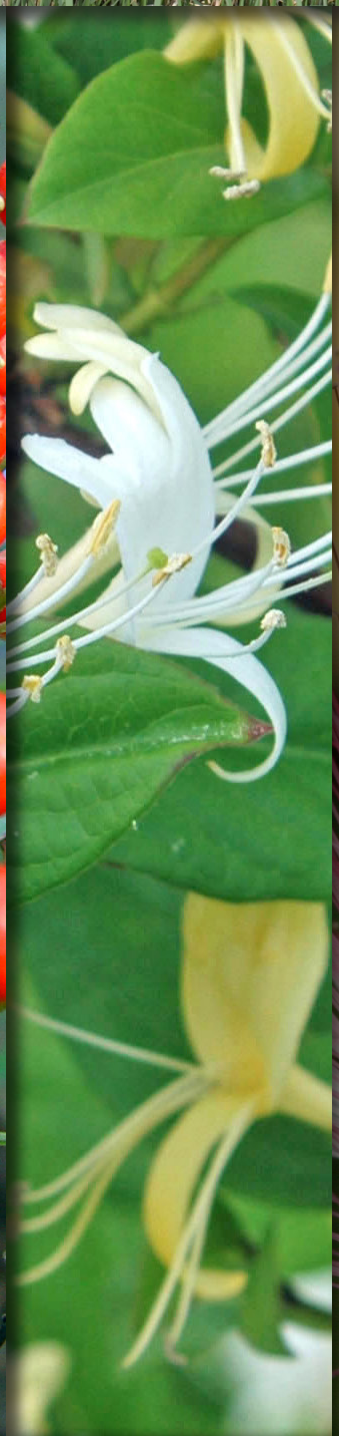
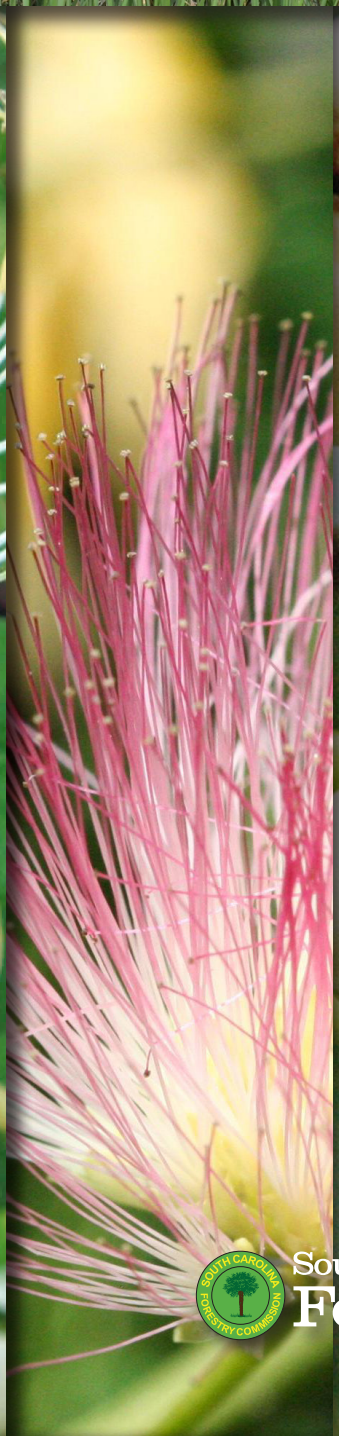
INVASIVE SPECIES
OF SOUTH CAROLINA FORESTS

South Carolina
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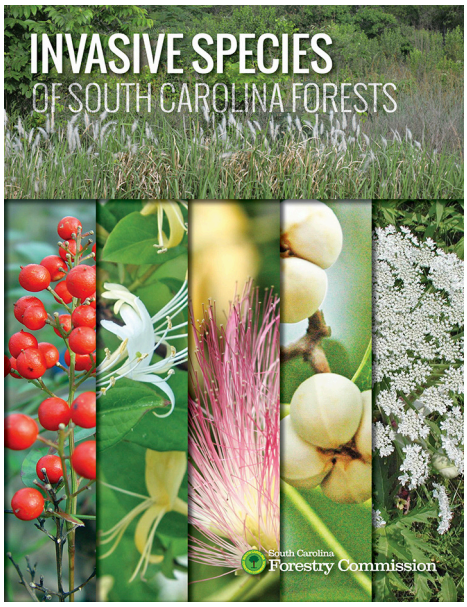
FOREWORD



Invasive Species Of South Carolina Forests, published by the South Carolina Forestry Commission
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The South Carolina Forestry Commission is proud to present this guide to some of the most common and problematic invasive species encountered in our state's forests.

This publication is the outgrowth of a series of social media posts that the Forestry Commission's Urban & Community Forestry, Forest Health and Communications & Public Information teams produced for National Invasive Species Awareness Week in 2018. The collaboration extended far beyond just that week, however, culminating in this comprehensive, though not exhaustive, catalog of invasive species that continues to grow.

What are invasive species?

The federal government defines invasive species as any non-native organism whose introduction causes or is likely to cause economic or environmental harm or harm to human health. According to the National Wildlife Federation, invasive species are among the leading threats to native wildlife. Approximately 42 percent of threatened or endangered species are at risk due to invasive species. Species that grow and reproduce quickly, and spread aggressively, with potential to cause harm, are given the label "invasive."

What are invasive species' impacts?

Invasive species have an enormous impact on our forests. The U.S. Fish & Wildlife Service reports that infestations of invasive plants and animals can negatively affect property values, agricultural productivity, public utility operations, native fisheries, tourism, outdoor recreation, and the overall health of an ecosystem, costing more than $120 billion in damages every year (Pimental et al. 2005).

Whom to call about invasive speciess

The Insects & Disease (I&D) Section of the South Carolina Forestry Commission has responsibility for monitoring, reporting and coordinating suppression of endemic pests affecting forest trees in South Carolina. I&D also works closely with Christmas tree growers, nurseries growing forest tree seedlings, seed orchards producing tree seed and urban areas with tree pest problems. Close cooperation is maintained with the U.S. Forest Service and other federal and state agencies such as the Bureau of Plant Industries.

The Insect and Disease Section also operates a laboratory for free diagnosis of insects and disease affecting forest resources in the State. Samples for diagnosis are submitted by South Carolina Forestry Commission personnel and various private individuals.

If you believe your property or land has been affected by invasive species, please contact SCFC Forest Health Coordinator David Jenkins at (803) 896-8838 or djenkins@ scfc.gov, or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant- protection/invasive/.

INVASIVE SPECIES
OF SOUTH CAROLINA FORESTS

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BRADFORD PEAR

PYRUS CALLERYANA

Callery or Bradford pear, *Pyrus calleryana*, was introduced to the United States in 1909, and its uniform shape, profuse white flowers, and bright red fall foliage made the Callery pear a much-planted ornamental throughout the southeast. For many years the trees were sterile, not producing fruit. But in the 2000s trees began to cross pollinate and produce abundant amounts of fruit that were spread by birds.

Bradford pear produces abundant white flowers before it leafs out.

Identification

Callery pear is a deciduous tree that reaches 60 feet in height (18 m). Callery pear produces abundant white flowers before it leafs out, and these flowers are pungent and unpleasant smelling. The foliage is ovate with a long petiole. In the fall the foliage is bright red and trees often have marble-sized hard fruit on them.

How it spreads

Birds consume the fruit after frost has softened it, subsequently spreading it. It can be very abundant in old fields.

Managing Callery pear

Do not plant Callery or Bradford pear. Instead, plant native alternatives, such as serviceberry, fringe tree, tupelo, or dogwood among many others. Trees should be cut and stumps immediately treated with herbicides to eliminate sprouting response.

What to do

If you would like more information on Callery pear, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

For information on how you can combat invasive plants in your community visit the South Carolina Exotic Pest Plant website at https://www.se-eppc.org/southcarolina/ or send an email to southcarolinaeppc@gmail.com.

Photo by Cheryl McCormick, University of Florida, Bugwood.org

CHINABERRY

MELIA AZEDARACH

Chinaberry, *Melia azedarach*, an invasive-exotic species native to China, was first brought over to the United States in 1830 by a French botanist. It has been favored mostly as a shade tree and ornamental hedge, but has also been used for medicinal purposes and as fuel wood. It thrives in forests and marshes, forming dense thickets and shading out native vegetation but also flourishes in open fields, forest edges and quickly establishes in disturbed areas as well.

Identification

Chinaberry is a deciduous tree that reaches an average height of 30 feet but can potentially grow to 50 feet. In the spring, it produces numerous clusters of fragrant, showy, pink-to- lavender, star-shaped flowers, similar to lilac flowers. Chinaberry belongs to the Mahogany family, *Melilaceae*, and exhibits smooth, purplish-reddish bark when young that develops into rough, flattened, gray plates, when mature. Leaves are twice-compound (bi-pinnately compound) with an oval-elliptical shape, large toothed margin and dark green color. The bright yellowish-green fruit form in clusters of rounded drupes encapsulating small, robust seeds with a sticky outer coating, considered poisonous to some species of animals.

How it spreads

Chinaberry has certain tendencies, like many invasive-exotic species, that give it an advantage to quickly colonize in an area and successfully displace native species. Chinaberry aggressively reproduces, sending vegetative sprouts from roots and stumps to form new plants. Seeds are widely disseminated by birds and other animals, which also fuels rapid spread, making this species difficult to control. Chinaberry has evolved to be very versatile, able to tolerate variable soil conditions with differing texture, light and moisture conditions, which enables it to thrive in open areas as well as forested areas.

Managing Chinaberry

The best form of invasive-species management is prevention.

Chinaberry produces star-shaped flowers similar to lilac flowers. (Photo by Chris Evans, University of Illinois, Bugwood.org)

Do not plant Chinaberry. Instead, plant alternative native trees, such as Carolina Silverbell (*Halesia carolina*), Fringetree (*Chionanthus virginicus*), Serviceberry (*Amelanchier arborea*), Sweetbay Magnolia (*Magnolia virginiana*), and Sassafras (*Sassafras albidum*) among many others.

Infestations of Chinaberry are best managed when plants are young. Seedlings may be hand-pulled, but mature trees are more difficult to control. Herbicides may be the best method to control Chinaberry. Herbicides applied to cut stumps or trunk bark (basal-bark application) has been shown to be effective methods for control. Trees should be cut and stumps immediately treated with herbicides to eliminate sprouting response.

Contact information

If you would like more information on Chinaberry, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

For information on how you can combat invasive plants in your community or to identify native alternatives to plant instead of exotics, visit the South Carolina Exotic Pest Plant website at https://www.se-eppc.org/southcarolina/ or send an email to southcarolinaeppc@gmail.com.

Photo by Karan A. Rawlins, University of Georgia, Bugwood.org

COGONGRASS

IMPERATA CYLINDRICA

Cogongrass, *Imperata cylindrica*, is one of the most invasive plants on the planet. Found on every continent except Antarctica, cogongrass is even a pest in its native Southeast Asia. It is particularly insidious as a pest of our forests; it can tolerate the low light conditions in healthy forests, exploding when more light is let in. Since cogongrass increases fuel loads, forest fires or prescribed burns in infested stands can get hotter than the trees can stand. When the trees die, the increased light allows the cogongrass to explode, effectively converting a forest to grassland.

Livestock won't forage on it because it is too tough and has low protein content.

Identification

It can be recognized by an offset midrib, pencil-sized rhizomes that are found below the soil surface, the feathery flowers that are visible in spring. From the air, infestations starting from rhizomes have a distinct oval or round shape as the rhizomes spread concentrically from the center.

How it spreads

It can be spread through seeds (less common in South Carolina) or rhizomes that get stuck on bulldozers or other equipment, making it a good practice to rinse your equipment after visiting a site that potentially has cogongrass.

Managing cogongrass

Tilling up cogongrass can exacerbate infestations by dividing rhizomes. Herbicides, particularly imazapyr and glyphosate, applied according to the label's instructions, are very effective if applied strategically and repeatedly. Herbicides can be applied after burning an infestation once the rhizomes sprout again. Applications in the fall are more effective, as the grass is mobilizing its sugars to the rhizome for the winter and will take the herbicide with it.

Contact information

If you think you know of a cogongrass infestation, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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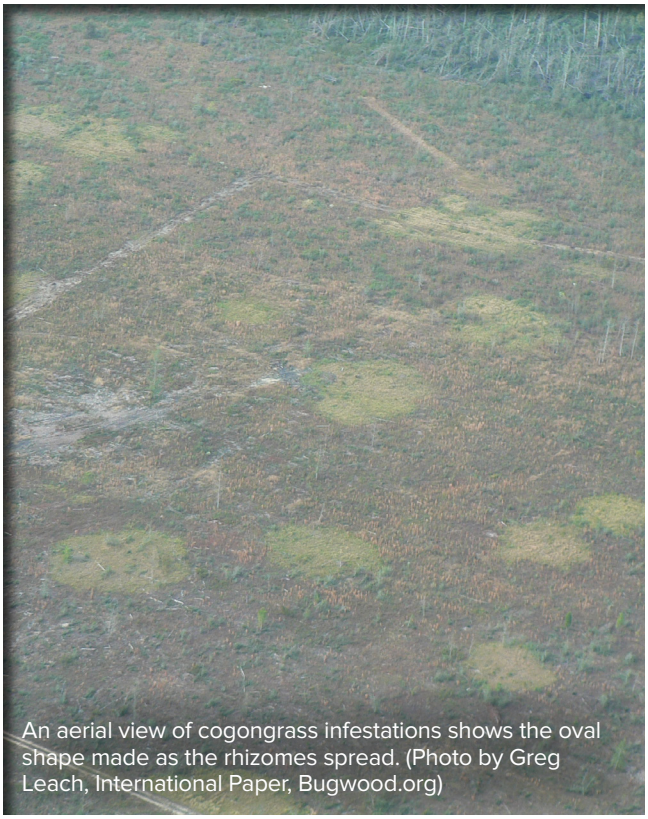

An aerial view of cogongrass infestations shows the oval shape made as the rhizomes spread. (Photo by Greg Leach, International Paper, Bugwood.org)

South Carolina Forestry Commission

Photo by Debbie Miller, USDA Forest Service, Bugwood.org

EMERALD ASH BORER

AGRILUS PLANIPENNIS

The emerald ash borer, *Agrilus planipennis*, is a flat-headed borer native to eastern Asia. Adults emerge from infested ash trees in the spring and lay eggs in the bark. The eggs hatch and spend between one and two years feeding on the phloem layer below the bark. Over the course of several generations (two to five years) the larvae completely girdle the tree all the way to the roots, killing the tree. Unlike native beetles in the genus *Agrilus* (we have 50 species in South Carolina), they attack healthy trees, in this case, specifically ash trees. They have been found in the related fringe tree on occasion. This insect is a serious threat to ash trees of all species and has had a dramatic impact on populations of ash trees where it has been found.

Identification

There are many insects that could be mistaken for the emerald ash borer, so it is best to keep the specimen in alcohol and bring it to an expert to confirm the identity. Adults are metallic green, about 8.5 mm (0.33 inches) long and 1.6 mm (0.063 inches) wide. If the elytra, the hard outer wing, is lifted the emerald ash borer has a bright red upper abdomen that can be used to distinguish emerald ash borer from native *Agrilus* species. The larvae, found under the bark of infested trees, are difficult to distinguish from native flathead borers.

A sign of emerald ash borer is D-shaped exit holes. (Photo by Pennsylvania Department of Conservation and Natural Resources - Forestry , Bugwood.org)

The larvae create galleries under the bark as they feed. (Photo by Michigan Department of Agriculture, Bugwood.org)

Infested trees have a progressively reduced crown as the borer larvae cut off the transport of water and sugars between the roots and the foliage. Infested trees will respond by producing epicormic sprouts, foliage and stems growing from the base of the tree. Woodpeckers feeding on larvae in infested trees will leave characteristic damage.

How it spreads

The adult emerald ash borer can fly, but it is not thought to move very far from its host tree. The most important means of spread is through the movement of infested logs. If you have an ash tree die on your property it is best to have it chipped on the spot.

Managing emerald ash borer

Currently there are no successful biological controls available for emerald ash borer. There are systemic pesticides that can be applied as soil drenches, bark sprays or trunk injections that can protect healthy trees.

Contact information

If think you know of an emerald ash borer infestation , contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

EMPRESS TREE

PAULOWNIA TOMENTOSA

Empress tree is native to eastern and central China. Historically, it has been prized for its showy clusters of violet-white flowers, rapid growth rate and attractive wood. It was first introduced into the United States around 1840 when it gained popularity as an ornamental planting. This species has the capacity for extremely fast growth, capable of growing over 30 feet in only a couple of years. Controversial to its invasive tendencies, it is known for its attractive wood characteristics and extreme durability and has been regarded by some as an economically lucrative species. Empress tree has been grown commercially as a crop tree for the wood products industry and has been used for various wood products, including furniture, plywood, musical instruments, packaging and lumber for home construction.

Empress tree flowers have a five-lipped calyx and violet and white petals. (Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org)

Identification

Empress tree, also known as princess tree, royal paulownia and Kiri tree, is a medium-sized, deciduous shade tree that can grow to a height of 30 to 60 feet. This is a very attractive tree, especially favored for its spectacular trumpet of pale, violet-white flowers in the spring. The heart-shaped leaves are quite large, measuring 5 to 12 inches in length and half as wide. The topsides of the leaves are lush green and hairless, while leaf undersides are a pale green and covered by a velvety layer of fine hairs. Empress tree produces rounded clusters of bright green, 1- to 2-inch, egg-shaped capsules each growing season that persist on the tree throughout winter and turn brown later in the season prior to releasing numerous small, winged seeds.

Empress tree leaves are heart-shaped and measure 5 to 12 inches in length. (Photo by Nancy Loewenstein, Auburn University, Bugwood.org)

Empress tree and Southern Catalpa tree (*Catalpa speciosa*) have similar characteristics that sometimes cause confusion between the two species; however, the main differences among the two trees are variances in flower, fruit, and twig characteristics. Southern Catalpa is native to the southeastern U.S. and is a popular ornamental landscape tree. Both trees have large, lush-green heart-shaped leaves,

Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

EMPRESS TREE

PAULOWNIA TOMENTOSA

but Catalpa leaves are slightly larger, have three lobes and are arranged in a whorled pattern as opposed to an opposite arrangement in empress tree. The attractive flowers of both trees are multi-colored and have a tubular shape; though empress tree flowers have a five-lipped calyx and violet and white petals, Catalpa flowers have a two-lipped calyx, white flowers, two distinct yellow spots and thin, purple stripes. Empress tree and Catalpa tree also differ in fruit and twig characteristics. Empress tree has distinct, glossy gray-brown twigs that are covered with pronounced white lenticels, used as surface pores for gas exchange, appearing as white dots. In addition, empress tree has a hollow (chambered) pith and Catalpa tree is solid. The fruit produced by the two trees also differentiates each species; Empress tree produces clusters of rounded, woody seed capsules enclosing tiny, winged seeds and Catalpa fruit are long, slender, dangly (18-inch) seed pods.

How it spreads

Paulownia tomentosa is a very aggressive tree that has been observed establishing rapidly in disturbed, open areas, especially following natural disturbances of fire, tornadoes and hurricanes. Empress tree also readily succeeds forest gaps and timber harvest areas (clear-cuts), and is known to quickly out-compete native, early successional species. Like most invasive-exotic species, it is a heavy seed producer, and its light-weight seed is readily dispersed by wind and water. Its vigorous growth rate gives this species an advantage for overtaking open, disturbed areas very quickly.

Empress trees produce clusters of bright green, egg-shaped capsules. (Photo by Chris Evans, University of Illinois, Bugwood.org)

Managing empress tree

To help prevent the spread, do not plant empress tree. Instead, select native alternatives, such as Carolina Silverbell (*Halesia carolina*), Sweetbay magnolia (*Magnolia virginiana*), Sassafras (*Sassafras albidum*) and Cucumber tree (*Magnolia acuminata*) among several others. Mature empress trees should be cut, and the outer two inches of cut stump surface should be immediately treated with herbicide, such as glyphosate concentrate (53.8 percent preferred) to eliminate sprouting response. For saplings, treat entire stump surface after cutting. When cutting large saplings and mature trees, be sure to collect and bag seed capsules if present on branches and remove from site. This will help eliminate risk of spread. Always follow the label recommendations when applying herbicides.

Contact information

If you would like more information on empress tree, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Photo by Terry English, USDA APHIS PPQ, Bugwood.org

GIANT HOGWEED

HERACLEUM MANTEGAZZIANUM

Giant hogweed, *Heracleum mantegazzianum*, is a biennial plant native to the Caucasus region of Europe and Central Asia. Introduced into Europe as an ornamental in the 19th century, it is now found throughout most of northern Europe. It has also been reported from the Pacific Northwest of North America and the East Coast of North America from Newfoundland to Virginia and North Carolina. The sap of giant hogweed contains phototoxic compounds, chemicals that become more toxic when exposed to sunlight. People who have been exposed to giant hogweed sap have suffered painful rashes, and some have even been hospitalized, **so extreme caution should be used around these plants.**

Identification

Giant hogweed has a bright green stem, often speckled with red and can reach heights of 6 feet. The foliage is large (3 to 5 feet in width) and usually at the base of the stem. The stem and leaf stalks have hairs and bristles. The flowers are formed in large umbels, very similar to its relative Queen Anne's lace, but much larger.

Giant hogweed foliage is usually at the base of the stem and is 3 to 5 feet in width. (Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org)

How it spreads

Giant hogweed spreads from the minute seeds produced in the second year of growth, after which the plant dies. It is most common on rivers and the seeds likely spread via water.

Management

Always wear protective clothing and even goggles when working around giant hogweed as exposure to the sap can cause a severe rash. Applying herbicides to the foliage before the flower is produced is the best way to avoid exposing yourself to the toxic sap and reduce seed production.

The flowers of giant hogweed are formed in large umbels. (Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org)

Contact information

If you would like more information on giant hogweed, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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South Carolina Forestry Commission

SC-EPPC South Carolina Exotic Pest Plant Council

Photo by Chuck Bargeron, University of Georgia, Bugwood.org

GOLDEN BAMBOO

PHYLLOSTACHYS AUREA

Golden bamboo (*Phyllostachys aurea*) is a very tall, fast-growing, perennial reed plant that belongs to the grass family, Poaceae. It was first introduced into the United States from southeastern China before 1870 for erosion control and soil stabilization. Later, golden bamboo made its ornamental debut as a landscaping plant, particularly favored for its rapid growth, remarkable height and suitability as a screening and barrier plant to sound and light. Since its introduction, this species has escaped cultivation and commonly grows in very dense monocultures where it establishes. Golden bamboo is a significant threat to many parts of the U.S., including the southern and southeastern states as well as the East Coast.

Young plant stems are green and turn yellowish-brown as they mature. (Photo by James H. Miller, USDA Forest Service, Bugwood.org)

Identification

Golden bamboo plants grow within a range of 16 to 40 feet tall. Plant stems, also called canes, have a hollow center, solid joints, stand upright and robust, and develop an average diameter of 1 to 6 inches. Young plant stems appear green at first and mature to a yellowish-brown color; however, canes usually remain green on very wet sites. Two branches typically emerge from each node. Lower stems exhibit more crowding with closer branching protruding at oblique angles, while upper stems develop wider-spaced branching. Smooth leaf sheaths occur along stems and are sometimes brown-spotted. Leaves are lanceolate-shaped and arranged alternately along the stem, measuring 3 to 10 inches long by ¼ to ¾ inches wide. Flowers form on spikelets, however, flowering is very infrequent, occurring only once every 10 years, on average. Golden bamboo may flower more often than other bamboos, but little seed is produced.

Golden bamboo has lanceolate-shaped leaves that are arranged alternately along the stem. (Photo by James H. Miller, USDA Forest Service, Bugwood.org)

How it spreads

Golden bamboo is an extremely aggressive spreader, especially in warmer, sunnier climates. Outside of planned growth in gardening landscapes, golden bamboo is often

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Photo by Haruta Ovidiu, University of Oradea, Bugwood.org

GYPSY MOTH

LYMANTRIA DISPAR

Overview

Intentionally imported into the U.S. in 1869 to investigate its potential for silk production, the moth, *Lymantria dispar*, soon escaped and became one of the most important defoliators of deciduous forests in the northeastern U.S. and southeastern Canada. Efforts to control it using pesticides and biocontrol have slowed its spread. There is also the Asian gypsy moth, the same species as the European moth, but the females of the Asian gypsy moth can fly. Although gypsy moth defoliation rarely kills a tree outright, continued defoliation weakens the tree and makes it susceptible to other pests or diseases.

Hosts

The caterpillar attacks a broad range of deciduous trees, particularly oak, sweetgum, maple, elm, apple trees and many others. If outbreaks are especially severe, older larvae may attack pines and spruces. The European gypsy moth usually avoids ash, tulip poplar, sycamore, butternut, black walnut, catalpa, dogwood, holly, cedars, locusts, junipers, balsam firs, horse chestnut/buckeyes, azaleas,mountain laurel and rhododendron.

Signs/symptoms

Severe defoliation in outbreak years can make it seem like winter. You can hear the caterpillars feeding, and the ground will be covered with frass, the fine, powdery wood residue produced by the activity of boring insects. You can also hear the frass falling.

Life cycle

Moths mate in the late summer. Only the males can fly; the female, although winged, is pregnant with eggs and unable to fly and has to climb up the trunk of host trees to lay her egg masses. The eggs hatch in the spring, and the larvae feed on the new foliage. Feeding continues until mid-summer when the mature larvae pupate.

Timeline

The larvae are active from spring until mid-summer. The adults emerge in the late summer and mate, and the females lay their egg masses.

Range

Although egg masses and isolated individuals have been occasionally found in South Carolina, the gypsy moth has not established in the Palmetto State. It ranges from the northeastern states west to Wisconsin and Michigan and south to Ohio, West Virginia and portions of North Carolina.

Management

Concerted efforts to control gypsy moth have included broadcast application of pesticides, including insect-specific viruses, *Bt*, and the use of parasitoids. Egg masses may also be placed on vehicles or firewood and be transported considerable distances. Vigilance for egg masses can help slow the spread. Tree banding, often used to control cankerworm, can be effective in keeping female adults from reaching the top of a tree to oviposit or keep larvae from moving into a new host tree.

A female gypsy moth deposits an egg mass on a tree. (Photo by Steven Katovich, USDA Forest Service, Bugwood.org)

JAPANESE CLIMBING FERN

LYGODIUM JAPONICUM

Japanese climbing fern, *Lygodium japonicum*, is a perennial viney fern that is native to Asia. It's filigree-like foliage attracts gardeners who have planted it as an ornamental, but it can be devastating to our forests! It can survive in low light, climbing up shrubs and trees. In the winter the dried out foliage can serve as a ladder fuel, moving ground fires to the crowns of trees.

Identification

The leaves are opposite on the vine, generally triangular in overall shape, but divided to varying degrees, some leaves elaborately so. The vine is narrow but tough.

How it spreads

Underground rhizomes may be moved on equipment. The fern produces thousands of spores that can transferred on the wind, hikers shoes or equipment. The vines use trees or understory shrubs to increase their height and optimize the dispersal of their spores.

Managing Japanese climbing fern

Don't plant Japanese climbing fern! We have plenty of beautiful native ferns that are just as pleasing, including a native species of *Lygodium* that is found in the upstate around waterfalls. If you do find Japanese climbing fern, treat green foliage with herbicide in the spring, or pull up the rhizomes as you find them, if it is a small infestation. Be sure to wash any equipment that has been exposed to Japanese climbing fern.

Contact information

If you think you know of a Japanese climbing fern infestation, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Japanese climbing ferns use trees or understory shrubs to increase their height.

Photo by Chris Evans, University of Illinois, Bugwood.org

JAPANESE HONEYSUCKLE

LONICERA JAPONICA

Japanese Honeysuckle was introduced into the United States in 1806 as an ornamental selection used for shrub borders, groupings and mass plantings. It is an evergreen, flowering, woody vine that has been favored by many land management professionals and landscapers for decades for its aesthetics, twining habit, and quick establishment. It has also been used in erosion control to help stabilize roadsides and banks and planted as wildlife forage for deer.

Identification

Japanese honeysuckle is an evergreen, woody vine that can be found trailing in forest understories, forest edges and roadsides or found climbing up into forest canopies. Leaves are simple, ovate-oval in shape and arranged oppositely along stems. Spring flowers are fragrant, attractive, and tubular-shaped with delicate, white and yellow petals. Young vines are thin, non-woody, copper colored and covered with fine hairs (pubescent). Stems can grow 80-120 feet long; mature vines can become thick and woody.

How it spreads

Japanese honeysuckle is abundant in the South Carolina landscape and can be found growing in various habitat conditions, ranging from forest understories to forest floors, to disturbed areas and wetlands. It is a rapid grower that can quickly out-compete native species for light, space and nutrients, and it is also known to girdle the stems of young saplings. This species is very opportunistic, swiftly establishing in new forest gaps, recently disturbed areas, roadsides and forest edges.

Japanese honeysuckle flowers are tubular-shaped with white and yellow petals. (Photo by Chris Evans, University of Illinois, Bugwood.org)

Managing Japanese honeysuckle

Do not plant Japanese honeysuckle. Instead, plant native alternatives, such as Trumpet creeper (*Campsis radicans*), Virginia creeper (*Pathenocissus quinquefolia*), Carolina jessamine (*Gelsemium sempervirens*), Crossvine (*Bignonia capreolata*), Coral honeysuckle (*Lonicera sempervirens*) and several others.

Mechanical control by hand pulling or using hand tools, such as loppers, hand saws, hand pruners, to cut stems can be an effective treatment method, especially if repeated regularly and done when soil is moist.

Chemical control using systemic herbicides for foliar application have been effective for control of Japanese honeysuckle, especially if applied during the growing season and under optimum temperature conditions. Special caution needs to be taken when applying herbicides to the landscape to minimize off target impacts and protect native plants and water quality.

Contact information

If you would like more information on Japanese honeysuckle, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Photo by Chris Evans, University of Illinois, Bugwood.org

MIMOSA TREE

ALBIZIA JULIBRISSIN

pink powderpuff appearance. The bark of mature trees is light brown and smooth while young stems are lime green in color that later turn light brown and develop numerous lenticels. Lenticels are surface pores needed for atmospheric gas exchange. Mimosa is a member of the legume family, Fabacae, and produces slender, 6-inch seed pods, each containing five to 10 ovular half-inch seeds.

How it spreads

Mimosa quickly succeeds in open, disturbed areas, reproducing by vegetative sprouts and by seed. Studies have revealed that this species produces very large amounts of seed, a common characteristic of invasive-exotic plants. Each individual tree is capable of producing as much as 8,000 seeds per year, and trees begin producing seed at an early age. Seeds are typically dispersed in close proximity to the parent plant; however, they can also be dispersed by wind and have the ability to travel up to 300 feet. Seeds can also be easily transported by water, and wildlife species that forage on seed also contribute to its movement. Successful germination of Mimosa seed requires seed scarification, a process that delays germination time and can allow seed to lie dormant in the soil for many years.

Mimosa trees produce slender, 6-inch seed pods. (Photo by Chuck Bargeron, University of Georgia, Bugwood.org)

Management

To help prevent the spread, do not plant Mimosa tree. Instead, select native alternatives, such as Red Buckeye (*Aesculus pavia*), Serviceberry (*Amelanchier arborea*), Carolina Silverbell (*Halesia carolina*), Eastern Redbud (*Cercis Canadensis*), Flowering Dogwood (*Cornus florida*) or Southern Sugar Maple (*Acer floridanum* or *A. barbatum*).

Mature trees can be controlled by cutting trees at ground level followed by herbicide treatment of stumps to eliminate and/or reduce sprouting. After initial treatment, sprouts can be removed with hand pruners or loppers followed by repeated herbicide application. Mimosa seedlings are easily controlled by hand-pulling, however, entire plants musts be removed or residual roots in the soil will likely regenerate new trees.

Contact information

If you would like more information on Mimosa tree, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Photo by Richard Gardner, Bugwood.org

MULTIFLORA ROSE

ROSA MULTIFLORA

Multiflora rose (*Rosa multiflora*) is a robust, multi-stemmed, deciduous shrub native to Japan that was first introduced to the eastern coast of the U.S. in 1866 as rootstock for ornamental roses. Multiflora rose was also favored as a garden ornamental that could be trained to grow on trellises, fences and other arbor structures. During 1930s it was widely planted in soil conservation and agriculture to serve as windbreaks and living farm fences to control livestock. In addition to its aesthetic qualities and use in erosion control, the fruits of multiflora rose are edible and are good nutritional sources of carotene, vitamin C and fatty acids. Multiflora rose and other rose species are currently being studied for their medicinal properties and link to cancer risk reduction.

Multiflora rose flowers are showy and white-pinkish with five petals. (Photo by Chris Evans, University of Illinois, Bugwood.org)

Identification

Multiflora rose is a very attractive, deciduous, thorny shrub that grows up to 15 feet tall. Rounded stems, also known as canes, are greenish-red in color, have an arching form and are covered in stiff, hooked thorns. Compound leaves are arranged pinnately (opposite each other along leaf axis), each having seven to nine obovate to elliptical-shaped leaflets with serrated margins, measuring 1 ½ inches long. Clusters of (0.4-0.6 inch) showy, white-pinkish flowers with five petals blossom from May through July. Small, red fruits, known as hips, are produced later on the plant and persist throughout winter. Several species of wildlife, especially birds, are known to consume the fruit. Multiflora rose is commonly found smothering neighboring trees, shrubs and other plants in a forest understory, enabling the plant to successfully ascend to greater heights and leverage a competitive advantage over a site.

How it spreads

Like many invasive-exotic plants, multiflora rose has prolific characteristics that aid in its successful growth, spread and dominance over a site, including a rapid growth rate and high adaptability to varying soil, moisture and light conditions. It forms very dense, nearly impenetrable thickets in forest openings, along forest edges and in agricultural pastures where it establishes. This creates a hindrance to movement of wildlife, livestock and humans and seriously displaces native plants. Multiflora rose is highly versatile and adaptable, able to successfully establish and spread on sites in both full sun and full shade as well as on sites of variable

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Photo by Richard Gardner, Bugwood.org

MULTIFLORA ROSE

ROSA MULTIFLORA

soil conditions. It can also tolerate growing near water, along creek banks, tolerate occasional flooding and can fare well amidst drought conditions. In addition, its robust, arching cane-like stems with hook-shaped thorns help thrust the plant to greater heights on a site which helps it outcompete other plants for resources. In addition, Multiflora rose is a heavy seed producer capable of producing 500,000 to 1 million seeds on one medium-sized shrub. Seed is widely disseminated by many bird and mammal species, adding to its difficulty in controlling.

Management

Multiflora rose has been favored as an ornamental garden plant, especially for its ability to be trained to grow on trellises, fencing and tree trunks. To help prevent the spread, do not plant multiflora rose. Instead, select native alternatives such as serviceberry (*Amelanchier arborea*), bottlebrush buckeye (*Aesculus parviflora*), oakleaf hydrangea (*Hydrangea quercifolia*) or Carolina allspice (*Calycanthus floridus*), among several others. Native flowering vines to plant include Carolina jessamine (*Gelsemium sempervirens*), crossvine (*Bignonia capreolata*), or passionflower (*Passiflora incarnata*).

Pulling and removing individual plants when they are small can be effective; however, entire root systems must be removed to avoid resprouting. In areas of densely established plant communities, cutting of individual plants is favored over mowing to minimize site disturbance. Herbicides have also been used for effective control; however, because of exceptional longevity of seed in soil banks, repeated applications are usually needed. For optimum success in control of larger stem resprouts, applying systemic herbicides to cut stems have been shown to be very effective, especially if applied during the late growing season.

Multiflora rose stems are covered in stiff, hooked thorns. (Photo by Chris Evans, University of Illinois, Bugwood.org)

Contact information

If you would like more information on multiflora rose, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Photo by John Ruter, University of Georgia, Bugwood.org

NANDINA

NANDINA DOMESTICA

Nandina is a small, semi-evergreen-to-evergreen shrub that is native to China and Japan. It earned the nicknames sacred bamboo and heavenly bamboo, due to its stout, upright form, unique cane-like stems and its stalk-like leaves. It was first introduced into the United States in 1804 as an ornamental plant and quickly became popular with homeowners and gardeners and the landscaping industry for its attractive bright red berries in the fall, pleasant white flower display in the spring and its lustrous, dark evergreen leaves.

Identification

Nandina is a small, upright shrub that grows up to 8 feet and has compound leaves. Each leaf has three 1- to 2-inch leaflets. The main stem of nandina has distinct, overlapping leaf sheaths, reminiscent of bamboo, hence the nickname, sacred bamboo. The bark on mature stems is light brown and has long, shallow, vertical furrows. Large panicles of attractive, tiny, white flowers bloom in spring. Each growing season nandina produces clusters of green berries that mature into attractive, vibrant red berries in the fall. The berries are considered toxic to animals, including livestock, cats, birds and likely some other domestic and wild animals, but they are non-toxic to humans. The berries contain plant compounds such as cyanide that break down to hydrogen cyanide, which is the toxic element present if ingested.

How it spreads

Nandina thrives in heavy shade and commonly invades riparian areas along creeks and rivers that offer ample shade and moist soils but can also survive in dappled sunlit areas. Nandina can also easily establish along forest edges and roadsides. It grows at a rapid rate and can quickly spread through vegetative sprouts, also known as sucker sprouts. Rhizomes, or false roots, are used to help quickly colonize an area, forming thick mats of new plant populations. Nandina habitually forms dense thickets where it establishes and successfully displaces many native plant species. Nandina plants produce large amounts of seed that are lightweight and easily transported by wind and water. Many species of wildlife facilitate its spread and move seed through consumption.

Management

To help prevent the spread, do not plant nandina. Instead, select native alternatives, such as red buckeye (*Aesculus pavia*), beautyberry (*Calicarpa Americana*), witch

Nandina produces green berries each growing season that turn red in the fall. (Photo by Chris Evans, University of Illinois, Bugwood.org)

Photo by John Ruter, University of Georgia, Bugwood.org

NANDINA

NANDINA DOMESTICA

quercifolia), possumhaw (*Ilex decidua*), or spicebush (*Lindera benzoin*). Other attractive, non-native alternative species include Fortune's tea olive (*Osmanthus x fortune*), fragrant tea olive (*Osmanthus fragrans*), azalea species (*Rhododendron spp.*), loropetalum white and red cultivars (*Loropetalum chinensis*), or doublefile viburnum (*Viburnum plicatum tomentosum*).

Although nandina is still commonly planted ornamentally, there are several sterile cultivars and hybrids available that do not produce seed or contribute to invasive spread. Some of the fruitless nandina cultivars with lovely spring flowering and attractive fall foliage include: Fire Power, Gulfstream, Nana Atropurpurea, Obsession, Woods Dwarf and Sienna Sunrise.

Non-sterile nandina plants already existing in the landscape should be removed, and residual stumps should be treated with herbicide, such as glyphosate or triclopyr, to prevent reproductive sprouting. When removing plants with seed present, extra care should

Each nandina leaf has three 1- to 2-inch leaflets. (Photo by James H. Miller, USDA Forest Service, Bugwood.org)

Tiny, white flowers bloom on nandinas each spring. (Photo by James H. Miller, USDA Forest Service, Bugwood.org)

be taken to ensure that all plant parts are disposed of properly and unintentional seed spread is avoided. After initial herbicidal treatment, subsequent sprouts can easily be removed with hand pruners followed by another herbicide application. Nandina seedlings that arise from suckers and rhizomes can be easily controlled by hand-pulling. However, entire plants musts be removed, or residual root fragments will likely regenerate new trees.

Contact information

If you would like more information on nandina, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Photo by Chris Evans, University of Illinois, Bugwood.org

NEPALESE BROWNTOP

MICROSTEGIUM VIMINEUM

Nepalese Browntop, *Microstegium vimineum*, commonly known as Japanese Stiltgrass, is an invasive-exotic grass species, native to Asia, and first noted in the U.S. in 1919. During the early twentieth century, it was commonly used as a porcelain packing material. It is highly shade-tolerant and flourishes in areas with moist soils, especially along creeks and rivers in forest floodplains and bottomland forests, but also inhabits forest margins, roadsides, ditches and other areas offering moist soils and ample shade.

Identification

Nepalese Browntop is a lush, sprawling annual grass with trailing stems that forms a dense groundcover on forest floors. It grows between 0.5 to 3.0 feet in height and has flat, short, pale-green leaves that are 3" in length, highlighted by a distinct silver stripe running down leaf center. Small, nondescript, flower spikes arise from the leaf axis near stem tips in late summer.

Nepalese Browntop leaves have a distinct silver stripe. (Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org)

How it spreads

Nepalese Browntop is extremely prolific and rapidly displaces many native plants, often successfully overtaking shaded areas. Like many invasive-exotic species, Nepalese Browntop is a heavy seed producer and colonizes communities by rooting new plants at stem nodes. As an annual grass species, its life cycle only extends through autumn, after which plants die. Nepalese Browntop is an aggressive seed producer with seed production capacity of 100 to 1,000 seeds per plant. Seeds accumulate in soil banks and can remain viable in the soil for up to five years. Infestations commonly occur along roadsides and trail edges and then spread progressively into forest understories. Although specific seed dispersal mechanisms are uncertain, a high amount of seed transport is likely attributed to surface runoff and the feet of animals. Spread may also be associated with heavy equipment and certain types of surface rock, such as shale, as small infestations have been observed along roads following disturbances caused by road construction and repair.

Managing Nepalese Browntop

In general, Nepalese Browntop is not considered difficult to control or suppress. However, suppression efforts are usually initiated after dense infestations have already established and seed has accumulated in abundance in the soil, making control more challenging. The key to successful control is reducing its spread by targeting established populations as early as possible. The smaller the population, the more successful the control efforts will be. Since this species is shallow-rooted, hand-pulling is very effective for managing recently established populations. Plants can then be bagged and disposed of off-site.

Mechanical control can be quite effective, but only if plants are cut at ground level. Herbicides have also been shown to be a very effective control method for Nepalese Browntop. There are several different herbicides, both pre-emergence and post-emergence, that are effective for combatting the spread this species. Management of Nepalese Browntop definitely requires persistence and often involves at least five years of annual treatment and attention. To avoid further spread, focus all control efforts during spring and summer months, when seed is not present on plants.

Contact information

If you would like more information on Nepalese Browntop, contact David Jenkins at the Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/. For information on how you can combat invasive plants in your community visit the South Carolina Exotic Pest Plant website at https://www.se-eppc.org/southcarolina/ or send an email to southcarolinaeppc@gmail.com.

Photo by Chris Evans, University of Illinois, Bugwood.org

PRIVET

CHINESE, EUROPEAN & JAPANESE

Chinese (*Ligustrum sinense*), European (*Ligustrum vulgare*) and Japanese (*Ligustrum japonicum*) privets are all listed as invasive-exotic species that threaten native South Carolina forests. These are semi-evergreen, multi-stemmed shrubs or small trees that can grow up to a height of 20 feet. *Ligustrum* sp. are native to China, parts of Europe and Japan, and were first introduced into the United States around 1909 for ornamental use as shrub borders, erosion control plantings and wildlife forage. Characteristic flowers of *Ligustrum* species are showy, panicles of tiny, creamy white flowers that are very fragrant and abundant in late spring through summer. Fruit produced are small, rounded dark-purple berries that persist throughout the winter, especially favored by birds.

Identification

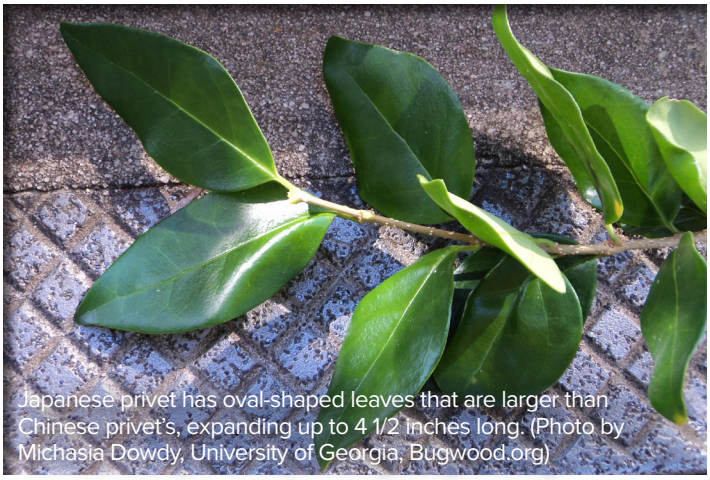
All three species of privet are similar, sharing common size, form, growth rate and habitat conditions. However, there are some distinct differences in the physical characteristics of the leaves, bark and mature size of each.

Chinese privet is a large, semi-evergreen shrub with small, oval-elliptical shaped leaves with a fleshy green texture and a bright green color. Leaves are the thinnest of all three privet species. Twigs and bark have a smooth texture and light-gray color with white blotches. This species is extremely aggressive and considered a very serious threat to native species in the Southeast. Chinese privet control and management can be very challenging to land managers due to its aggressive growth patterns, prolific root and stump sprouting nature, abundant seed production, and widespread dispersal by animals, particularly birds. Chinese privet forms dense thickets and can tolerate a range of light and soil moisture conditions, varying from forest understories and riparian forests to invasion of old fields and roadsides.

European privet is a large, semi-evergreen shrub that is commonly planted as an ornamental hedge. This species has

Chinese privet has small, oval-elliptical shaped leaves with a fleshy green texture and bright green color. (Photo by Chris Evans, University of Illinois, Bugwood.org)

European privet has lanceolate-shaped leaves that are thick, waxy and glossy. (Photo by Robert Vidéki, Doronicum Kft., Bugwood.org)



Japanese privet has oval-shaped leaves that are larger than Chinese privet's, expanding up to 4 1/2 inches long. (Photo by Michasia Dowdy, University of Georgia, Bugwood.org)

PRIVET

CHINESE, EUROPEAN & JAPANESE

lanceolate-shaped leaves that are thick, waxy and glossy in appearance. It is a multi-stemmed, fast-growing shrub with several long, leafy branches, and an average height of 15 feet. Twigs and bark have a brownish-gray appearance.

Japanese privet is a large, evergreen, multi-stemmed shrub or small tree with oval-shaped leaves that are larger than Chinese privet, expanding up to 4 ½ inches long and 2 inches wide. Also, the leaves of Japanese privet have a very glossy, thick and waxy texture in appearance, as compared to Chinese privet. Twigs and bark are greenish-brown to gray and have larger, more evident, surface pores for gas exchange, called lenticels. These appear as large, white dots.

How it spreads

Privet is widely disseminated by many birds and other wildlife species that consume the fruit. Historically, it was primarily shade-tolerant, however, it has since adapted to more light exposure and can establish successfully in sunnier locations. Dense populations of privet can be found in shady areas with moist soils, especially areas along creeks, rivers and streams, as this is a preferred habitat. Privet can be found in most areas of the state with differing soil moisture and light conditions and can quickly dominate the understory shrub layer of a forest, altering community structure through shading out herbaceous plants and reducing survival of tree seedlings.

Privet can be found in shady areas with moist soils and can quickly dominate the understory shrub layer of a forest. (Photo by David J. Moorhead, University of Georgia, Bugwood.org)

Managing privet

Do not plant Chinese, European or Japanese privet. Plant alternative native species instead, such as Red buckeye (*Aesculus pavia*), Bottlebrush buckeye (*Aesculus parviflora*), Beautyberry (*Callicarpa Americana*), Spice bush (*Lindera benzoin*), Oakleaf hydrangea (*Hydrangea quercifolia*) or native Azalea species (*Rhododendron spp.*).

Privet is difficult to control as it spreads aggressively through bird/animal seed dissemination and aggressively colonizes through root and stem sprouts/suckers.

Mechanical control of privet using hand tools, tree wrenches and heavy equipment are effective, especially when combined with foliar and/or stump herbicidal treatment.

Chemical treatment can also be effective control, especially effective on young plants that have not begun producing seed. Prescribed fire has not been shown to be an effective control method for privet.

Contact information

If you would like more information on Chinese, European or Japanese privet, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Spotted lanternfly nymphs crawl on a branch. (Photo by Eric R. Day, Virginia Polytechnic Institute and State University, Bugwood.org)

SPOTTED LANTERNFLY

LYCORMA DELICATULA

Overview

The spotted lanternfly, *Lycorma delicatula,* is a strikingly colored insect native to Southeast Asia where it has never been reported as a pest. In 2006 it was reported in Korea as a pest of fruit crops, particularly grapes. In 2014 it was reported in Pennsylvania and, as of the fall of 2018, has spread to three counties in New Jersey, two counties in New York and one county in Virginia. It is unusual in the distinction that it is one of very few fulgorid insects that is reported to be a pest. This has primarily been an agricultural pest, hitting grapes particularly hard. Feeding damage can cause the vine to die back. It is also reported to feed on a number of trees and causes weeping wounds, but it is not clear yet how this impacts tree health and probably depends on the species.

Adult spotted lanternflies are about an inch long. (Photo by Lawrence Barringer, Pennsylvania Department of Agriculture, Bugwood.org)

Hosts

Older nymphs and adults of the spotted lanternfly are attracted to tree of heaven, *Ailanthus altissima*. This exotic invasive tree is filled with toxins that protect the spotted lanternfly from predators. Younger nymphs have a very broad host range, including grapes and a number of fruit tree species and forest species.

Spotted lanternflies are attracted to tree of heaven. (Photo by Richard Gardner, Bugwood.org)

Signs/symptoms

This insect is a phloem-feeder, inserting its proboscis into the sap of the host trees. This feeding can result in weeping wounds that may attract ants, bees and wasps. In addition, the insects excrete copious amounts of excess sap to concentrate the nutrients. Sooty mold fungus

Spotted lanternfly nymphs crawl on a branch. (Photo by Eric R. Day, Virginia Polytechnic Institute and State University, Bugwood.org)

SPOTTED LANTERNFLY
LYCORMA DELICATULA

grows on these excretions. The spotted lanternfly is very gregarious, helping to spot infestations. The egg masses, usually laid on the bark of tree of heaven, can be laid on any smooth surface, including other smooth-barked species (e.g. maple or beech) or on non-animate objects, like vehicles or railway cars. The eggs are typically covered with a gray putty-like substance that hardens.

Life Cycle

Nymphs hatch from their eggs in early spring. Nymphs cannot fly and crawl to the nearest host. Adults begin to appear in June or July. Adults begin laying their eggs at the end of summer. Adults are poor fliers and move mainly by jumping.

Timeline

Eggs can be found from late summer to early spring. Adults and nymphs are active during the growing season.

Range

The spotted lanternfly is native to Vietnam, India and China, but has spread to Korea, Pennsylvania, New York, New Jersey and Virginia.

Management

Monitor for adults and egg masses on sentinel trees of tree of heaven. Removing most tree of heaven in a clump but leaving one that can be monitored is a good strategy. Egg masses can be manually removed. Because tree of heaven is dioecious (separate male and female trees) and an invasive, remove all female trees to reduce seed production. Sticky material, such as Tanglefoot, can be applied to the bark of the tree to intercept nymphs and adults. Infested trees can be treated with systemic insecticides to kill feeding nymphs and adults.

Spotted lanternfly egg masses are covered with a gray putty-like substance. (Photo by Emelie Swackhamer, Penn State University, Bugwood.org)

TALLOW TREE

TRIADICA SEBIFERA

Tallow tree, or popcorn tree, *Triadica sebifera*, has been in our country since its inception, with none other than Ben Franklin touting the virtues of this invasive tree. Like many invasive plants, it is often sold in nurseries and planted as an ornamental for its bright red autumn foliage and striking spikes of small yellow flowers. Although many beekeepers esteem the tallow tree as a wonderful honey plant, there are many native alternatives that you can plant instead to support bees. Tallow tree can survive low-light conditions, establishing in healthy forests with little trouble. The fallen foliage of tallow tree produces allelopathic chemicals that inhibit the growth of other plants. With its rapid growth, tremendous output of seed and chemical warfare with other plants, tallow tree turns healthy forests into monocultures.

Identification

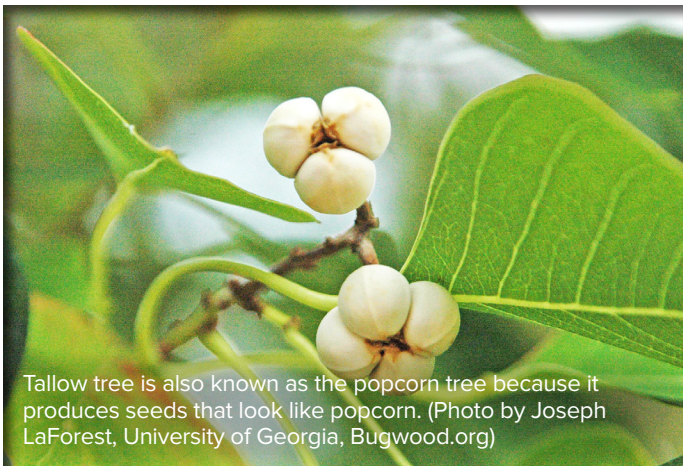
It is a deciduous tree reaching 60 feet in height at maturity. The leaves are deltoid-shaped with extended tips. Flowers are produced from April to June, and it produces drooping spikes about 20 cm (8 inches) long of small yellow flowers. In the fall its foliage turns bright red.

How it spreads

It is an early and prolific fruiter, producing thousands of seed within three years of establishment, and it can continue to bear seeds for up to 100 years. Birds transport some seeds, but water is the main way seeds are moved. Once a tallow tree is established along a stream, seeds will float downstream and colonize streambanks and riverbanks. Tallow tree is also a prodigious sprouter, producing suckers from cut stumps unless they are treated with an effective herbicide right after cutting.

Managing tallow tree

Don't plant tallow tree! Opt for a wonderful native, such as eastern redbud or red mulberry, which are also good bee trees! Cutting down tallow tree can result in stump sprouts and should be followed as soon as possible with an herbicide treatment applied to the fresh stump. Prescribed burns can exacerbate tallow tree infestations by opening up the canopy. If burning is used it should be followed by herbicide treatment.



Tallow tree is also known as the popcorn tree because it produces seeds that look like popcorn. (Photo by Joseph LaForest, University of Georgia, Bugwood.org)

Contact information

If you think you know of a tallow tree infestation, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

TREE OF HEAVEN

AILANTHUS ALTISSIMA

Female trees are prolific seed producers, producing as many as 300,000 seeds per year, which compounds this species' ability to replicate and spread aggressively. Seeds are extremely light-weight and are adorned with paper-thin wings, allowing easy wind dispersal.

In spite of its advantageous and prolific tendencies, Tree of Heaven tends to be a short-lived species, often surviving less than 50 years.

Management

To help prevent the spread, do not plant Tree of Heaven. Instead, select native alternatives, such as red buckeye (*Aesculus pavia*), musclewood (*Carpinus caroliniana*), Carolina silverbell (*Halesia carolina*), American holly (*Ilex opaca*), sassafras (*Sassafras albidum*) or Southern sugar maple (*Acer floridanum* or *A. barbatum*).

Tree of Heaven is very difficult to control, especially due to its aggressive re-sprouting ability, rapid growth and extensive root system. The key to controlling Tree of Heaven is controlling the root system. Hand pulling seedlings during moist soil conditions is effective as long as the entire root system is extracted. Any root fragments left behind in the soil are capable of quickly generating new plants.

Tree of Heaven leaves are bi-pinnately compound with a smooth edge and numerous leaflets. (Photo by Karan A. Rawlins, University of Georgia, Bugwood.org)

For control along roadsides, existing stems must be cut first and mowed regularly to prevent re-establishment. Regrowth from an established root system will be fast and furious, but new seedlings will be soft-wooded and can be mowed easily. It could take several years to completely deplete a firmly-established root system. One missed mowing cycle can allow sprouts to become too big to mow and successful control more challenging.

Several herbicides provide effective chemical control against Tree of Heaven, such as Triclopyr and Imazapyr, branded as Garlon 3A and Arsenol, respectively, among others. These herbicides are applied to leaves (foliar), stems and cut surfaces. For best results, apply herbicides during the growing season, between summer and fall. Foliar sprays are usually most effective and produce the best results. Basal bark sprays chemically girdle stems and are also effective when applied during the growing season to selected stems. However, basal bark sprays can be quite labor-intensive, especially when treating areas where Tree of Heaven is well-established with a high number of stems. Cut surface treatments are also an effective treatment method but are also considered to be quite laborious when treating in areas of dense populations.

In general, successful control will require repeated steps and ongoing maintenance to prevent re-establishing in an area.

Contact information

If you would like more information on Tree of Heaven, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Photo by Chris Evans, University of Illinois, Bugwood.org

VINCA VINE

PERIWINKLE (VINCA MAJOR, V. MINOR)

Vinca vine, also known as periwinkle, comes in two varieties, Vinca major and Vinca minor; both are evergreen perennials with a creeping habit. They are not to be confused with the annual flower that is also commonly called Vinca (*Catharanthus roseus*).

Both types of vinca vines have often been planted as an attractive groundcover for shady habitats, but they outcompete native plants. In shaded, moist areas with rich soil, Vinca major and Vinca minor will spread vigorously, sending rooting stems around or through other plants.

Identification

Periwinkles are running vines that form dense mats with glossy opposite leaves. The foliage is evergreen, persisting through the winter. It flowers in the spring, producing violet five-petaled pinwheel-like blossoms.

How it spreads

Periwinkles spread primarily as a creeping vine that stays on the ground. Although they can produce seed, the seeds are usually sterile.

Management

Do not plant vinca vine. Instead, plant native alternatives, such as yellow jessamine (*Gelsimium sempervirens*), Virginia creeper (*Parthenocissus quinquefolia*), or coral honeysuckle (*Lonicera sempervirens*) among many others. Vines should be uprooted from the soil. Herbicides can be applied year round, but are most effective when applied during the growing season.

Contact information

If you would like more information on periwinkles, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Periwinkles form dense mats of groundcover and outcompete native plants. (Nancy Loewenstein, Auburn University, Bugwood.org)

Photo by Chris Evans, University of Illinois, Bugwood.org

WILD OLIVE

AUTUMN, RUSSIAN & THORNY

There are three species of *Eleagnus* that are listed as invasive-exotic species that threaten native species of South Carolina forests, autumn olive (*Eleagnus umbellata*), Russian olive (*Eleagnus angustifolia*) and thorny olive (*Eleagnus pungens*). These are large, deciduous or evergreen shrubs or small trees of the Oleaster family, often referred to simply by their genus name, *Eleagnus*, as well as wild olive and Japanese silverberry. *Eleagnus* species are native to Asia and Europe and were introduced into the United States during the 19th century as ornamental plantings and cover for wildlife and erosion control. All three species of olive share similar physical characteristics of size, growth rate and habitat condition preferences; however, they differ slightly in physical appearance.

Identification

Autumn olive is an attractive, large, multi-stemmed, deciduous shrub or small, rambling tree that grows to a height of 10 to 16 feet. It is native to China, Japan and Korea and was first introduced into the United States from Japan in 1830 and was initially planted for restoration of former strip mine sites. It quickly became a popular ornamental selection and was planted extensively throughout the country in subsequent years. Later, autumn olive was planted as wildlife forage, cover for windbreaks and as a focus of beautification projects along highways.

Leaves are elliptical in shape, have a slightly wavy margin, and are arranged alternately along stems. The upper surfaces of leaves are lush green and dappled with a light coating of silvery-white scales. Conversely, leaf undersides luster with a shimmery coating of silvery-white scales. Young twigs are also wrapped with silvery scales that later fade to light brown and develop distinctive, sharp thorns that protrude from twigs and appear as spur branches. Clusters of tiny, red berries, which are also dotted with silvery scales, are produced in abundance each year. An attractive display of golden-yellow, fragrant, tubular-shaped flowers is also showcased each spring. Russian olive is a similar species; however, it is differentiated from autumn olive by its longer, slender, light green, lanceolate-shaped leaves and yellow fruits. These yellow fruits seldom ripen in its native region of Europe but are relished by birds in the U.S., which has aided in the plant's dissemination and cause for its successful escape from cultivation. Another distinctive difference between autumn olive and Russian olive are the silvery-scales found on both leaves and twigs of autumn olive but found solely on the leaves

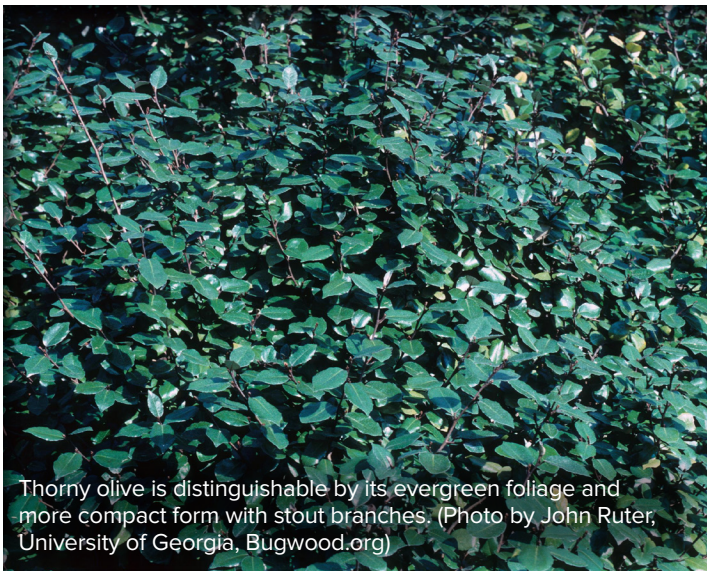
Autumn olive produces clusters of red berries that are dotted with silvery scales. (Photo by Pennsylvania Department of Conservation and Natural Resources - Forestry , Bugwood.org)

Russian olive has yellow fruit and slender, light green, lanceolate-shaped leaves. (Photo by John M. Randall, The Nature Conservancy, Bugwood.org)

Photo by Chris Evans, University of Illinois, Bugwood.org

WILD OLIVE

AUTUMN, RUSSIAN & THORNY



Thorny olive is distinguishable by its evergreen foliage and more compact form with stout branches. (Photo by John Ruter, University of Georgia, Bugwood.org)

Thorny olive is also similar to autumn olive; however, it is distinguishable by its evergreen foliage and more compact form with stout branches. The two species share common foliage and flower characteristics; nevertheless, thorny olive is noted for producing smaller, less frequent fruit crops, though autumn olive and Russian olive species are considered more aggressive seed producers.

How it spreads

Eleagnus is incredibly adaptable and extremely prolific, like many invasive exotic species. Its abundant seed production, rapid growth rate and adaptability to variable site conditions deliver a formidable advantage for this species that allow for quick, successful establishment and early domination on a site. *Eleagnus* also suppresses competition of nearby native plants through nitrogen fixation, an ability to alter the form of nitrogen in the soil and render it unavailable to other plants. It can thrive on sites offering full sun as well as partial shade and tends to fare well in both moist and dry conditions, varying soil pH levels of fairly acidic to strongly alkaline, and a multitude of soil types, ranging in composition from loam, to clay-loam, to sand and gravel. Once more, these species can tolerate soils with a higher than average salt content. Olive species can be found commonly inhabiting forest edges, fencerows and roadsides. They relish in riparian habitats and can swiftly seize open areas created by forest gaps and abandoned fields. Many wildlife species also contribute to the spread of *Eleagnus* through consumption of fruit.

Management

To help prevent the spread, do not plant autumn olive, Russian olive or thorny olive. Instead, select native alternatives, such as red buckeye (*Aesculus pavia*), serviceberry (*Amelanchier arborea*), American holly (*Ilex opaca*), eastern redbud (*Cercis Canadensis*), or flowering dogwood (*Cornus florida*).

Eleagnus saplings and trees should be cut down at ground level followed by a herbicide treatment of stumps to eliminate and/or reduce sprouting. After initial treatment, sprouts can be removed with hand pruners or loppers and subsequent herbicide application. *Eleagnus* seedlings are easily controlled by hand-pulling. However, entire plants musts be removed, or residual roots in the soil will likely regenerate new plants. Mowing and the use of prescribed fire have not been shown to be effective control methods, as resprouts will quickly arise from the root system of established plants.

Contact information

If you would like more information on *Eleagnus*, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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Photo by Wendy VanDyk Evans, Bugwood.org

CHINESE WISTERIA

WISTERIA SINENSIS

Chinese wisteria, *Wisteria sinensis*, is a long-lived woody vine that has been planted in North America as an ornamental. Although the blossoms are pretty and have a sweet smell, this vine is invasive and kills trees by girdling them. It can tolerate shade, but needs at least partial sun to flower.

Chinese wisteria produces blue or violet dangling racemes of flowers early in the spring.

Identification

Wisteria produces blue or violet dangling racemes of flowers early in the spring as foliage emerges. Foliage occurs alternately on the vine, each leaf compound with seven to 13 leaflets. The vine is woody.

How it spreads

Wisteria forms long vines that wind counterclockwise around tree trunks to move up into the canopy. Wisteria can also form runners along the ground surface. Seeds can be moved with flowing water to colonize downstream from an initial infestation.

Managing wisteria

Do not plant wisteria. Cut back vines as soon as they leaf out in the spring and continue doing so until the roots are depleted and are no longer able to produce vines or foliage. Application of herbicides such as triclopyr and glyphosate directly to cut tissue is also very effective.

Contact information

If you would like more information on wisteria, contact David Jenkins at the SC Forestry Commission at djenkins@scfc.gov or contact the Clemson Invasive Species Program at https://www.clemson.edu/public/regulatory/plant-protection/invasive/.

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