

A GUIDE FOR THE IDENTIFICATION AND MANAGEMENT OF INVASIVE PLANT SPECIES COMMON IN RIPARIAN AREAS OF EAST TENNESSEE

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What is an invasive species?

According to federal Executive Order 13112, an invasive species is one that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm, and in some cases harm to human health. Invasive plants spread rapidly and aggressively, shading and outcompeting other native plants, as they have no natural inhibitors or enemies in their invaded environment.

What is the difference between an invasive plant and a “weed”?

A “weed” is generally considered to be a plant that is undesirable where it is growing. Some plants considered to be weeds may be native, or otherwise not harmful to their surroundings, and are undesirable purely for aesthetic reasons. Dandelions are a common example of a weed because they don't necessarily pose a threat to their environment, but many find them aesthetically undesirable. A noxious weed is a plant designated by federal, state or local government that is harmful to public health, agriculture, recreation, wildlife or property. An invasive plant is one that grows aggressively outside its native range and significantly disrupts the ecology of an area. Many invasive plants are also considered to be noxious weeds. However, not all “weeds” are invasive or harmful and can be beneficial in supporting other native flora and fauna.

Why do invasive plants need to be managed in riparian areas?

Invasive plants pose a threat to riparian areas because of their ability to outcompete other native plants, which is detrimental to the integrity and biodiversity of a region. Native trees, shrubs, grasses, and forbs have evolved for millions of years to provide essential food and habitat for a variety of organisms both on land and in the water in their specific range. Invasive species outcompete native vegetation, and as a result reduce resources available to aquatic ecosystems. In addition, the moist and frequently disturbed soils of riparian zones often provide an ideal environment for invasive introduction, spread, and establishment.

Riparian forests are unique not only because of the numerous benefits they provide to their adjacent waterways and surrounding communities, but also because of their inherent connectivity to other stream ecosystems across the region. When a riparian forest is affected by invasive species, this reduces its ability to provide these services. This has impacts that reach far downstream and reduces the habitat quality and resilience of streams and rivers across the state.

The best defense against the spread of invasive plants are knowledgeable and informed citizens who act in managing their riparian areas. As land or homeowners with stream-side property, or as anyone who lives near a stream that is affected by invasive species, this guide will provide descriptions of common invasive plants that may be present, and resources available to help manage their spread and establishment.

List of invasive plants in riparian areas in Tennessee

Each invasive plant listed in this guide includes general characteristics and photos, a description of the ecological threat posed, and some common control methods. A QR code leading to the i-Naturalist page for each plant is provided for more detailed identification.

Information for each plant was gathered from the Tennessee Invasive Plant Council (TNIPC) or the US Invasive Plant Atlas. Some plants are not considered to be invasive in Tennessee according to the TNIPC, but still pose a potential risk due to their invasive status elsewhere in the US.

For further information on plant invasive plant identification and management, see other resources such as A Field Guide for the Identification of Invasive Plants in Southern Forests, <https://www.fs.usda.gov/research/treesearch/35292>, and A Management Guide for Invasive Plants in Southern Forests, <https://www.fs.usda.gov/research/treesearch/36915>.

Both can be downloaded for free on the US Forest Service's website.

About the CRRP:

The Community Riparian Restoration Program for Tennessee (CRRP) is a program operated through the UT Institute of Agriculture funded by the Tennessee Division of Forestry that aims to drive community involvement in riparian restoration through applied research. This is a multidisciplinary effort between the University of Tennessee's School of Natural Resources, Biosystems Engineering & Soil Science, Civil & Environmental Engineering, and Agricultural Leadership Education & Communication. The CRRP's work has focused on identifying watersheds that are in highest need for riparian restoration and implementing educational workshops, collecting data and creating publicly available resources related to riparian forest health and management across the state.

The information in this guide was compiled from data collection efforts completed in fall of 2022. Vegetation data was collected from 45 randomly selected riparian sites in the following ten East Tennessee counties: Bradley, Cumberland, Greene, Hamilton, Jefferson, Knox, Loudon, Roane, Sullivan and Washington. Vegetation was identified within the 30-foot buffer zone adjacent to each stream. This is not an exhaustive list of invasive plants that are present in riparian areas, but it may be helpful in identifying those that are likely to be impacting riparian areas.

For a full list of all invasive plants in Tennessee, visit tnipc.org.

For more about the CRRP, visit riparian.utk.edu.

References

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Invasive trees



Callery pear/ Bradford pear

Pyrus calleryana

Status: Established threat in Tennessee

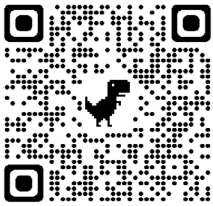
Ecological threat: Once established, Callery pear forms dense thickets that push out other plants including native species that can't tolerate the deep shade or compete with Callery pear for water, soil and space. A single tree can spread rapidly by seed and vegetative means forming a sizable patch within several years.



Description: Medium-sized deciduous tree, with pyramidal rounded crown shape up to 30 feet wide. Oval, glossy, alternately arranged leaves, finely toothed with wavy edges. Numerous white flower clusters appear in early spring, and often considered to have an unpleasant smell.

Control options: Seedlings can be pulled when soil is moist, ensuring that all roots are removed due to resprouting. A combination of glyphosate and triclopyr can be applied to foliage of small trees less than 10 feet tall (ideally smaller) ensuring to get good coverage when the trees are actively growing between May and October. Medium to large trees can be cut down, and glyphosate or triclopyr can be used for foliar spraying or basal bark application. Basal bark treatments, sprayed one to two feet from the soil line using triclopyr in basal oil, is an effective means of control. Cut stump and basal bark treatments can be used throughout the year when temperatures are not freezing.

Look-alikes: Callery pear looks similar to the native American basswood (*Tilia americana*) or apple trees (*Malus spp.*).



Paper mulberry

Broussonetia papyrifera

Status: Established invasive in Kentucky, reported in Tennessee

Ecological threat: Once established it grows vigorously, displacing native plants through competition and shading. If left unmanaged, paper mulberry can dominate a site. Its shallow root system makes it susceptible to blowing over during high winds, posing a hazard to people and causing slope erosion and further degradation of an area.

Description: Deciduous tree with milky sap with hairy reddish-brown twigs. Leaves are alternate and oppositely arranged, with 3-15 lobes on each leaf, with sharply toothed leaf margins. Separate male and female flowers appear in spring, and female trees produce reddish purple to orange-colored fruits.

Control options: Seedlings can be pulled when soil is moist, ensuring that all roots are removed and not resprout. A combination of glyphosate and triclopyr can be applied to foliage of small trees less than 10 feet tall ensuring good coverage when the trees are actively growing between May and October. Medium to large trees can be cut down, and stumps can be treated with glyphosate or triclopyr following cutting. Basal bark treatments one to two feet from the soil line up with triclopyr ester in basal oil are effective means of control. Cut stump and basal bark treatments can be applied when temps are not freezing throughout the year.

Look-alikes: Although paper mulberry is not a true mulberry (member of the genus *Morus*), there are species of mulberry that appear similar. Red mulberry (*Morus rubra*) is native to Tennessee, and white mulberry (*Morus alba*) is considered invasive in some eastern states.





Mimosa/silk tree

Albizia julibrissin

Status: Established threat in Tennessee

Ecological threat: Competes with native trees in open areas and forest edges. Produces dense stands that reduce sunlight and nutrients for other native plants.

Description: Small deciduous tree growing 10-50 feet in height, with small bi-pinnately compound leaves that resemble ferns. Flowering occurs in summer with bright pink fragrant flowers in groups at the ends of branches.

Control options: Hand-pull seedlings, making sure to remove all roots. Cutting regularly before seed set during flowering can help prevent spreading but must be repeated for resprouts to exhaust the reserves. Girdling is effective for larger trees. Glyphosate or triclopyr can be used for foliar spraying or basal bark application. Spraying can be most effective when trees are flowering using Transline (clopyralid) but will damage other legumes such as redbud and yellowwood in the vicinity.

Look-alikes: Due to its similar leaf pattern, mimosa can be confused with the native honey locust (*Gleditsia triacanthos*).



Tree of heaven

Ailanthus altissima

Status: Established threat in Tennessee

Ecological threat: This tree produces an overabundance of viable seeds that are wind-dispersed and readily germinate in spring reducing the ability of native trees and shrubs to establish. Tree of heaven also has the ability to form dense thickets by “suckering,” spreading roots that develop into cloned trees up to 50 feet away from the parent tree. Trees also produce allelopathic chemicals in leaves and roots that are released into the soil and harm surrounding plants.

Description: Deciduous tree that can reach heights of up to 80 feet with coarse, light gray bark resembling cantaloupe. Leaves are pinnately compound, with leaves up to 1-4 feet in length, with anywhere from 10-40 leaflets. The base of each leaflet contains a protruding bump on either side. Female trees produce seeds (1-2 inches long) in clusters at the end of branches. This tree is often called “Stinking sumac” because of the strong offensive smell from its flowers.

Control options: Seedlings can be pulled by hand while soil is moist before a taproot develops. Basal bark sprays while the tree is fully leafed out or application of herbicide around the base of the tree can be effective for smaller infestations and does not require cutting. A less labor-intensive method for Tree of Heaven removal is foliar spraying. Glyphosate, imazapyr, triclopyr and dicamba can be applied to the foliage in the summer to early fall when the leaves are grown and the tree is actively growing before the fall color change. This method is most effective on small trees, but drift can damage or kill other nearby plants. The cut stump method is also an effective means of control but requires the most labor by cutting the trees down and immediately applying imazapyr or triclopyr to the cut surface.

Look-alikes: Tree of heaven can be confused with other trees with opposite leaf arrangements, including black walnut (*Juglans nigra*) or smooth sumac (*Rhus glabra*). Tree of heaven can be distinguished because its leaves have smooth edges, and red stems.



Invasive grasses/herbaceous plants



Japanese stiltgrass
Microstegium vimineum



Status: Established threat in Tennessee

Ecological threat: This grass is especially well-adapted to low-light conditions and grows to form extensive and dense patches that displace other native grasses that are food sources for wildlife. Japanese stiltgrass also produces an overabundance of seeds, which can stay dormant in soil for up to three years.

Description: Stems form a dense mat, often 1-3 feet in height. Stems are thin and delicate and are supported by small stilt-like prop roots. Elongated blades have a silver stripe in the middle.

Control methods: Preventing the introduction of stiltgrass from infested to non-infested areas should be a priority. Early control of new infestations will also reduce the likelihood of establishment and expansion before seed set in the summer. Mowing of established grass before flowering will minimize the seeds deposited into the seedbank. Manual removal of plants results in unavoidable disturbance to the soil which can result in additional germination of stiltgrass seed. Pre-emergent herbicides such as trifluralin, prodiamine or pendimethalin can be used following removal of plants in order to prevent seeds from germinating. Pre-emergent herbicides must be applied 2-3 weeks prior to germination in early spring. Post-emergent herbicides such as glyphosate and glufosinate are effective when applied before seed set. Sethoxydim is a selective grass herbicide that can be used around non-grass plants.

Look-alikes: Virginia cutgrass (*Leersia virginica*), hairy jointgrass (*Arthraxon hispidus*), small carpet grass (*Arthraxon hispidus*) and possibly other delicate grasses and wildflowers like Pennsylvania knotweed (*Polygonum persicaria*).



Creeping Charlie/ground ivy
Glechoma hederacea

Status: Established invasive in Kentucky, reported in Tennessee

Scientific name: Glechoma hederacea

Ecological threat: Ground ivy is a vigorous grower that spreads across the ground forming dense patches that push out native plants. It is toxic to many vertebrates, including horses, if eaten in large quantities either fresh or in hay.

Description: Leaves are bright green, kidney shaped with scalloped edges. Plants grow in dense patches along the ground, producing small blue funnel-shaped flowers in the spring.

Control options: Once established, this plant is difficult to control because it is hard to remove all root and stolon fragments. Seed banks may also remain viable after control methods are used. Small patches can be pulled by hand or using a rake when the soil is damp, but all roots must be removed to be effective. Large infestations can be effectively controlled using herbicides such as glyphosate, 2,4-D, dicamba or triclopyr, but care must be taken to avoid drift to desirable plants. Herbicides should be applied when the weeds are actively growing either in the fall (sending stores to roots), in the spring (when plants are in bloom) or both. Sometimes multiple applications may be necessary, and it is best to alternate active ingredients. A rust fungus *Puccinia glechomatis* attacks ground ivy causing severe damage or death and may hold some potential for biological control.

Look-alikes: Similar in appearance to the native common blue violets (*Viola sororia*).





Creeping Jenny
Lysimachia nummularia

Status: Invasive in Kentucky, reported in Tennessee

Ecological threat: Grows in dense mats and reduces native herbaceous plant growth.

Leaves are rounded, slightly ruffled and green. Produces cup-shaped yellow flowers in the spring. Grows in a dense carpet along the forest floor.

Description: A low-growing perennial plant with smooth creeping multi-branched stems and oppositely arranged leaves. Leaves are small and round, resembling coins. Flowers are small and yellow and bloom from June to August.

Control options: Hand-dig plants in moist soil before flowering, making sure to remove all roots. Plants can also be sprayed with a glyphosate or 2,4-D herbicide when actively growing. Pull new plants every few weeks when new growth appears.



Johnson grass
Sorghum halepense

Status: Established threat in Tennessee

Ecological threat: Johnson grass is adapted to a wide variety of habitats including open forests, old fields, ditches and wetlands. It spreads aggressively through self-seeding and an extensive rhizome system, and it forms dense colonies which displace native vegetation and restrict tree seedling establishment. It also contains toxins that can harm livestock.

Description: Fast-growing perennial grass that can grow up to 7 feet tall. Leaf blades are 1-inch wide and can grow up to 2 feet long. Spreads easily through horizontal underground roots. Yellow/purple seeds are produced in fall.

Control options: Small patches can be hand-pulled, making sure to remove all root systems and burn the remains. Heavier infestations can be managed with persistent mowing, tilling and burning. Pre-emergent herbicides (dinitroanilines such as pendimethalin and prodiamine) can be applied in the spring to prevent seeds from germinating. To control rhizomes, glyphosate, monosodium methyl arsonate (used in bermudagrass and tall fescue), sulfonyleurea herbicides (used in bermudagrass and bahiagrass) and imazapic (used in bermudagrass) can be applied in the fall as post-emergent herbicides to control the rhizomes.

Look-alikes: Johnson grass resembles a variety of other native grasses but can be identified by its egg-shaped, dark brown seeds. In the absence of seed heads, Johnson grass can be identified with its prominent white mid-vein.





Japanese clover
Kummerowia striata

Status: Established invasive in Kentucky, reported in Tennessee

Ecological threat: This plant is used for ground cover but can quickly become invasive and crowd out native plant species.

Description: Dark green trifoliate leaves with wiry stems that grow in patches along the ground. Small pink flowers produced in summer.

Control options: Hand-pulling, cutting and mowing can be effective. Pre-emergent herbicides such as dithiopyr provide excellent control prior to germination if applied in the early spring before soil temperatures reach the 50+ F. Atrazine, dicamba, metsulfuron, simazine, triclopyr + clopyralid, or quinclorac + 2,4-D + dicamba + sulfentrazone can all be applied as post-emergent herbicides when the weed is actively growing, but use with caution to prevent damage to surrounding broadleaf plants. Utilizing multiple modes of action is recommended for better control and resistance management.



Garlic mustard
Alliaria petiolata

Status: Established threat in Tennessee

Ecological threat: Garlic mustard is an aggressive invader of wooded areas throughout the eastern and middle United States. A high shade tolerance allows this plant to invade high-quality, mature woodlands, where it can form dense stands. These stands not only shade out native understory flora but also produce allelopathic compounds that inhibit seed germination of other species.

Description: Biennial ground-covering forb with large-toothed, round, kidney-shaped or triangular leaves. Small white flowers grow in clusters at the end of stems and bloom in late April to May. Garlic mustard can be recognized by a pungent garlic odor emitting from leaves when crushed.

Control options: Hand-pulling is effective with small populations of garlic mustard, ensuring that soil is moist to encourage full root extraction. Hand-pulling is effective most times of the year and may have to be repeated to discourage reseeding. For larger infestations, cutting can also be used when stems are flowering, repeating until seedbank is exhausted. Post-emergent herbicides work best when applied to actively growing plants while still young and effective products contain 2,4-D, triclopyr, glyphosate, imazapic and metsulfuron.

Look-alikes: Garlic mustard can be confused with the native mountain sweet cecily (*Osmorhiza berteroi*).





Bitter dock
Rumex obtusifolius

Status: Established invasive in Oregon, reported in Tennessee

Ecological threat: Grows rapidly in areas dominated by native species. Host to a number of plant pathogens and nematodes.

Description: Perennial ground-covering plant with a heart-shaped basal leaves, red stems, and coarsely scalloped around the edges. Long clusters of yellow-green flowers that eventually turn red.

Control options: Hand-pulling or plowing can help reduce the spread of bitter dock if done before they go to seed. Complete infestation removal requires both hand-pulling and herbicide treatment. Use of isoxaben as a pre-emergent herbicide before seed germination can be an effective management tactic to diminish the weed seed bank. Post-emergent herbicides are most effective when applied while plants are actively growing and young. Effective post-emergent herbicides include 2,4-D, atrazine, chlorsulfuron, clopyralid, MCPA, mecoprop and triclopyr.



Invasive vines

Japanese honeysuckle
Lonicera japonica

Status: Established threat in Tennessee

Ecological threat: Japanese honeysuckle is a fast-growing vine that twines around stems of shrubs, herbaceous plants and other vertical supports. In full sun it forms large tangles that smother and kill vegetation. It can kill shrubs and saplings by girdling.

Description: Semi-deciduous twining vine with opposite ovate leaves. Bi-lobed flowers produced in spring that turn from white to yellow. Small black fruits produced in fall.

Control methods: Small infestations can be controlled by hand removal of vines. Prescribed burning of infested areas can greatly diminish overgrown areas for better chemical penetration and control. Mowing twice or more per year or treatment with systemic herbicides like those containing glyphosate or triclopyr are also effective. Glyphosate can be applied when surrounding vegetation is dormant in the fall before freezing temperatures are reached, in order to avoid damage to other surrounding plants. Triclopyr + 2,4-D (Crossbow) may also be applied during the same conditions, but be aware of causing damage to surrounding broadleaf plants. Mowing or cutting plus herbicide treatment is also an effective management tactic.





Winter creeper
Euonymus fortunei

Status: Established threat in Tennessee

Ecologic threat: Winter creeper is a vigorous vine that invades forest openings and margins. It can climb, but it grows extensively across the ground, displacing herbaceous plants and seedlings and climbing trees high into the tree canopy by clinging to the bark. Forest openings, caused by wind, insects or fire are especially vulnerable to invasion.

Description: Evergreen woody vine, with opposite glossy dark green leaves with light-colored veins. Flowers are small and green with 5 petals, and fruits are small, pink-red and round. Winter creeper can be found climbing tree trunks but more commonly covering the ground.

Control methods: Hand-pulling can be effective if roots are removed and is effective most times of the year — but especially when soil is damp. Mowing without smothering or herbicide application directly following may encourage more rampant growth. Large-diameter vines greater than a quarter inch in diameter can be treated with a glyphosate solution, or leaves can be sprayed with a triclopyr solution in April-May. Damaging leaves prior to herbicide treatment, such as with a string trimmer, can improve control.



Porcelain berry
Ampelopsis brevipedunculata

Status: Emerging threat in Tennessee

Ecological threat: This fast-growing vine clings to trees and shrubs inhibiting their growth, increasing their susceptibility to damage and reducing light penetration to the understory.

Description: Woody climbing vine with simple alternate heart-shaped leaves. The undersides of the leaves have small hairs. Fruit appears in fall and are a variety of colors including blue, purple, green and pink, with white flesh.

Control methods: Hand-pulling can be effective if roots are completely removed and is effective most times of the year. Vines can be cut and treated with a > 50 percent solution of glyphosate. A basal bark treatment of triclopyr mixed with oil and applied from the ground up to twelve inches on the base of the stem during the fall can avoid damage to surrounding vegetation. A foliar application of triclopyr or triclopyr + 2,4-D (Crossbow) in the growing season is also effective.

Look-alikes: Porcelain berry can often be confused with a variety of native grapes, including riverbank grape (*Vitis riparia*).





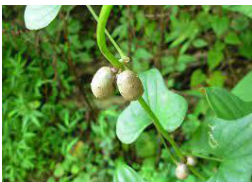
Chinese clematis
Clematis terniflora

Status: Established threat in Tennessee

Ecological threat: This species is found invading forest edges, rights-of-way and urban areas along streams and roads. It grows vigorously over other vegetation, forming dense blankets that block sunlight to the plants underneath. In late summer, infestations are conspicuous as a result of its abundant showy white flowers.

Description: Deciduous perennial woody vine with oppositely arranged leaves with three to seven leaflets. Flowers are yellow-green, and seeds are wispy, white, round clusters.

Control methods: Small populations can be hand-pulled, ensuring tuberous roots are fully removed and burned. Consistent mowing to reduce energy stores in the tubers will eventually kill the vines after years of treatment. Glyphosate is effective at killing the aboveground foliage but should be applied before bulbils are formed. Crossbow (2,4-D + triclopyr) can be applied to foliage.



Chinese yam
Dioscorea oppositifolia

Status: Established threat in Tennessee

Ecological threat: This vine grows rapidly to shade out and kill native plants in disturbed sites.

Description: Vine with slender, pointed, heart-shaped leaves with indents on the side. Vines are slender and spiral counterclockwise. Air tubers (look like small potatoes) appear in summer. Small green-yellow flowers in spring.

Control methods: Small populations can be hand-pulled, ensuring tuberous roots are fully removed and burned. Consistent mowing to reduce energy stores in the tubers will eventually kill the vines after years of treatment. Glyphosate is effective at killing the above ground foliage but should be applied before bulbils are formed. Crossbow (2,4-D + triclopyr) can be applied to foliage.

Look-alikes: Chinese yam looks very similar to air potato (*Dioscorea bulbifera*), which is not native to the United States but is not harmful or invasive.





Kudzu
Pueraria montana var. lobata

Status: Established threat in Tennessee

Ecological threat: Its vigorous growth and large leaves smother and shade out native plants including trees. It can also kill trees through girdling, and the extra weight of vines can lead to toppling during storms. Once established, kudzu plants grow rapidly, extending as much as sixty feet per season, about 1 foot per day. One of the most pervasive vines in the southeastern United States.

Description: Semi-woody vine with alternating leaves consisting of oval-shaped or lobed leaflets. Purple or red flowers are produced after 3 years.

Control methods: Do not plant kudzu. The US Department of Agriculture is investigating biological control agents for kudzu, including the naturally occurring fungus *Myrothecium verrucaria*. For successful long-term control of kudzu, the extensive root system must be destroyed. Any remaining root crowns can lead to reinfestation of an area. Mechanical methods include repeated cutting of vines just above ground level, frequent mowing, grazing and cultivation. Use of systemic herbicides with the active ingredients triclopyr and glyphosate have been used effectively when the leaves are fully expanded in the summer and early fall. Several applications may be needed for the foliar treatment method. The cut stump method is very effective and much easier to accomplish in the early spring before leaf set. Both glyphosate and triclopyr can be applied to the cut stumps.



Oriental bittersweet
Celastrus orbiculatus

Status: Established threat in Tennessee

Ecological threat: Oriental bittersweet is a vigorous growing plant that threatens native vegetation from the ground to the canopy level. Thick masses of vines sprawl over shrubs, small trees and other plants, producing dense shade that weakens and kills them. Shrubs and trees can be killed by girdling and by uprooting as a result of excessive weight of the vines.

Description: Deciduous woody vine with round alternate glossy leaves with serrated edges. Clusters of small green flowers and green-yellow fruits in late spring.

Control methods: Hand-pulling can be effective for small infestations. For vines affecting native trees, cut vines from the bottom to kill upper portions, and remove from tree while minimizing damage to bark. Whenever possible (except during the heavy sap flow in the spring) and especially for vines climbing up trees or buildings, a combination of cutting followed by application of concentrated systemic herbicide (glyphosate or triclopyr) to rooted, living cut surfaces is the most effective approach. For large infestations spanning extensive areas of ground, a foliar application of triclopyr may be the best choice rather than manual or mechanical means, which could result in soil disturbance. Seedlings can be hand-pulled or mowed and vines cut by hand. Plants can be dug up entirely and burned. Vines will regrow if not completely removed or constantly mowed. Triclopyr can be applied to the foliage, basal bark or cut stump method. Glyphosate solution can be used in the cut stump treatment as well.

Look-alikes: Often confused for American bittersweet (*Celastrus scandens*).



Invasive shrubs



Amur bush honeysuckle

Lonicera maackii

Status: Established threat in Tennessee

Ecological threat: One of the most common and pervasive invasive species in Tennessee. Grows in extremely dense thickets and prevents reforestation of disturbed areas; shades out native species.

Description: Upright, deciduous shrub, can grow up to 15-20 feet high. Leaves are opposite ovate with tapered tip. Produces small white-yellow flowers in spring and bright red berries in late summer.

Control methods: Young plants can be pulled by hand, larger plants either pulled using weed wrench-type tools or cut repeatedly. Systemic herbicides containing glyphosate, triclopyr or 2,4-D + triclopyr can be applied to foliage when leaves are green. To avoid damage to other vegetation, use foliar application of glyphosate when leaves emerge in early spring, or in late fall when other deciduous plants are dormant. Other management options include cut stump herbicide treatment, another effective means of control when applied in the late summer or early fall. 2,4-D + triclopyr and a diesel fuel or oil-based carrier works best when applied to the cut stump top and sides. A basal spray application to the lower 12 inches of the stems to the soil line applied during the late fall or winter (for ease of application due to heavy canopy) using 2,4-D + triclopyr and a basal oil is also an effective means of control.



Chinese privet

Ligustrum sinense

Status: Established threat in Tennessee

Ecological threat: Forms dense thickets in disturbed areas; reduces growth of understory trees, shrubs and grasses.

Description: Semi-evergreen shrub that can grow up to 20 feet high. Small opposite oblong leaves. Produces clusters of white cream flowers in spring and round dark blue fruits in the fall.

Control methods: Hand-pulling can be helpful for small seedlings and saplings. Large shrubs can be hand-cut and treated with foliar, cut stump, and basal bark herbicide treatments. Always read and follow the herbicide label, paying attention to site and rate restrictions and safety recommendations for applicators. Glyphosate is recommended as an effective foliar herbicide for privet (a concentrate with > 41 percent active ingredient) when applied in the late fall or early spring when other vegetation is dormant. For cut stump applications (triclopyr amine), Remedy Ultra (triclopyr ester) and glyphosate work best when applied after cutting. This can be coupled with mulching as well.

For basal bark applications, apply a herbicide and basal oil to the lower 12 inches of the stem or trunk.

Remedy Ultra (*Triclopyr ester*) basal bark applications work slowly.





Multiflora rose

Rosa multiflora

Status: Established threat in Tennessee



Ecological threat: Due to its thorns, it forms impenetrable thickets that restrict human and wildlife movement and shades out other native species.

Description: Perennial shrub that can grow up to 15 feet high in dense thickets, with alternate pinnately compound leaves with serrated edges. Stems are round with curved thorns. Flowers are white to light pink in the spring, and red fruits are produced in fall through the winter.

Control methods: Individual plants can be pulled using a root extraction tool. Pulled plants should be gathered and burned to prevent re-establishment. Mowing can also be effective if done consistently during the growing season for multiple years on at most a 4-inch cutting height. Many herbicides have been proven effective when applied to the foliage in the late spring or when early or mid-flower is emerging. Herbicides containing the active ingredients dicamba, 2,4-D, Metsulfuron, glyphosate, triclopyr or imazapyr are effective. For resistance management and best control, it is recommended to use a product mixture of metsulfuron + dicamba + 2,4-D (Cimarron Max) to utilize different modes of action.

Look-alikes: Multiflora rose is often confused with Allegheny blackberry (*Rubus allegheniensis*), a native shrub to Tennessee, because of its similar leaf and flower patterns and thorns.



Chinese bush clover

Lespedeza cuneata

Status: Established threat in Tennessee

Ecological threat: Once established, it out competes and displaces native plants and forms extensive monocultures. High tannin content makes it inedible to livestock and wildlife.

Description: Perennial herbaceous shrub growing 3-5 feet high, with stems that consist of sharp flattened bristles. Leaves are numerous and small, oblong and pointed. Flowers are small and creamy white to pale yellow with central purple spots.

Control methods: Do not plant Chinese lespedeza. Hand-pulling is impractical due to lespedeza's extensive perennial root system. Mowing plants in the flowering stage for two or three consecutive years may help control it. Plants should be cut as low as possible. Systemic herbicides can be effective when applied early to mid-summer when plants are actively growing. Triclopyr + fluroxypyr (PastureGard) is very effective when applied to 12-inch plants or larger.





Rose of Sharon

Hibiscus syriacus

Status: Established invasive in Kentucky, reported in Tennessee

Ecological threat: Despite being prized for its large showy flowers, extremely fast growing due to its extensive root system and seed dispersal that easily takes over disturbed sites.

Description: Deciduous multi-stemmed shrub reaching up to 10 feet in height. Oval-shaped leaves, 2-3 inches long with 3 lobes. Large ornate 5 petal flowers ranging from white to reddish purple.

Control methods: Pull or dig seedlings with a diameter of less than 1 inch from the roots as early as possible to prevent spreading. Larger shrubs can be removed with an uprooting tool. If the shrub cannot be removed, cut as much as possible and treat with a high concentration glyphosate solution (> 41 percent active ingredient) on the cut stump. Constant pruning of regrowth on non-treated stumps will eventually starve and kill the plant after multiple seasons.



Glossary

Basal bark application: An oil soluble herbicide is mixed with an oil carrier instead of water and applied directly to the bark of plants with a stem less than 6 inches in diameter. Can be used on trees, large woody vines and shrubs; is often most effective in late fall.

Cut stump: Control method for woody vegetation combining mechanical and chemical controls. Invasive plants are cut down to stumps, and treatments are applied directly to exposed stump. This method can be done any time of year, but late fall is often easiest logistically as other plants are dormant.

Foliar spraying: Applying herbicide directly to the leaves of invasive plants. Must be applied when plant is fully leafed out and is best to apply while other desirable native plants are dormant, such as in late fall or early spring.

Introduced: An introduced species, often termed 'exotic', is one that exists outside of its natural range, and are often present as a result of human activity, either directly or indirectly.

Native: When describing plants, 'native' indicates those that originate from a particular region, and occur naturally there without human introduction or dispersal.

Noxious: Describing plants that have been deemed to be physically harmful to public health, agriculture, wildlife, recreation or property.

Riparian: Pertaining to anything on or relating to a river bank.

Riparian Area: A riparian area, or zone, is a pronounced land feature that acts as a transitional area between land and water. Riparian areas experience both standing water and extremely moist soils during some parts of the year, but can also experience pronounced levels of drought. The size and extent of the riparian zone varies depending on the size of the waterway, and local geology and hydrology.



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