacorus* fruit David G. Smith; *Iris pseudacorus* fruit John Moyer

43. *Iris versicolor* flower CB; *Iris versicolor* habit CB; *Iris versicolor* habit CB; *Iris versicolor* fruit AT

44. *Ranunculus ficaria* tuber Mark Birkle; *Ranunculus ficaria* stem bulblets AT; *Ranunculus ficaria* habit David G. Smith; *Ranunculus ficaria* flower CB; *Ranunculus ficaria* flower David G. Smith

45. *Caltha palustris* roots AT; *Caltha palustris* habit David G. Smith; *Caltha palustris* flowers David G. Smith; *Caltha palustris* leaf Jonathan Landsman

47. Weed wrench Chris Evans, River to River CWMA, Bugwood.org (CC by-nc 3.0); Hand pulling Spotted Knapweed MS; Tractor with rotary mower MS; Felling Tree-of-heaven MS

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