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TECHNOLOGY TRANSFER

NEW INVADERS OF THE SOUTHEAST

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The Forest Health Technology Enterprise Team (FHTET) was created in 1995 by the Deputy Chief for State and Private Forestry, USDA, Forest Service, to develop and deliver technologies to protect and improve the health of American forests. FHTET became Forest Health Assessment and Applied Sciences Team (FHAAST) in 2016. This booklet was published by FHAAST as part of the technology transfer series.

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Cover photos: a. *Aristolochia elegans* infestation (Forest & Kim Starr, Starr Environmental); b. *A. elegans* flower (Forest & Kim Starr, Starr Environmental); c. *Spiraea thunbergii* flower (Аимаина хикари); d. *S. thunbergii* infestation (Kenpei); e. *Sphagneticola trilobata* infestation (Forest & Kim Starr, Starr Environmental); f. *S. trilobata* inflorescence (Dan Clark, USDA National Park Service, bugwood.org); g. *Liriope muscari* flower (Denis.prévôt); h. *L. muscari* infestation (David J. Stang)

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NEW INVADERS OF THE SOUTHEAST

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About This Field Guide

The purpose of this guide is to help landowners and land managers recognize new invasive plants that are not yet widely distributed, so they can be treated rapidly and eradicated rather than becoming large and expensive problems. Invasive plants are a major concern worldwide. They displace native species, decrease forage and agricultural production, alter soil nutrient and water cycling, and lower the aesthetic value of natural areas. With the increase of world travel, exotic plant introductions are on the rise.

Not all newly introduced species become invasive. Those which do often follow an invasion pattern; they remain at low levels for several years or decades (lag phase) and then enter a phase where they increase dramatically. Attempting to control large invasive plant infestations is a costly endeavor; it is much more cost effective to allocate resources toward invasive plant prevention or the rapid treatment of new introductions. Unfortunately, the process of adding newly introduced species to watch lists or control lists is frequently tedious and lengthy. By the time many invasive species are on the radar, they have become widely established.

This guide focuses on species considered potentially problematic in the 13 states that comprise the southeastern United States: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia. Not all species included herein will be problematic in all portions of this region, and species restricted to southern Florida (where the climatic conditions differ significantly from all other southeastern USA states) have been omitted.

The species in this guide were selected through a multi-step process by:

1. First combining the noxious weed, watch, and new invader lists/alerts of southeastern states and regional exotic plant councils
2. Adding species with high ecological impact ratings as assigned by the NatureServe and state and regional exotic plant councils
3. Identifying which of the above species are not yet widespread throughout southeastern North America
4. Eliciting the opinions of numerous state and regional invasive plant experts to narrow the candidate list to those present in this guide

It was not possible to include all new species of concern, but this manual will hopefully serve as a good starting point. The plants included herein are arranged first by flower color, and then grouped with related species progressing from grasses through forbs, vines, shrubs, and trees. Aquatic plants are given their own section. Non-flowering terrestrial plants are included in the green flower section; non-

flowering aquatic plants are included in the aquatic section. Select definitions of plant terms are included in the glossary. For more in-depth explanations of plant parts and plant life cycles, or for more help with plant identification, please see the suggested references listed at the end of this guide. **Additional references are also provided for guidebooks and websites with identification information on other, more established invasive plants in the Southeast.**

Each plant is represented by multiple photos and descriptions emphasizing key identification traits and ways to distinguish it from look-alike species. Attempts were made to utilize the most current scientific names for all invasive plants. The GRIN (Germplasm Resources Information Network), GBIF (Global Biodiversity Information Facility), databases and ITIS (Integrated Taxonomic Information System) were largely followed in this regard, with input from taxonomists and other sources. Please note the scientific names for many species have changed since previous invasive plant publications.

Plant distribution data is presented in a map for each species. This information was sourced from the Early Detection & Distribution Mapping System (EDDMapS, www.eddmaps.org). Distribution information was also provided by individuals and recent invasive plant alert reports. Counties where the invasive plant has been documented are colored red. Some documented populations of invasive plants have since been eradicated. The locations of these populations are still included in the distribution maps because it is possible some plants, seeds, or propagules survived. Invasive plant spread is often rapid. Even if an invasive plant is not depicted as occurring in a specific region, it could have spread into that region since the collection of distribution information presented herein. Particular care should be taken searching for species in areas surrounding known infestations, as invasive plant spread into nearby areas is likely.

If You Find a New Invader

Should you find one of the species listed in this manual in a new region (or a species you believe to be a new invader), notify your local invasive plant authority immediately (e.g. your county weed superintendent or state department of agriculture), and devise a treatment plan to eradicate the infestation as promptly as possible. The infestation should also be mapped and submitted to the EDDMapS database. For more information on how to utilize or contribute to the EDDMapS tools, visit www.eddmaps.org/about/ and apps.bugwood.org/.

Invasive Plant Regulations

Some species in this guide are listed as noxious, prohibited, or restricted within a state(s). Where applicable, this information is included in a special section on the species' description page. Regulations pertaining to these designations are given in the table below. This table is for informational purposes only and should not be interpreted as complete, nor should it be considered legally binding. Coordination with your state plant regulatory agency is recommended to stay up-to-date on revised regulations for any species included in this guide.

State	Designation	Definition
Alabama (AL)	Noxious	Species for which the movement of any living stage, including but not limited to, seeds and productive parts or subdivision of a kind, into or within Alabama is prohibited.
Arkansas (AR)	Noxious	Species for which the transportation, distribution, or sale within the state is prohibited.
Florida (FL)	Noxious	Species for which it is unlawful to introduce, possess, move, sell or release any living stage, including but not limited to, seeds and productive parts or subdivision of a kind, into or within the state of Florida, except under permit issued by the department or the USDA.
	Prohibited Aquatic Plant	Aquatic species for which possession, collection, transportation, cultivation, and importation are not permitted.
Georgia (GA)	Noxious	Plants listed on the Federal Noxious Weed List are prohibited from sale or distribution in Georgia. Noxious weed seeds are also prohibited as contaminants in agricultural or vegetable seed for planting purposes.
Kentucky (KY)	Noxious	Seed which contains in excess of a pre-determined limitation of noxious weed seeds per pound (limitations based on species) is prohibited from sale in Kentucky. Some additional species require eradication and control by the Kentucky Highway Department.
Louisiana (LA)	Noxious	Seed which contains in excess of a pre-determined limitation of noxious weed seeds per pound (limitations based on species) is prohibited from sale.
Mississippi (MS)	Noxious	Plant species for which the sale, distribution or movement into and within Mississippi is prohibited, except under special permit for research purposes.
	Prohibited Aquatic Weed	Aquatic plant species for which sales and distribution are prohibited in Mississippi.

State	Designation	Definition
North Carolina (NC)	A	Movement of all Class A noxious weeds into or within all portions of North Carolina is prohibited. Sale of these species is prohibited.
	B	Movement of all Class B noxious weeds is prohibited in select counties in North Carolina. Sale of these species is prohibited.
	C	Movement of the single Class C noxious weed species is prohibited in select counties. Sale of this species may be permitted in select quarantined counties in North Carolina.
	Aquatic Noxious Weeds	Aquatic weed species for which the movement, control, and eradication are subject to state regulations.
Oklahoma (OK)	Noxious	It is unlawful to sell, offer for sale, or expose for sale any agricultural or vegetable seed in Oklahoma if the noxious weed seed per pound is in excess of pre-determined limitations. There is no tolerance applied to seed for select noxious weed species.
	Prohibited Aquatic Noxious Plant	A person shall not knowingly propagate, sell, or offer for sale any aquatic noxious plant.
South Carolina (SC)	Noxious	Species for which the importation into South Carolina, or the sale or distribution within the state is prohibited.
Tennessee (TN)	Noxious	Species which are illegal to be propagated, sold, offered for sale, or released within the state.
Texas (TX)	Noxious	Species for which it is an offense to sell, distribute or import into Texas, unless permitted by the Texas Parks and Wildlife Department or the Texas Department of Agriculture. It is also unlawful to sell, offer for sale, or expose for sale any agricultural or vegetable seed for planting purposes in Texas containing noxious weed seed in excess of pre-determined limitations.
Virginia (VA)	Noxious (State-Listed)	The movement of any state-listed noxious weed or any article or means of conveyance known to be infested or determined by an inspector to present a risk of spreading a listed noxious weed is prohibited, unless accompanied by a valid certificate or limited permit.
	Noxious (County-Option)	It is at the discretion of individual counties whether county-option noxious weeds shall be regulated at the same level as state-listed weeds.

Big blue lilyturf & Creeping liriope

Liriope muscari (Decne.) L.H. Bailey & *L. spicata* (Thunb.) Lour.

Big blue lilyturf a. plants; b. variegated leaves; c. inflorescences emerging from non-variegated leaves (a. James H. Miller, Forest Service, bugwood.org; b. Forest & Kim Starr, Starr Environmental; c. Syrio)

Creeping liriope d. plant; e. variegated leaves; f. inflorescences tucked among non-variegated leaves (d,f. Forest & Kim Starr, Starr Environmental; e. Denis.prévôt)

SYNONYMS: Big blue lilyturf **(BL)**: monkeygrass, border grass; Creeping liriope **(CL)**: creeping lilyturf, lily turf, *Liriope spicatum* (Thunb.) Lour.

ORIGIN: East Asia (both species)

GROWTH TRAITS: Both species are grass-like perennials with spreading root systems that produce small, scattered, fleshy, and peanut-shaped corms. Leaves are long, narrow, arching, and flat with smooth margins. Numerous cultivars of both species are available, with foliage ranging from deep glossy green to variegated white and green. The foliage of both species is evergreen in warm climates, but dies back in areas with cold winters. Bluish-purple to whitish flowers appear on narrow spikes in summer, giving way to small green berry-like fruits that turn black with maturity in the fall and winter. **BL** has stolons and short rhizomes. It grows up to 18" (45 cm) tall with leaves up to 1" (2.5 cm) wide. Inflorescences typically extend beyond leaves. **CL** has longer rhizomes, allowing it to spread more aggressively. It grows up to 15" (38 cm) tall with leaves up to 0.25" (0.6 cm) wide. Inflorescences are typically obscured by the arching leaves.

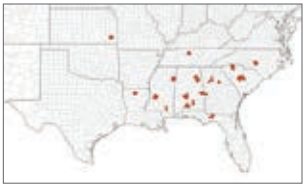
REPRODUCTION: Both species spread by seed, rhizomes, and corms. The rhizomes of **CL** are more extensive. The seeds of both species may remain viable for over 10 years under some conditions.

HABITAT: Both species tolerate a wide range of light and soil conditions, as well as heat, humidity, and drought. Both grow best in moist, fertile soil in partial shade.

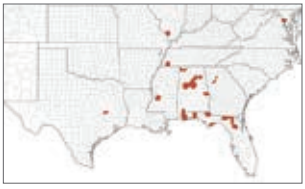
LOOK-ALIKES: The combination of clumped growth, long flat grass-like leaves, and purple clustered flowers help differentiate these species from many unrelated potential look-alikes. Related species (including other lilyturfs, mondo grasses, and grape hyacinths) differ in either leaf length, flower shape/color, or root structures and measurements. **BL** differs from **CL** in being slightly taller, having wider leaves, and a more conspicuous inflorescence.

NOXIOUS WEED LISTINGS: Neither species is listed as noxious in any southeastern state.

NOTES: Both species are frequently sold as ornamentals and numerous cultivars are available.



big blue lilyturf



creeping liriope

Climbing nightshade

Solanum dulcamara L.

SYNONYMS: bittersweet nightshade, blue nightshade, European bittersweet, fellenwort, woody nightshade

ORIGIN: Europe, Asia

GROWTH TRAITS: Perennial vine or scrambling shrub with a rhizomatous root system, woody base, and herbaceous aboveground stems that die back each winter. The sprawling stems root where nodes touch the ground. Stems are typically 3.3-6.6' (1-2 m) long, either erect or clambering, but may grow longer where suitable support is available. Leaves are dark-green, alternate, up to 4" (10 cm) long, and have smooth or slightly wavy margins. Some leaves are arrowhead-shaped with two basal lobes; other leaves are ovate. Leaves have an unpleasant odor when crushed. Flowers occur in loose clusters of 6-20 May through November. Flowers are star-shaped, up to 0.5" (1.2 cm) across, and have 5 purple recurved petals and yellow centers. Fruits are green berries 0.4" (1 cm) across that turn red when ripe and contain many seeds.

Climbing nightshade a. plant; b. infestation (a. Ohio State University Weed Lab, bugwood.org; b. MPF)

Climbing nightshade c. lobed leaf and stem; d. flowers; e. immature (green) and mature (red) fruit (c. Leslie J. Mehrhoff, University of Connecticut; d. Rob Routledge, Sault College; e. Ohio State University Weed Lab; c-e. bugwood.org)

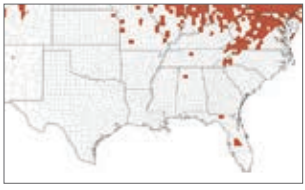
REPRODUCTION: Spreads by seed, rhizomes, and rooting at stem nodes. Most seeds germinate within two years.

HABITAT: Most frequently occurs in riparian areas and deciduous forests with partial shade, but occasionally grows in open, drier habitats such as grasslands and meadows.

Look-alike: evergreen clematis (Robert Vidéki, Doronicum Kft., bugwood.org)

LOOK-ALIKES: Several *Solanum* species have similar alternate leaves, 5-petal star-shaped flowers, and berry fruit. The combination of arrowhead-shaped leaves, purple recurved flowers, red berries, and vining habit help differentiate climbing nightshade. The exotic Oriental bittersweet (*Celastrus orbiculatus*) is a similar vine with alternate leaves and red berry-like fruit; it differs with its oval toothed leaves and tiny white flowers. The exotic evergreen clematis (*Clematis vitalba*) is a similar vine with arrowhead leaves; it differs with its white flowers, silky fruits, and opposite leaves being separated into distinct leaflets.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.



NOTES: Climbing nightshade is considered poisonous to humans and some other mammals. The unripe berries are the most toxic.

Beach vitex

Vitex rotundifolia L. f.

SYNONYMS: roundleaf chastetree

ORIGIN: Asia, Australia, the Pacific Islands (including Hawaii)

GROWTH TRAITS: Prostrate, deciduous shrub or sprawling vine growing up to 2' (0.6 m) tall from a deep, minimally-branched taproot. The sprawling stems root at the nodes and may spread as much as 33-60' (10-20 m) away. Stems are green, square, and fleshy when young. Mature stems are brown, woody, and brittle, breaking off easily in high tide and colonizing new areas after rooting from stem nodes. Leaves are oval, 1-2" (2.5-5 cm) long, opposite, strongly aromatic, and have smooth margins. The upper leaf surface is pale green and lightly hairy while the lower surface is silvery-gray and has dense, matted hairs. Flowers are 0.3" (8 mm) long, 2-lipped with bluish-purple petals fused at their base, and occur in small clusters at the ends of branches. The fruit is round, 0.25" (6 mm) in diameter, green when young, and dark purplish-black when mature. At temperate locations, flowers appear spring to summer, fruits mature

Beach vitex a. plant; b. infestation (a,b. Forest & Kim Starr, Starr Environmental)

Beach vitex c. leaves; d. flowers; e. fruits (c-e. Forest & Kim Starr, Starr Environmental)

in early autumn, and the plant drops its leaves in winter. In warm climates, the plant retains its leaves and flowers year-round.

REPRODUCTION: Spreads by seed and vegetatively by rooting at stem nodes. Seeds remain viable in the soil for up to four years.

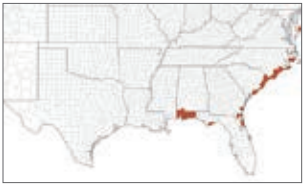
HABITAT: Does best in sandy soils in full sun. Highly tolerant of drought and salt.

LOOK-ALIKES: Several dune species resemble beach vitex, including the native Brazilian bayhops (*Ipomoea pes-caprae* ssp. *brasiliensis*) and gulf croton (*Croton punctatus*). The combination of opposite leaves with smooth margins, 2-lipped bluish-purple flowers, and low sprawling growth form help differentiate beach vitex from potential look-alikes.

Look-alike: Brazilian bayhops (Forest & Kim Starr, Starr Environmental)

NOXIOUS WEED LISTINGS: NC (B), VA (State-Listed)

NOTES: This species was intentionally introduced into the continental United States in the 1980s as a beach stabilization plant, although it is much less effective than native dune grasses that have more fibrous root systems.



Japanese sedge

Carex kobomugi Ohwi

SYNONYMS: Asiatic sand sedge

ORIGIN: temperate Asia

GROWTH TRAITS: Perennial, sprawling sedge that grows from a fibrous, rhizomatous root system. Plant stems are triangular in cross-section, 4-12" (10-30 cm) tall, and have brown scales at their base. Leaves are stiff, arching, tapering, 0.1-0.25" (3-6 mm) wide and often longer than the flowering stems. Leaves have papery sheaths at their base and small teeth all along their margins which are rough to the touch. Plants have an overall yellow-green color. Flowers grow in spiked inflorescences at stem tips. Male and female flowers generally occur on separate plants, though some stems may contain both. Male inflorescences are cylindrical, up to 1.5" (4 cm) long, and up to 0.5" (1.2 cm) wide. Female inflorescences are slightly more ovoid, up to 2.4" (6 cm) long, and up to 1.5" (4 cm) wide. Each female flower is surrounded by a papery sac and produces a single brown seed. Flowering and fruiting typically occur from April to June.

Japanese sedge a. plants; b. infestation (a,b. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

Japanese sedge c. roots and stem bases; d. female inflorescence and leaves; e. male inflorescence and leaves (c-e. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

REPRODUCTION: Spreads primarily by rhizomes but also by seed. Seeds have a low germination rate but may remain viable in the soil for many years.

HABITAT: Japanese sedge prefers open, sunny areas with high disturbance and coarse soils. It is typically found on sandy beaches along sea coasts, inlets, rivers and lake margins.

Look-alike: American beach grass (Fungus Guy)

LOOK-ALIKES: Two native grass species, American beach grass (*Ammophila breviligulata*) and beach panic grass (*Panicum amarum*), may resemble Japanese sedge plants that are not in flower. Both are both rhizomatous, grow in similar beach habitats, and have long narrow leaves. Japanese sedge leaves have small teeth along their margins and are yellow-green, as compared to the blue-green of the native grasses. Japanese sedge stems are also triangular in cross-section while grass stems are round. Other sedge species that may occur in the same habitat flower later in summer and lack serrated leaf margins and rhizomes.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Japanese sedge has been intentionally planted as a dune stabilizer, but frequently becomes invasive. Its seeds are buoyant, impermeable to water, and tolerate salinity, suggesting they may be excellent dispersers over long distances.

Ravenna grass

Saccharum ravennae (L.) L.

SYNONYMS: hardy pampas grass, elephant grass, plume grass, *Erianthus ravennae* (L.) Beauv., *Andropogon ravennae* L., *Ripidium ravennae* (L.) Trin., *Tripidium ravennae* (L.) H. Scholz

ORIGIN: Eurasia, the Mediterranean

GROWTH TRAITS: Perennial bunchgrass growing 8-13' (2.4-4 m) tall from a densely fibrous root system. Leaves are basal and also distributed up the stem to the bottom of the inflorescence. Leaves have serrated margins, a thick, white midvein on the upper sides of blades, and can be 1.6-3.3' (0.5-1 m) long and 0.5" (1.2 cm) wide. Leaf bases are unlobed and are densely covered with long, fuzzy hairs that typically hide the ligule. Dense flower plumes are purplish (maturing to silver to tan), up to 2' (0.6 m) long, and bloom from July through October. Florets are covered in tufts of silky hairs, giving the inflorescence an overall fluffy appearance.

Ravenna grass a. plant; b. infestation (a. Jennifer Andreas, Washington State University Extension; b. The Nature Conservancy Archive, The Nature Conservancy, bugwood.org)

Ravenna grass c. leaf blade with serrated margins and white midveins; d. hairy leaf base; e. inflorescences (c-e. Wendy DesCamp, Washington State Noxious Weed Control Board)

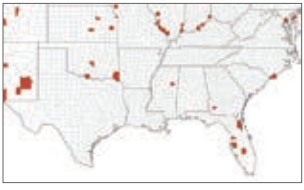
REPRODUCTION: Spreads by seed. Seed longevity is unknown but believed to be only a few years.

HABITAT: Ravenna grass can be found in open, disturbed locations at both moist and dry sites, and it is tolerant of cold weather.

Look-alike: jubata grass (Gordon Leppig & Andrea J. Pickart)

LOOK-ALIKES: Several native and exotic grasses resemble Ravenna grass. The clumped bunches help differentiate Ravenna grass from the rhizomatous and linear-growing giant and common reeds (*Arundo donax* and *Phragmites australis,* respectively). Jubata and pampas grass (*Cortaderia jubata* and *C. selloana*) are similar-looking bunchgrasses, but both lack hairs at leaf and stem bases, their leaf margins are much sharper, and their leaf midveins are not thick and white on the upper sides of the blades. Most native plumegrass species (*Saccharum*) have much more compact inflorescences. Giant plumegrass (*S. giganteum*) and shortbeard plumegrass (*S. brevibarbe*) inflorescences may be open, but both species typically grow shorter than Ravenna grass with overall smaller features, and their leaf bases are far less hairy.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.



NOTES: This species is frequently used for soil erosion control and as an ornamental, but often escapes cultivation.

Ricegrass paspalum & Tussock paspalum

Paspalum scrobiculatum L. & *P. quadrifarium* Lam.

Ricegrass paspalum a. plants; b. open inflorescence; c. (sideways) open inflorescence, leaf blade, and stem (a. David Eickhoff; b,c. Forest & Kim Starr, Starr Environmental)

Tussock paspalum d. plant; e. open inflorescence; f. (sideways) leaf blades and closed inflorescence (d,f. David J. Moorhead, University of Georgia; e. Chris Evans, University of Illinois; d-f bugwood.org)

SYNONYMS: Ricegrass paspalum **(RP)**: kodo millet, ditch millet, Indian paspalum, ricegrass; Tussock paspalum **(TP)**: crown grass

ORIGIN: **RP:** Africa, tropical Asia, Australia; **TP:** South America

GROWTH TRAITS: Both species are tufted perennial grasses (**RP** is sometimes an annual) with keeled sheaths on the stems. Leaves are 5-16" (12-40 cm) long with flat blades, smooth margins, and membranous ligules. Seeds are brown to gray, ellipsoidal, and ~0.08" (2 mm) long. **RP** grows up to 5' (1.5 m) tall from a shallow fibrous root system; stems of some cultivars may also root at basal nodes. Leaves are up to 0.5" (1.2 cm) wide, and ligules have a row of dense hairs behind the membrane. Inflorescences are produced in summer and have 4-6 seed-bearing branches, each 1-3" (2.5-7.5 cm) long. **TP** may grow up to 6' (1.8 m) tall from a fibrous root system with short rhizomes. Leaves are up to 0.3" (0.8 cm) wide. Inflorescences are produced twice per year and have 15-25 seed-bearing branches, each approximately 3" (8 cm) long.

REPRODUCTION: Both species spread by seed. **TP** also spreads via rhizomes, and **RP** may root at basal nodes. Seeds of **RP** are reportedly viable in the soil for only one year; **TP** seed longevity is unknown.

HABITAT: Both species are weeds of warmer-temperate, sub-tropical and tropical regions and prefer disturbed sites. Infestations can be found in or along fields, roadsides, ditches, rice fields, abandoned lots, and escaping ornamental plantings.

LOOK-ALIKES: The combination of bunched tussocks, flat leaf blades with membranous ligules, and relatively loose inflorescences help differentiate **RP** and **TP** from numerous other grass species. **RP** differs from **TP** in being slightly shorter and having wider leaf blades, a hairier ligule, and an inflorescence with far fewer branches. The related vaseygrass (*P. urvillei*) has long silky hairs on flower margins.

NOXIOUS WEED LISTINGS: **RP**: AL, FL (Noxious), NC (A), SC; **TP**: Not listed in any southeastern state.

NOTES: **RP** has been introduced throughout the world as a grain crop or a pasture species. **TP** is frequently sold as an ornamental.

ricegrass paspalum

tussock paspalum

Serrated tussock grass

Nassella trichotoma (Nees) Hack. ex Arechav.

SYNONYMS: nassella tussock, Yass River tussock, *Stipa trichotoma* Nees

ORIGIN: South America

GROWTH TRAITS: Perennial grass forming tussocks up to 2' (60 cm) tall and 10" (25 cm) wide (at their base) from a deep, fibrous root system. Stems are up to twice as long as leaves, but both droop and appear bleached at maturity. Leaves are basal, tightly rolled to 0.02" (0.5 mm) in diameter, and finely serrated. Leaves have a small, white, membranous ligule 0.04" (1 mm) long. Inflorescences are produced in spring and summer and are open and branching with thin, brittle stems that break off quickly, leaving the plants free of inflorescences for most of the year. Florets are purplish in color and have long awns up to 1" (2.5 cm) long. Awn attachment is slightly off center. A mature plant can produce over 140,000 windblown seeds per year, and plants may live up to 20 years.

REPRODUCTION: Spreads by seed. Most seeds germinate or die within three years, but some may stay viable for decades.

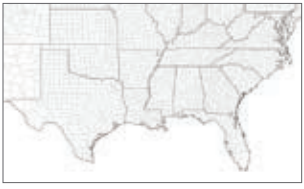
Serrated tussock grass a. plant; b. infestation (a. Harry Rose; b. ©Bill Strong, natureshare.org.au)

Serrated tussock grass c. rolled leaf base, ligule, and stem; d. inflorescence; e. florets with long awns (c-e. Harry Rose)

HABITAT: Serrated tussock grass is a weed of temperate and semi-arid regions, commonly growing in full sun at disturbed sites, along roadsides, and in pastures, grasslands, open woodlands and drier forests. It can tolerate repeated frost as well as drought, though it is often limited by extended high temperatures. As such, it is more commonly found in upland sites in areas with hot climates.

LOOK-ALIKES: Several native and exotic tussock and needlegrasses (*Nassella* spp.) resemble serrated tussock grass with their bunched and nodding growth and their long awns. The native finestem tussock grass (*Nassella tenuissima*) can be differentiated by having a longer ligule, a longer awn, and a less open inflorescence. Other *Nassella* spp. and other bunchgrasses can be differentiated by their specific combination of height, leaf, ligule, awn, and inflorescence traits. Many potential look-alikes grow taller or have smooth leaves, awns that are twisted or of different lengths, ligules that are hairy, longer, or missing, and/or more closed inflorescences. For example, weeping lovegrass (*Eragrostis curvula*) grows taller with larger leaves, has a hairy ligule, and has denser inflorescences.

Look-alike: finestem tussock grass (Stan Shebs)



NOXIOUS WEED LISTINGS: AL, AR, FL (Noxious), GA, NC (A), OK (Noxious), SC, TX

NOTES: This species has a low nutritional value and is not preferred by grazing animals, which can lead to its domination of pastures and rangelands.

Umbrella plant

Cyperus involucratus Rottb.

SYNONYMS: umbrella sedge, flatsedge, *Cyperus alternifolius* auct. non L.

ORIGIN: Africa, Arabian Peninsula, Madagascar

GROWTH TRAITS: Perennial sedge forming clumps 2-6' (0.6-1.8 m) tall from a woody, rhizomatous root system. True leaves are barely noticeable; they are reduced to small sheaths that encase the bottoms of stems. Stems are triangular in cross-section. At stem tips are 10-25 leaf-like bracts that are radially arranged like wheel spokes. Bracts are 6-15" (15-38 cm) long, 0.5" (1.3 cm) wide, bright green, drooping, and have smooth, straight margins. Flowers grow in clustered inflorescences arising among the bracts at stem tips. Flowers are green at first but mature to brown and bloom summer to fall and are followed by small, triangular fruits ('nuts') that mature to dark brown. In warm climates, the plant grows year-round; elsewhere plants die back to the roots and re-sprout in spring.

REPRODUCTION: Spreads by seed and rhizomes. Seeds may remain viable in the soil for many years.

Umbrella plant a. plant; b. infestation (a,b. Forest & Kim Starr, Starr Environmental)

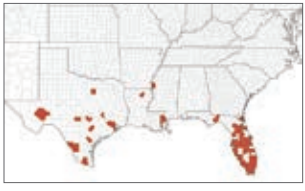
Umbrella plant c. bracts that resemble leaves; d. inflorescence; e. tiny green (immature) and brown (mature) flowers (c-e. Forest & Kim Starr, Starr Environmental)

HABITAT: Umbrella plant is a weed of wet and boggy areas, although it will also thrive in drier locations. It is typically found in wetlands and along the margins of lakes and rivers. Plants tolerate both sun and shade, but they die back to the root mass with frost.

LOOK-ALIKES: The triangular stems, non-showy green flowers that mature to brown, and nut-like fruit are all characteristic of the sedge family and help differentiate umbrella plant and other sedges from similar, unrelated species. Within the family, the tall stem height and large, radially-arranged drooping bracts help differentiate umbrella plant from other sedges. The native drain flatsedge (*Cyperus eragrostis*) has radially-arranged leafy bracts that are much narrower and fewer than in umbrella plant. Drain flatsedge is also shorter and has well-developed leaves at its stem bases.

Look-alike: drain flatsedge (John Tann)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.



NOTES: Umbrella plant is a popular ornamental species but frequently escapes.

Wavyleaf basketgrass

Oplismenus undulatifolius (Ard.) P. Beauv.

SYNONYMS: *Oplismenus hirtellus* ssp. *undulatifolius* (Ard.) U. Scholz

ORIGIN: southern Europe, southern Asia

GROWTH TRAITS: Perennial, low-growing grass reaching only 8-12" (20-30 cm) tall from a shallow root system. Stems are stoloniferous and branch and root at lower nodes. Leaf blades are alternate, 1.5-4" (4-10 cm) long by 0.5" (1.3 cm) wide, elliptical, elongate, and sharply pointed. Leaves are a rich green with undulating ripples across their surface, resulting in the common name of "wavyleaf". Small hairs are scattered on both leaf surfaces; stem and node hairs are longer (up to 0.16" or 4 mm) and more dense. Flowering stems may be up to 20" (50 cm) tall and produce delicate-looking inflorescences from August through November. Florets are pinkish and have long, sticky awns that readily adhere to animals and people, aiding in dispersal. Leaves remain green through late fall, dying back overwinter. New stems sprout from stolons in spring.

Wavyleaf basketgrass a. plants; b. infestation (a. Dalgial; b. Kerrie L. Kyde, Maryland Department of Natural Resources, bugwood.org)

Wavyleaf basketgrass c. leaf blades; d. hairy branching, rooting stems and stolon; e. inflorescence (c. Kerrie L. Kyde, Maryland Department of Natural Resources, bugwood.org; d. Garrett Waugaman, M-NCPPC Weed Warriors, bugwood.org; e. Yasunori Koide)

REPRODUCTION: Spreads by seed and stolons. Seeds remain viable in the soil for up to five years.

HABITAT: Wavyleaf basketgrass grows best in moist soil in full shade to partial sun, allowing it to thrive under forest canopies where it forms dense mats covering forest floors.

Look-alike: bristle basketgrass (Forest & Kim Starr, Starr Environmental)

LOOK-ALIKES: Native bristle basketgrass (*Oplismenus hirtellus*) is very similar, but its stems have few if any hairs, and its inflorescence branches are longer and have more florets that are a deeper purple. The native deer-tongue grass (*Dichanthelium clandestinum*) has similar hairy stems and sometimes rippled leaves, but it grows taller and in clumps. The exotic small carpetgrass (*Arthraxon hispidus*) has low-growing hairy stems and sometimes rippled leaves, but its leaves are heart-shaped at their base and clasp the stem.

NOXIOUS WEED LISTINGS: VA (State-Listed)

NOTES: First discovered in Maryland in 1996, this species is spreading rapidly. There is currently taxonomic uncertainty with this group. Some taxonomic sources refer to wavyleaf basketgrass as a subspecies of the native *Oplismenus hirtellus*, while others (including those used for this guide) consider it a separate species.

Autumn fern

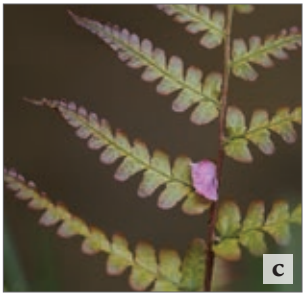
Dryopteris erythrosora (D. C. Eat.) O. Kuntze

SYNONYMS: Japanese wood fern, copper shield fern

ORIGIN: eastern Asia

GROWTH TRAITS: Herbaceous, perennial fern growing from short, creeping rhizomes. Fronds are arching, appear to radiate from the crown, and grow from 1-2' (30-60 cm) long. Frond stems are stout with cinnamon-colored fuzz along their length, which is more noticeable at their base. Fronds are triangular and twice-divided; the smallest sections (leaflets) are rounded, often have small teeth on their margins, and occur in pairs of 8-20. New fronds unfurl in shades of orange-red to copper-pink, gradually changing to bright green, and eventually maturing to a glossy deep green by summer. As a fern, this species does not flower. Instead it produces spores that are arranged along the margins of the undersides of fertile leaflets. The reproductive structures containing the spores are a bright brick red. The fronds may be evergreen and produce spores year-round in warm climates. In temperate regions, fronds die back in late winter, and new fronds emerge as fiddlenecks the following spring.

Autumn fern a. older plant; b. multiple fronds of varying age (a. harum.koh; b. David J. Stang)



Autumn fern c. young frond; d. older frond; e. undersides of leaflets with spores (c. harum.koh; d,e. Stan Shebs)

REPRODUCTION: Spreads by spores and vegetatively via rhizomes. Spores are typically viable for at least one year.

HABITAT: Autumn fern tolerates drier conditions better than many other ferns, but it grows best in moist soil high in organic matter in partial to full shade. It can be found invading moist forests, tree plantations, rock walls, and roadsides.

LOOK-ALIKES: Several native species of wood fern (*Dryopteris* spp.) resemble autumn fern. Autumn fern differs in that its young fronds are orange-red to copper-pink, and the reproductive structures surrounding the spores are a bright brick red.

Look-alike: marginal woodfern (Krzysztof Ziarnek, Kenraiz)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Autumn fern remains a popular species in landscaping.

Chinese brake fern

Pteris vittata L.

SYNONYMS: Chinese brake, ladder brake, Chinese ladder brake

ORIGIN: Asia, Africa, Australasia, Europe

GROWTH TRAITS: Herbaceous, perennial fern growing from short, creeping rhizomes that are covered in scales which are pale brown, papery, and often have long, hair-like tips. Fronds are arching, appear to radiate from the crown, and grow from 8-31" (20-80 cm) long. Frond bases are brown and covered with the same hair-like scales as rhizomes, but fronds become green and less scaly towards their tips. Fronds are singly-divided into 20-40 narrow, linear, opposite leaflets. Leaflets are dark green with a smooth upper surface, prominent midrib on the lower surface, and prominent tip. Upper leaflets are 4-6" (10-15 cm) long by 0.4" (1 cm) wide, decreasing in size towards the base of the frond where leaflets are 0.8-2" (2-5 cm) long. The terminal leaflet at the tip of the frond is the longest of all. As a fern, this species does not flower. Instead it reproduces by spores that are arranged along the margins of the undersides of fertile leaflets. Fronds may be evergreen and

Chinese brake fern a. frond; b. large plant with multiple fronds (a. Te Papa Tongarewa, Museum of New Zealand, P026163; b. Daderot)

Chinese brake fern c. frond base; d. upper surface of leaflets; e. undersides of leaflets (c,e. Te Papa Tongarewa, Museum of New Zealand, P026163; d. Forest & Kim Starr, Starr Environmental)

produce spores year-round in warm climates. In temperate regions, fronds die back over winter and new fronds emerge as fiddlenecks the following spring.

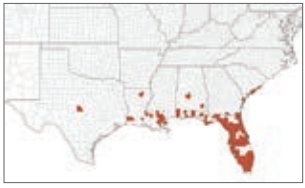
REPRODUCTION: Spreads by spores and vegetatively via rhizomes. Spores are typically viable for up to 6 months.

HABITAT: Typically found in areas with exposed limestone including pinelands, roadside cuts, and rockland hammocks, as well as old masonry, sidewalks, and building crevices. It grows best near water in partial shade with moist soils but can tolerate heat, drought, frost, full sun, and full shade.

Look-alike: swamp fern (Homer Edward Price)

LOOK-ALIKES: The once-divided and radiating dark green fronds of Chinese brake fern resemble those of the native swamp fern (*Blechnum serrulatum*) and Bahama brake fern (*Pteris bahamensis*). Swamp fern differs in that spores form lines along the leaflet midrib rather than leaflet margins. Bahama brake fern has non-hairy frond stems and blunt leaflet tips.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.



NOTES: Chinese brake fern is a hyperaccumulator of arsenic. Though it has been used to remediate soils contaminated with arsenic, it should be managed as an invasive species.

Japanese chaff flower

Achyranthes japonica (Miq.) Nakai

SYNONYMS: Oriental chaff flower, *Achyranthes bidentata* var. *japonica* Miq.

ORIGIN: East Asia

GROWTH TRAITS: Herbaceous, upright perennial typically growing 1.6-6.6' tall (½-2 m) from a well-developed but non-rhizomatous root system. Young plants have one stem, while older plants have multiple stems arising from the same root crown. Stems are thin, wiry, 4-angled, branched, and often purple-tinged at their slightly swollen nodes. Leaves are opposite, elliptical, and have prominant veins and smooth (sometimes wavy) margins. Leaves are 4-8" long (10-20 cm), gradually becoming smaller up the stem. Leaves and stems are slightly hairy. Flowers are produced from late summer to early fall. They are tiny with no petals and 5 green stamens. Flowers initially occur in tight clusters on spikes at branch and stem tips, but as fruits appear, spikes elongate significantly. Flowers diverge at nearly a 90° angle from the spike, but as fruits mature they lay flat (downwards) against the spike. The fruits are slender and dry with a single hard seed, and have a pair of stiff bracts arising from their base.

Japanese chaff flower a. plant; b. infestation (a,b. Chris Evans, University of Illinois, bugwood.org)

Japanese chaff flower c. leaves; d. flowers; e. mature fruit and hairy stem (c-e. Chris Evans, University of Illinois, bugwood.org)

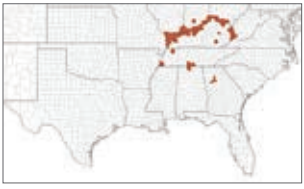
REPRODUCTION: Spreads by seed. Seeds have very high germination rates, though longevity is unknown.

HABITAT: Usually found in partial shade and moist soil, but it will also grow in drier areas in both sunny and densely-shaded habitats. Often found in bottomland forests, along waterways and roadsides, and at the edges of fields.

LOOK-ALIKES: Several related pigweed species (*Amaranthus*) are present in North America and have similar flowers and reddish stems. However, they have alternate leaves, unlike the opposite leaves of Japanese chaff flower. The native bloodleaf (*Iresine rhizomatosa*), American lopseed (*Phryma leptostachya*), and swamp verbena (*Verbena hastata*) all have opposite leaves and similar fruit. Bloodleaf has tiny white flowers with papery-white petals, and female flowers have tufts of hairs at their base. American lopseed and swamp verbena leaves are toothed, and their flowers have true petals with pinkish-white and purple petals, respectively. American lopseed is most similar in fall/winter but can be differentiated by its bracts arising from fruit tips instead of the fruit base as in Japanese chaff flower.

Look-alike: swamp verbena (© Gerald D. Carr 2017)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.



NOTES: The pair of stiff bracts on the fruits aid in dispersal by readily attaching to clothes or fur.

Spiny emex

Rumex spinosus L.

SYNONYMS: devil's thorn, spiny threecorner Jack, prickly doc, *Emex spinosa* (L.) Campd.

ORIGIN: the Mediterranean

GROWTH TRAITS: Herbaceous annual that germinates in autumn or winter and grows 12-24" (30-60 cm) tall from a long, thick taproot. Stems are round, ridged, sometimes reddish, often somewhat sprawling, and branch periodically. Leaves are alternate, smooth, triangular to egg-shaped, 2-5" long (5-12.5 cm), and have slightly wavy margins. Leaves become increasingly smaller up the stem. Leaf stalks are long, hairless, and with membranous sheaths (ochreae) at their bases. Flowering occurs from early summer to winter with separate male and female flowers occurring on the same plant. Male flowers are small, inconspicuous, green, and occur in short clusters on stalks. Female flowers are spiny, without stalks, and occur in clusters around leaf axils. Fruits are produced on the stem and root crown. Stem fruits are triangular and green when young, turning reddish-brown, hardened, and with 3 sharp spines at maturity. Spines are up to 0.11" (3

Spiny emex a. plant; b. infestation (a,b. Forest & Kim Starr, Starr Environmental)

Spiny emex c. leaves; d. male flowers; e. immature fruits; f. mature fruits (c,d. Forest & Kim Starr, Starr Environmental; e. Rolf Engstrand; f. Julia Scher, USDA APHIS PPQ, bugwood.org)

mm) long. Fruits on the root crown are larger but less spiny. These are yellowish-red but turn brown with maturity. Each fruit contains a single glossy seed. When the plant dies back, its drying root pulls the crown seeds into the soil.

REPRODUCTION: Spreads by seed. Seeds remain viable in the soil for at least eight years.

HABITAT: Tolerates a wide variety of conditions but does best with disturbance. It is typically found along roadsides, railways, flood zones, field edges, pastures, grasslands, and other dry or sandy locations and can tolerate drought and cold temperatures.

LOOK-ALIKES: While various native and exotic species have similar triangular wavy leaves, non-showy male flower clusters, or spiny female flowers clustered around leaf axils, the combination of all of these traits helps differentiate spiny emex from most possible look-alikes. The closest relative of spiny emex (the exotic southern threecorner Jack, *Rumex hypogaeus*) is very similar but has larger spiny fruits, smaller leaves, and tends to grow more prostrate than spiny emex.

Look-alike: southern threecorner Jack (Kevin Thiele)

NOXIOUS WEED LISTINGS: AL, FL (Noxious), NC (A), SC

NOTES: The spiny fruits readily adhere to clothing/shoes, fur, and equipment, aiding in the weed's dispersal.

Mile-a-minute weed

Persicaria perfoliata (L.) H. Gross

SYNONYMS: devil's tearthumb, Asiatic tearthumb, giant climbing tearthumb, *Ampelygonum perfoliatum* (L.) Roberty & Vautier, *Polygonum perfoliatum* L.

ORIGIN: Asia

GROWTH TRAITS: Herbaceous, annual climbing vine growing from a shallow and fibrous root system. The vines grow up to 20' (6 m) long in a single growing season, blanketing trees and surrounding vegetation. Stems are green but turn red with age. Stems, petioles, and the undersides of major leaf veins all have sharp, hook-like barbs that are distinctively curved backwards. Leaves are alternate, triangular, and 1.2-2.8"(3-7 cm) long by 0.8-2" (2-5 cm) wide. An ochrea (saucer-shaped sheath) up to 0.8" (2 cm) across surrounds the stem at each leaf node. Flowers are tiny, greenish-white, and inconspicuous. In summer, they grow from ochreae in clusters of 10-15. They are produced from midsummer to the first frost and each contains a single shiny black or reddish seed.

Mile-a-minute weed a. vines; b. infestation (a,b. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

Mile-a-minute weed c. leaves, barbs, and ochreae; d. flowers; e. fruit and ochrea (c,e. Leslie J. Mehrhoff, University of Connecticut, bugwood.org; d. Dalgial)

REPRODUCTION: Spreads by seed. Seeds may remain viable in the soil for up to six years.

HABITAT: Grows best in low, wet ground and full sun, but it can tolerate partial shade. In North America, it can be found in open disturbed areas such as flood plains, conservation areas, orchards, forest edges, and roadsides.

Look-alike: halberd-leaved tearthumb (SB Johnny)

LOOK-ALIKES: Native tear-thumbs, including halberd-leaved tearthumb (*Persicaria arifolia*), have similar triangular leaves, barbed stems, tiny flowers, and sometimes a vining habit. The large ochreae and blue fruits help differentiate mile-a-minute weed from similar tear-thumbs. The triangular, alternate leaves, small green flowers, barbed stems, and vine growth habit separate mile-a-minute weed from most other potential look-alikes.

NOXIOUS WEED LISTINGS: AL, NC (A), SC

NOTES: This species was introduced to North America accidentally in the 1930s as a contaminant in other seed.

Norway maple

Acer platanoides L.

SYNONYMS: *Acer platanoides* var. *schwedleri* K. Koch

ORIGIN: Eurasia

GROWTH TRAITS: Deciduous tree typically growing 40-60' (12-18 m) tall but sometimes reaching heights of 100' (30 m). Trees grow from a shallow root system and usually produce one trunk (reaching 24-31" or 60-80 cm in diameter) that is multi-branched and forms a broad, rounded canopy. The bark is grayish-brown with shallow grooves. Leaves are opposite and attached to the branch with long petioles that exude a milky sap when broken. Leaves are 4-7" (10-18 cm) wide and usually broader than long. They are shaped like the palm of a hand, typically with 5 lobes. Each lobe has 1-3 side teeth and an otherwise smooth margin. Leaves are typically green and turn yellow in autumn before falling to the ground for winter, but some popular cultivars have deep maroon leaves. Flowers appear in clusters of 15-30 in spring before new leaves emerge. Each is 0.3" (8 mm) across and has 5 yellow-green sepals and 5 yellow-green petals. The fruits are up to 2" (5 cm) long and are double samaras (two winged seeds fused together). The wings are

Norway maple a. tree; b. bark (a. John Ruter, University of Georgia, bugwood.org; b. © Gerald D. Carr 2017)

Norway maple c. green leaves; d. flowers; e. fruits (samaras)(c. © Gerald D. Carr 2017; d. Jan Samanek, Phytosanitary Administration, bugwood.org; e. Krzysztof Ziarnek)

widely divergent, approaching a 180° angle. Plants generally live 60 years in North America, but may live up to 250 years under ideal conditions in their native range.

REPRODUCTION: Spreads by seed. The majority of seeds germinate within one year, though some may remain viable longer.

HABITAT: Capitalizes on disturbance or intentional planting to establish initially, but then readily spreads into undisturbed areas. It is typically found in forests and forest wetlands, along roadsides and abandoned lands, and in urban gardens.

Look-alike: sugar maple maturing fruit (Paul Wray, Iowa State University, bugwood.org)

LOOK-ALIKES: The opposite, palmately lobed leaves and samara fruits help differentiate this species from unrelated look-alikes. Within the family, many maples are shrubs, have smoothly lobed leaves, and/or differing fruits. The native sugar maple (*Acer saccharum*) is perhaps most similar. It differs by having clear sap in the leaf petiole, slightly more rounded leaf lobes, and samara wings that diverge at less than 180° .

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Norway maple is a popular, fast-growing ornamental. Due to their weak, brittle wood, branches frequently break during storms, causing significant damage and cleanup costs for municipalities and homeowners.

Largeflower Mexican clover

Richardia grandiflora (Cham. & Schltdl.) Steud.

SYNONYMS: largeflower pusley, Florida snow, fairy cups

ORIGIN: South America

GROWTH TRAITS: Herbaceous perennial that forms a dense, low-growing groundcover from a deep central taproot with extensive rhizomes. Stems are hairy (especially near stem tips), prostrate, green to reddish, and may root wherever nodes touch the ground. Leaves are opposite, 0.5-0.75" (1.3-2 cm) long, elliptical with smooth margins, and taper to a point at both ends. Flowers occur in clusters at stem tips year-round, but most frequently over winter. Flowers are 0.8" (2 cm) long, trumpet-shaped with (usually) 6 petals fused at their bases, and range from pink (or nearly white) at their tips to white at their bases. Flowers are short-lived, close at night, and remain closed in low light. Fruits are capsules containing variable numbers of tiny seeds.

Largeflower Mexican clover a. plant; b. infestation (a. Mark A. Garland, USDA-NRCS PLANTS Database; b. © Susan J. Hewitt, iNaturalist.org)

Largeflower Mexican clover c,d. leaves and hairy stem; e. flowers; f. fruits (c. Mark A. Garland, USDA-NRCS PLANTS Database; d,f. © Joseph MDO, iNaturalist.org; e. Bob Peterson)

REPRODUCTION: Spreads by seed, rhizomes, and rooting at stem nodes. Seed longevity is unknown, but seeds of related species remain viable at least one year following dispersal.

HABITAT: Grows best at open, disturbed sites and tolerates sandy soil, drought, and low temperatures. It is a frequent invader of lawns and roadsides, but readily moves into natural, undisturbed areas.

Look-alike: tropical Mexican clover (Harry Rose)

LOOK-ALIKES: The combination of groundcover growth, opposite leaves, hairy stems, and trumpet-shaped flowers help differentiate largeflower Mexican clover from unrelated look-alikes. Four other *Richardia* species occur in the USA, including tropical Mexican clover (*Richardia brasiliensis*). All four have smaller flowers with whiter petals compared to largeflower Mexican clover.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species is a frequent invader of lawns and turf in southern Florida. Mowing the low-growing mats does not provide control, but increases fragmentation, leading to plant spread.

Spiny plumeless thistle

Carduus acanthoides L.

SYNONYMS: plumeless thistle, bristly thistle, welted thistle

ORIGIN: Europe, Asia, northern Africa

GROWTH TRAITS: Herbaceous winter annual or biennial growing from a fleshy taproot that is hollow near the crown. Rosettes form either in fall and overwinter, or they grow in spring. Stems bolt in later spring, are typically 3-4' (0.9-1.2 m) tall, and have spines along their length. Leaves are up to 8" (20 cm) long within the rosette and decrease in size further up the stem. Leaves are hairy on the undersides, narrow, deeply lobed almost to the midrib, and have spines along their wavy margins. Basal leaves on some plants may have white margins. Stem leaves are alternately arranged and lightly clasp the stem. Flower heads are up to 1" (2.5 cm) in diameter and are either solitary or form small clusters of up to 5 heads at the ends of stems and branches. Bracts are needle-like and tipped with sharp spines. Florets are pink to purple and appear from June to October. Flower heads produce numerous straw-colored seeds with faint striping and a tuft of silky hairs at their tips.

Spiny plumeless thistle a. plant; b. infestation (a. Todd Pfeiffer, Klamath County Weed Control, bugwood.org; b. Loke T. Kok, Virginia Polytechnic Institute and State University, bugwood.org)

Spiny plumeless thistle c. rosette; d. stem leaves and winged stems; d. flower head; e. seed (c-e. Todd Pfeiffer, Klamath County Weed Control, bugwood.org; f. Stefan.lefnaer)

REPRODUCTION: Spreads by seed. Seeds of many *Carduus* species may remain viable in the soil for up to 10 years, though most germinate within three.

HABITAT: Spiny plumeless thistle capitalizes on disturbance for establishment. It prefers moist conditions and well-drained soil and can be found in open areas such as pastures, rangelands, and rights-of-way.

LOOK-ALIKES: Over 80 native thistle species and more than 20 exotic thistles occur in North America, and all resemble spiny plumeless thistle to some extent. Unlike spiny plumeless thistle, native thistles never have spines along their entire stems. Having the combination of spines along its entire stem length, small flower heads ≤1" or 2.5 cm, and needle-like bracts helps differentiate spiny plumeless thistle from other exotic thistles. The exotic Italian thistle (*Carduus pycnocephalus*) and slenderflower thistle (*Carduus tenuiflorus*) resemble spiny plumeless thistle the most, but both have more triangular bracts at the base of the flower head.

Look-alike: Italian thistle (Eric Coombs, Oregon Department of Agriculture, bugwood.org)

NOXIOUS WEED LISTINGS: AR, NC (B)

NOTES: Seeds are frequently transported in contaminated hay and grass clippings.

Black swallow-wort

Vincetoxicum nigrum (L.) Moench

SYNONYMS: black dog-strangling vine, Louis' swallow-wort, *Cynanchum louiseae* Kartesz & Gandhi, *Cyanchum nigrum* (L.) Pers.

ORIGIN: Europe

GROWTH TRAITS: Herbaceous, perennial, twining vine with one to many stems growing from a fleshy, fibrous, and rhizomatous root system. Stems are erect initially but then twine around adjacent vegetation or each other for support, often forming impenetrable thickets. Vines are typically 2-6.5' (60-200 cm) long. Stems have hairs in longitudinal bands and are green but turn brown with age. Leaves are opposite, up to 4.8" (12 cm) long, elliptical with a pointed tip, and rounded or heart-shaped at their base. Leaves have smooth margins and sometimes appear glossy. Cut stems and leaf petioles exude a milky sap. Flowers are up to 0.25" (7 mm) across, star-shaped, and have 5 fleshy petals that are wider at their base. Petals are purplish-black with white hairs and are

Black swallow-wort a. climbing plants; b. infestation (a,b. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

Black swallow-wort c. leaves and stems; d. flowers; e. mature and splitting fruit (c-e. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

wide at their base. Flowers appear in clusters of 6-10 at leaf axils from June to September. Fruits are thin pods up to 2.7" (7 cm) long that often occur in pairs. At maturity, pods split open to release multiple tufted, wind-borne seeds. Plants die back in the fall and re-sprout from the root system in spring.

REPRODUCTION: Spreads by seed and rhizomes. Seeds are typically viable for two years or less.

HABITAT: Germination rates are highest where seeds are subjected to cold winter temperatures. It tolerates a wide range of light and moisture conditions from sunny and dry to moist and wooded, and it is often found at temperate, upland sites.

Look-alike: pale swallow-wort (Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

LOOK-ALIKES: The exotic pale swallow-wort (*Vincetoxicum rossicum*) grows in similar habitat and has opposite leaves, but its flowers are pale pink. Most native milkvines (*Matelea* spp.) that occur in the Southeast either have green or white flowers or their fruits are markedly bumpy, spiny, winged, or mottled. Many other vines resembling black swallow-wort have alternate leaves and flowers with different colors.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species was intentionally introduced to North America in the late 1800s as an ornamental and subsequently naturalized.

Calico flower

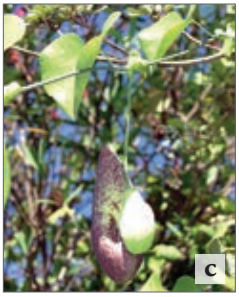
Aristolochia elegans Mast.

SYNONYMS: elegant Dutchman's pipe, pipevine, *Aristolochia littoralis* auct.

ORIGIN: South America

GROWTH TRAITS: Herbaceous, perennial, evergreen vine with stems typically growing up to 20' (6 m) long from a woody and sometimes rhizomatous root system. Vines are slender, rounded, green at first but becoming woody with age, and twine tightly around structures or other vegetation, often creating dense mats. Leaves are alternate, heart-shaped, up to 4" (10 cm) long and wide, and have long petioles. At the base of each leaf petiole is a small ear-shaped ligule that cups the stem. Flowers appear on drooping stalks from leaf axils throughout summer. Flowers are tubular with a flared mouth and S-shaped posterior. In profile, they resemble smoking pipes and are up to 3" (7.5 cm) long. Flowers are mottled white with deep purple-brown. Fruits are hanging, cylindrical capsules up to 2.5" (6 cm) long. Fruits, which are green at first, turn brown and split open at maturity (resembling parachutes), releasing numerous flattened, winged seeds.

Calico flower a. plant with deep purple mottled flowers; b. infestation on a tree (a,b. Forest & Kim Starr, Starr Environmental)



Calico flower c. leaves, ligule, and a flower profile; d. purple and white mottled flower; e. leaves, ligules, and immature fruit; f. mature open fruit and seeds (c,e,f. Forest & Kim Starr, Starr Environmental; d. John Tann)

REPRODUCTION: Spreads primarily by seed, but can reportedly spread vegetatively though root cuttings as well. Seed longevity is unknown.

HABITAT: Calico flower is a weed of warm climates and does not tolerate freezing temperatures. It is typically found in full sun to partial shade in forested areas with moist soil.

Look-alike: pelicanflower (Maja Dumat)

LOOK-ALIKES: The combination of vining habit, heart-shaped leaves, and pipe-shaped flowers help differentiate this species from unrelated look-alikes. Several native and exotic species in this genus are present in the USA which resemble calico flower. The exotic pelicanflower (*A. grandiflora*) has similar leaves, flowers, and fruits, but lacks the ligules at the base of leaf petioles. The exotic gaping Dutchman's pipe (*A. ringens*) has the ligules, but has a longer and narrower flower that splits into an upper and lower lobe.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Calico plant is a popular ornamental. Flowers produce an unpleasant carrion-like odor that attracts flies to aid in pollination.

Three-lobe morning glory

Ipomoea triloba L.

SYNONYMS: little bell, Aiea morning glory, potato vine

ORIGIN: tropical South and Central America, Mexico, the Caribbean

GROWTH TRAITS: Herbaceous, annual vine with stems growing up to 10' (3 m) long from an extensive root system. Vines are rounded, slightly ridged, and highly twining so appear much shorter than they are; they do not climb much higher than grasses and low shrubs. Leaves are alternate, 0.8-5" (2-12 cm) long, and vary in shape from deeply 3-5 lobed to heart-shaped. Cut stems and leaf petioles exude a milky sap. Flowers appear in leaf axils throughout summer. Flowers are funnel-shaped with fused petals, 0.5-1" (1.2-2.5 cm) across, and vary in color from white to pink to pale purple with darker centers. They have 5 green, fringed sepals. Fruits are round, hairy, brown capsules containing 2-4 dark brown seeds.

REPRODUCTION: Spreads by seed. Seed longevity is unknown, but seeds of related *Ipomoea* species can remain viable for over 30 years.

Three-lobe morning glory a. plant; b. infestation (a. Neha.Vindhya; b. Vengolis)

Three-lobe morning glory c. leaf; d. flowers; e. mature capsule fruit (c. J.M.Garg; d. Vengolis; e. Forest & Kim Starr, Starr Environmental)

HABITAT: Tolerates a wide variety of conditions in warm climates, including full sun to deep shade. It can be found in cultivated fields, grassy swamp margins, in hedgerows, along roadsides, and in waste places in sandy ground.

LOOK-ALIKES: The vining habit combined with white to purple funnel-shaped flowers help differentiate this species from unrelated look-alikes. Several native and exotic morning glory species occur in North America and can be distinguished by their differences in flower color, leaf shape, and root structures. The weedy field bindweed (*Convolvulus arvensis*) is a perennial with a rhizomatous root system and smaller, arrowhead-shaped leaves. Hedge bindweed (*Calystegia sepium*) is a similar native but typically weedy species that climbs much higher on vegetation or structures (6.5-13' or 2-4 m) compared to three-lobed morning glory. Hedge bindweed leaves are also narrower and much less lobed, appearing nearly triangular. The exotic sweet potato (*Ipomoea batatas*) has larger flowers (1.25-2.75" or 3-7 cm across) and sweet potato tuber roots.

Look-alike: sweet potato (Forest & Kim Starr, Starr Environmental)

NOXIOUS WEED LISTINGS: AR, FL (Noxious), OK (Noxious), SC

NOTES: Germination greatly increases if the seed coat is damaged (scarification).

Marlberry

Ardisia japonica (Thunb.) Blume

SYNONYMS: Japanese ardisia, *Bladhia japonica* Thunb.

ORIGIN: East Asia

GROWTH TRAITS: Evergreen sub-shrub growing 8-12" (20-30 cm) tall from a stoloniferous root system. Underground runners root at nodes and send up stems, eventually forming dense mats. Stems do not branch. Leaves are alternate or sometimes whorled at branch tips, shiny, dark green, and leathery. Leaves are elliptical, up to 1.5-2.75" (4-7 cm) long and 0.6-1.5" (1.5-4 cm) wide, and have finely toothed margins. Flowers appear in small and often hanging clusters beneath new foliage in early summer. Flowers are star-shaped with 5 pale pink petals and are 0.5" (1.3 cm) across. Fruits are red, 0.25" (0.6 cm) across, and cherry-like with stone centers. Fruits appear in fall and persists on the plant throughout winter. Most plants are long-lived when growing under favorable conditions.

Marlberry a. plant; b. infestation (a. Krzysztof Ziarnek, Kenraiz; b. Erika Simons, San Felasco Hammock Preserve State Park, Gainesville, FL 2009)

Marlberry c. leaves and fruit; d. flowers; e. fruit (c. Qwert1234; d. Alpsdake; e. Hamachidori)

REPRODUCTION: Spreads by seed and stolons. Seeds of many *Ardisia* species lose viability rapidly upon drying. Once fruits lose moisture or breakdown to expose seeds, viability is typically limited to a few weeks.

HABITAT: Grows best in moist, well-drained, acidic soil, and in partial to full shade. It cannot tolerate long periods of full sun. In North America, it can be found in upland southern hardwood forests.

Look-alike: coral ardisia (Dick Culbert, Gibsons, B.C., Canada)

LOOK-ALIKES: Three additional *Ardisia* species are present in the USA and all share some traits with marlberry, including the native island marlberry (*A. escallonioides*), the exotic coral ardisia (*A. crenata*), and the exotic shoebutton ardisia (*A. elliptica*). All three grow much taller (at least 3.3' or 1 m, but frequently taller), have branched stems, and produce more fruit. The fruits of island marlberry and shoebutton ardisia turn black when ripe.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Marlberry is a popular ornamental groundcover that only recently escaped cultivation in the USA.

Roughhairy indigo

Indigofera hirsuta L.

SYNONYMS: hairy indigo

ORIGIN: Africa, southern Asia, Australia

GROWTH TRAITS: Herbaceous annual that can grow erect up to 3.2' (1 m) tall from a deep central taproot. More frequently, however, it forms a spreading, low-growing groundcover. Stems are reddish, rounded, slightly ridged, and covered in reddish hairs. Leaves are alternate, 1-4" (2.5-10 cm) long, and divided into 5-7 opposite leaflets with one terminal leaflet. Leaflets are 0.6-1.6" (1.5-4 cm) long, elliptical-oblong, and have smooth margins. The terminal leaflet is longer than the lateral leaflets. Both sides of leaflets are hairy. Numerous flowers are produced in late summer through fall and are clustered together at the tips of flowering stems. Flowers are pea-like (having a banner, wing and keel, typical of the pea family) and can be brick red to rose-colored. Sepals are covered in stiff, brown hairs. Fruits are straight, skinny, pods up to 0.8" (2 cm) long. They are covered in small hairs and contain 6-9 brown, cubic seeds.

Roughhairy indigo a. plant segment; b. spreading growth (a,b. Ahmad Fuad Morad)

Roughhairy indigo c. plant with taproot; d. stem and leaf with opposite leaflets and one terminal leaflet; e. flowers; f. fruits (c,d,f. Alex Popovkin, Bahia, Brazil; e. Bob Peterson)

REPRODUCTION: Spreads by seed. Seeds remain viable for at least four years.

HABITAT: Grows best on open, disturbed sites and tolerates sandy, infertile soil as well as dry and moist conditions. It typically invades cultivated and waste areas, grasslands, savanna, dry and deciduous forests, river banks, and beaches. It does not tolerate frost.

Look-alike: upright indigo (Forest & Kim Starr, Starr Environmental)

LOOK-ALIKES: The combination of groundcover growth, alternate leaves with opposite leaflets, hairy stems, and pea-like flowers help differentiate roughhairy indigo from unrelated look-alikes. Several species of *Indigofera* occur in the USA and may resemble roughhairy indigo at various stages. Most of these potential look-alikes can be differentiated by growing as taller shrubs, lacking hairs, having pink flowers, and different shapes/sizes to their leaves and fruits. For example, the exotic softhairy indigo (*I. pilosa*) lacks the red/brown hairs and dense foliage of roughhairy indigo. The native upright indigo (*I. suffruticosa*) is a less hairy shrub with thicker, more curved fruits.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species was intentionally introduced into Florida and promoted as a groundcover since the early 1900s. It has since naturalized.

Australian pine

Casuarina equisetifolia L.

SYNONYMS: Australian beefwood, common ironwood, beach she-oak, coast she-oak, horsetail she-oak, *Casuarina litorea* L. ex Fosberg & Sachet

ORIGIN: Asia, Australia, the Pacific Islands

GROWTH TRAITS: Deciduous tree growing 26-110' (8-33.5 m) tall from a dense, fibrous, and shallow root system. Trees often have a single trunk and an uneven canopy. The exterior bark is gray, brittle, and furrowed; inner bark is reddish-brown. Branchlets resemble pine needles and are drooping, very thin, 4-8" (10-20 cm) long, and gray-green. True leaves are reduced to tiny scales that encircle branchlet joints in whorls of 6-8. Tiny male and female flowers are produced separately on the same plant. Male flowers are on non-showy spikes at branchlet tips. Female flowers grow in reddish clusters at branchlet bases. Flowering occurs twice per year in the USA in early spring and fall. Fruits are produced in early summer and winter. They are woody cone-like structures up to 0.75" (2 cm) long and containing 70-90 winged seeds. A typical tree lives 40-50 years.

Australian pine a. trees; b. bark (a. Tony Pernas, USDI National Park Service, bugwood.org; b. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

Australian pine c. needle-like twigs and immature fruit; d. female flowers, twigs, scale-like whorled leaves, and fruit; e. mature fruit (scale bar in cm)(c. Atamari; d. PePeEfe; e. Christina Southwick, USDA APHIS PPQ CPHST, bugwood.org)

REPRODUCTION: Spreads by seed but can also re-sprout from the root system following damage. Seeds typically remain viable for up to one year.

HABITAT: Grows best on open, disturbed sites and tolerates sandy, infertile, and salty soil. It typically invades sand dunes and ocean shores, and can move into coastal pinelands and filled wetlands. It does not tolerate frost or permanently waterlogged soil.

Look-alike: *Casuarina glauca* (Forest & Kim Starr, Starr Environmental)

LOOK-ALIKES: The needle-like branchlets and cone-like fruits resemble true pines, but the jointed nature of the branchlets and the long clusters of the fruits help differentiate this species from true pines. There are other species of exotic *Casuarina* present in the southeastern USA. Other species are monoecious (their male and female flowers are on separate plants), have larger numbers of whorled leaves at branchlet joints, smaller fruits, longer branchlets, and may have root suckers and/or a more shrubby form.

NOXIOUS WEED LISTINGS: FL (Noxious, Prohibited Aquatic)

NOTES: The shed leaves of Australian pine are allelopathic, chemically suppressing the germination of other species.

Broadleaved pepperweed

Lepidium latifolium L.

SYNONYMS: perennial pepperweed, broadleaf peppergrass, broadleaf pepperwort, dittander, peppergrass, perennial peppergrass, perennial pepperwort, tall whitetop

ORIGIN: Asia, Europe, the Mediterranean

GROWTH TRAITS: Herbaceous, perennial growing 1-5' (0.3-1.5 m) tall from an extensive creeping root system. Rosettes develop in late fall to early spring and have waxy, toothed leaves that are 4-12" (10-30 cm) long and 1-2" (2.5-5 cm) wide. Stems emerge from semi-woody crowns or the creeping roots. Stem leaves are waxy, alternate, oblong, and often have toothed margins. Stem leaves are up to 4" (10 cm) long and decrease in size higher up on the stem. Lower leaves have petioles while upper leaves do not. Flowers appear spring through summer in dense clusters at stem tips. Flowers are white, up to 0.1" (3 mm) in diameter, and have 4 petals and 6 stamens. Fruits are spherical to slightly oval, up to 0.8" (2 mm) long, contain 2 seeds, and are typically smooth but may be slightly hairy.

Broadleaved pepperweed a. plant; b. infestation (a. Mary Ellen (Mel) Harte; b. Leslie J. Mehrhoff, University of Connecticut; a,b. bugwood.org)

Broadleaved pepperweed c. leaves and stem; d. flowers; e. matured and dried out fruits
(c. Mary Ellen (Mel) Harte; d,e. Leslie J. Mehrhoff, University of Connecticut; c-e. bugwood.org)

REPRODUCTION: Reproduces occasionally by seed, but most spread is vegetative by sending new shoots up from its creeping root system (or fragments) and its semi-woody crown. Seeds may remain viable for at least two years.

HABITAT: Broadleaved pepperweed can tolerate a wide variety of conditions. It is a frequent invader of moist sites such as riparian areas and wetlands, but readily spreads into other habitats, including arid rangelands, open mountainsides, roadsides, and other disturbed sites.

Look-alike: whitetop (Luis Fernández García)

LOOK-ALIKES: Several related species are present in North America and resemble broadleaved pepperweed with their similar leaves and/or tiny flowers with 4 petals and 6 stamens. Many look-alikes have yellow flowers and linear fruit. Of those with white flowers, several look alikes have different leaf and fruit shape and grow smaller than broadleaved pepperweed. The exotic whitetop (*Lepidium draba*) can look very similar, but typically only grows 16-20" (40-50 cm) tall and has heart-shaped fruit.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species alters the ecosystem in which it grows by changing the concentration of different chemical constituents throughout the soil profile, affecting both the type and number of species capable of growing there.

Cutleaf teasel

Dipsacus laciniatus L.

SYNONYMS: cut-leaved teasel

ORIGIN: Eurasia

GROWTH TRAITS: Herbaceous, short-lived perennial that grows from a taproot. The plant remains as a basal rosette for 1-3 years, after which it sends up flowering stalks that can reach 6-7' (2 m) in height. Leaves have a thick, light-colored midvein. Rosette leaves have fringed margins; stem leaves are more deeply lobed, opposite, and fused at the base to form cups that surround the prickly stem. Large, oval flower heads are covered in tiny white flowers, with each flower having a stiff, spiny bract. Even larger spiny bracts cup the flower heads. Flowers bloom from July to September. The middle of the head blooms first, followed by the upper and lower parts. Each flower produces a single, hairy achene fruit that contains 1 seed. The plant only flowers once before dying.

REPRODUCTION: Spreads by seed. Seeds may remain viable in the soil for more than three years, though the majority germinate within one.

Cutleaf teasel a. plants; b. infestation (a,b. Chris Evans, River to River CWMA, bugwood.org)

Cutleaf teasel c. rosette leaves; d. stem leaves; e. prickly stem; f. flower heads (c. Robert Vidéki, Doronicum Kft.; d,f. Chris Evans, River to River CWMA; e. Todd Pfeiffer, Klamath Country Weed Control; c-f. bugwood.org)

HABITAT: Cutleaf teasel is found in open, sunny habitats where it prefers roadsides and other disturbed waste areas, although it can sometimes be found in high quality habitats such as prairies, seeps, and meadows.

LOOK-ALIKES: The opposite and jagged leaves, prickly stems, and stiff flower heads subtended by long bracts help differentiate this species from unrelated look-alikes. Another species of invasive teasel, common teasel (*Dipsacus fullonum*), is very similar to cutleaf teasel, but has purple-colored flowers and leaves without deep teeth or lobes. Some species of *Eryngium*, such as Leavenworth's eryngo (*Eryngium leavenworthii*) may also resemble cutleaf teasel when the flower heads are immature. Leavenworth's eryngo differs by having purple flowers and purple bracts in and beneath the flower head.

Look-alike: common teasel (Ohio State Weed Lab Archive, Ohio State University, bugwood.org)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Flower heads of many teasel species were once used to card wool.

Elephant ear

Xanthosoma sagittifolium (L.) Schott

SYNONYMS: arrowleaf elephant ear, malanga, cocoyam

ORIGIN: tropical South and Central America

GROWTH TRAITS: Stout herbaceous perennial growing 6.5' (2 m) tall from a root system comprised of slender rhizomes. It has a thickened, tuberous underground stem (corm) and numerous smaller, tuberous offshoots (cormels). Leaves arise from the underground stems and have sheathing, overlapping bases. Leaves are arrow-shaped, up to 3.2' (1 m) long, and resemble elephant's ears, resulting in the plant's common name. Leaves are light green, smooth, and with wavy margins. Leaf stalks are ribbed, grow up to 6' (1.8 m) tall, and attach to the margin of the leaf between the two lobes of the "arrow". When cut, the plant exudes a milky, watery sap. The inflorescence consists of tiny, densely packed, cream-colored flowers produced on a long, narrow spadix surrounded by a large greenish-white spathe. The fruit is a small, yellow berry. The plant is fast-growing; corms sprout and can form mature plants within 14-20 weeks.

Elephant ear a. plant; b. infestation (a. Obsidian Soul; b. Tau'olunga)

Elephant ear c. leaf; d. sheathing, overlapping leaf bases and base of inflorescence; e. spadix and spathe (c,d. Dick Culbert, Gibsons, B.C., Canada; e. Jeevan Jose, Kerala, India © 2009 Jee & Rani Nature Photography)

REPRODUCTION: May spread by seed (uncommon). Spreads most frequently by sprouting and fragmentation from rhizomes, corms, and cormels. Corms can be stored for up to 18 weeks in dry conditions but sprout quickly under moist conditions.

HABITAT: Does best in partially shady habitats in tropical rainforest climates in a variety of soils. Leaves may die back in drought, though corms continue growing. The plant is intolerant of waterlogging and freezing temperatures.

LOOK-ALIKES: The arrow-shaped leaves and spadix/spathe inflorescences resemble the exotic taro (*Colocasia esculenta*) and native *Peltandra* species. Taro leaf stalks attach to the undersides of leaves, leaves are smaller, and taro plants exude clear to reddish sap. *Peltandra* species grow smaller than elephant ear and are found in wetland habitats.

Look-alike: taro (Graves Lovell, Alabama Department of Conservation and Natural Resources, bugwood.org)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species was intentionally introduced and cultivated in Florida for its edible tubers. It has since escaped cultivation and is becoming weedy at some locations in the southern USA.

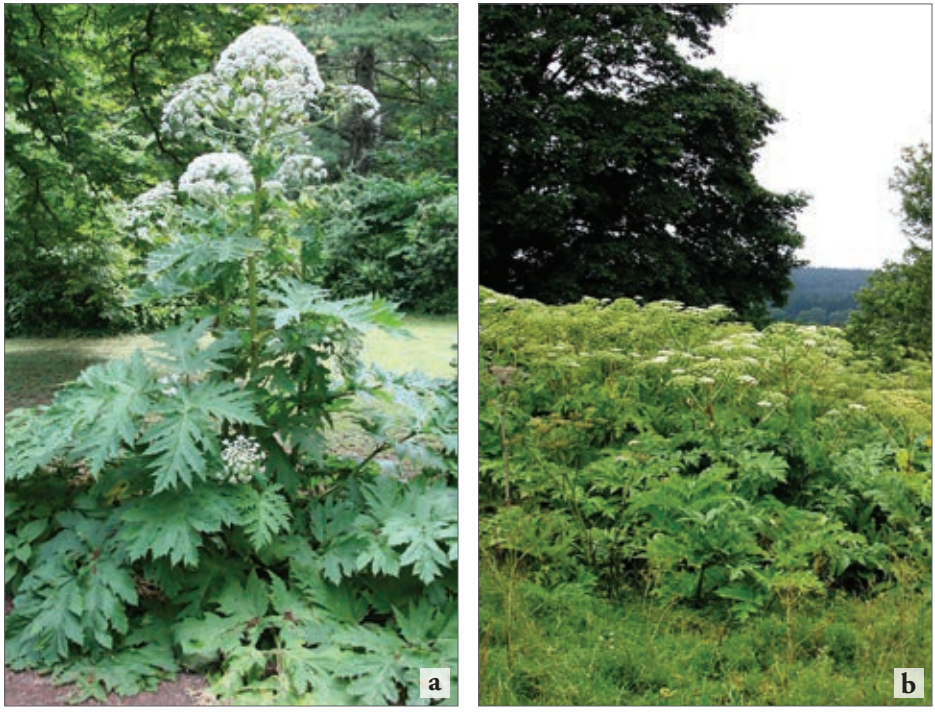
Giant hogweed

Heracleum mantegazzianum Sommier & Levier

SYNONYMS: cartwheel flower, giant cow parsnip

ORIGIN: Eurasia

GROWTH TRAITS: Herbaceous, short-lived perennial growing from a large, branched root system. The plant remains a rosette for 3-5 years. Flowering stems are 2-4" (5-10 cm) in diameter, 6.5-18' (2-5.5 m) tall, hollow, ridged, and marked with purple blotches. Leaves are deeply lobed, coarsely toothed, and up to 6' (1.8 m) in breadth but get progressively smaller up the stem. Stems, leaf undersides, and leaf petioles are covered with coarse, bristly hairs. Small white flowers occur on a large compound umbel (all flower stalks arising from the same point) that can be 2.5' (0.8 m) in diameter. Flowering occurs throughout summer. Fruits are elliptical, up to 0.7" (1.8 cm) long, and when dry are marked with brown, swollen resin canals less than 0.04" (1 mm) in diameter. The plant dies after flowering.



Giant hogweed a. plant; b. infestation (a. Robert Vidéki, Doronicum Kft.; b. Jan Samanek, State Phytosanitary Administration; a,b. bugwood.org)

Giant hogweed c. leaves; d. leaf attachment on stem; e. umbel inflorescence; f. seed (c,e. Robert Vidéki, Doronicum Kft.; d. Rob Routledge, Sault College; f. USDA APHIS PPQ; c-f. bugwood.org)

REPRODUCTION: Spreads by seed. Seeds are dormant the first year but can remain viable in the soil for many years.

HABITAT: Grows best in partial shade and can be found in moist, disturbed soils such as riverbanks, ditches and railroad rights-of-way.

Look alike: common cowparsnip (Dlanglois)

LOOK-ALIKES: The white umbel inflorescences and hollow stems of giant hogweed differentiate it from unrelated look-alikes. Numerous relatives in the Apiaceae are present in North America and some resemble giant hogweed. Only common cowparsnip (*Heracleum maximum*) comes close to approaching the size of giant hogweed's massive leaves. Common cowparsnip differs in that even at its maximum size, it can only reach heights of 10' (3 m) and has smaller leaves up to 18" (45 cm) wide. The native purple stem angelica (*Angelica atropurpurea*), native spotted water hemlock (*Cicuta maculata*), and the exotic poison hemlock (*Conium maculatum*) all have white umbel flowers, hollow stems, and sharply lobed leaves. All three grow shorter and have smaller, more finely divided leaves.

NOXIOUS WEED LISTINGS: AL, FL (Noxious), NC (A), SC, VA (State-Listed)

NOTES: Produces sap that causes skin sensitivity to UV radiation and delayed blistering, severe swelling, and sometimes permanent blindness. **Great care should be taken when handling.**

Narrowleaf bittercress

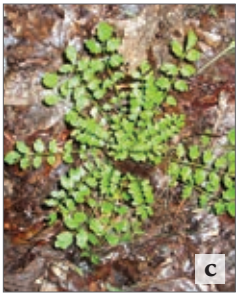
Cardamine impatiens L.

SYNONYMS: touch-me-not bittercress

ORIGIN: Asia, Europe

GROWTH TRAITS: Herbaceous annual or perennial growing up to 2' (0.6 m) tall from a shallow root system. Plants often remain a rosette the first year, and then die back over winter to bolt, flower, and die completely the second year. Stems are erect and smooth. Leaves are thin, membranous, hairless, and divided into 7-19 leaflets. Rosette leaflets have rounded lobes that may be be further notched or lobed. Stem leaves are alternate and at their bases are two narrow, pointed lobes that clasp the stem. Stem leaflets are typically lance-shaped, but can have rounded lobes or jagged teeth. Flowers are arranged in clusters at stem tips and appear from May to September. Flowers are tiny (up to 0.1" or 2.5 mm long) and have 4 white petals and 6 stamens. Fruits are slender, erect, and up to 0.8" (2 cm) long. They split upon maturity, catapulting their numerous tiny rounded seeds long distances.

Narrowleaf bittercress a. plant; b. infestation (a,b. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)



Narrowleaf bittercress c. rosette leaves; d. upper leaves and lobes clasping the stem; e. flowers; f. fruits, some already opened (c-e. Leslie J. Mehrhoff, University of Connecticut, bugwood.org; f. Sarefo)

REPRODUCTION: Spreads by seed. Most seeds germinate within one year; a small percentage may remain viable in the soil for up to five years.

HABITAT: Narrowleaf bittercress prefers moist areas and shade to partial sun. It is typically found in forests and along shaded roadsides, hillsides, rivers, and streams.

Look-alike: Pennsylvania bittercress (Robert H. Mohlenbrock, USDA SCS, USDA-NRCS PLANTS Database)

LOOK-ALIKES: Several native and exotic bittercress species occur in North America and resemble narrowleaf bittercress with their similar leaves and tiny flowers with 4 petals and 6 stamens. The exact combination of tiny white flowers, long and slender fruit, hairless clasping leaves, short height, and moist/shady habitat help differentiate narrowleaf bittercress from potential look-alikes. The native Pennsylvania bittercress (*Cardamine pensylvanica*) has larger white flowers and lacks the clasping leaf lobes. The native sand bittercress (*C. parviflora*) has smaller leaves and narrower leaflets, and no leaf lobes clasping the stem.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: The means of introduction for narrowleaf bittercress is not known, but since its identification in 1916, it has spread throughout New England and is rapidly moving south and east.

Air potato & Winged yam

Dioscorea bulbifera L. & *D. alata* L.

Air potato a. plant; b. leaf and flowers; c. tan bulbil, stem, and underside of leaf (a. Forest & Kim Starr, Starr Environmental; b,c. Karen Brown, University of Florida, bugwood.org)

Winged yam d. plant; e. new leaf and winged stem; f. leaf and flowers; g. bulbil (d. Chris Evans, University of Illinois, bugwood.org; e-g. Forest & Kim Starr, Starr Environmental)

SYNONYMS: Air potato **(AP)**: air yam, bitter yam; Winged yam **(WY)**: water yam

ORIGIN: **AP**: Africa, Asia, Australia; **WY**: Asia

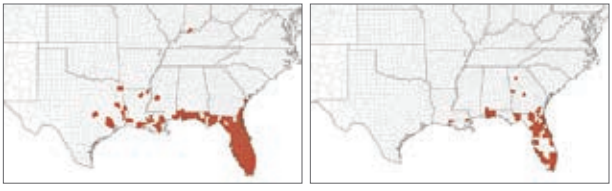
GROWTH TRAITS: Herbaceous, perennial twining vines growing from persistent underground tubers. Vines blanket trees and surrounding vegetation. Leaves are smooth-margined, heart-shaped, attached by long petioles, and up to 8" (20 cm) long. Leaf veins are deep; all arise from the same point and terminate at the same point. Bulbils (aerial tubers) arise from leaf axils. In summer, male and female flowers occur on separate plants, hanging down on spikes from leaf axils. Seeds are tiny and partially winged. Vines die back in winter and re-sprout from tubers in spring. **AP**: Underground tubers are up to 6" (15 cm) in diameter. Vines are non-spiny and grow 66' (20 m) or longer. Leaves are alternate and nearly as wide as long. Bulbils are brown or tan, typically round or angled, and 0.4-5" wide (1-13 cm). Flowers are whitish-green, fragrant, and small. **WY**: Underground tubers can grow 6-8' (1.8-2.4 m) long and weigh 100-150 lbs (45-68 kg). Vines are square in cross-section and compressed to form wings that are often tinged in purple. Mature vines grow 30' (9.1 m) or longer and may be cylindrical and spiny at their base. Leaves are opposite and more narrow than wide. Bulbils are elongate, up to 6" (15 cm) long, and brown when mature. Flowers are creamy white, tiny, and attached to winged fruits.

REPRODUCTION: Both species spread by bulbils and can re-sprout from tubers. Though both can reproduce by seed, they rarely flower in North America. Bulbils are typically viable for up to one year.

HABITAT: Both species tolerate partial to dense shade. They grow in moist, mesic, and/or hardwood forests, forest gaps, along roadsides, and other disturbed areas.

LOOK-ALIKES: **AP** differs from **WY** by growing longer, producing more bulbils, and having smaller tubers and alternate, wider leaves. Native *Dioscorea* have smaller leaves and never produce aerial bulbils. The exotic Chinese yam (*D. polystachya*) has shorter vines, smaller and warty bulbils, and flowers that smell of cinnamon. Some native greenbriar vines (*Smilax* spp.) have similar leaves but can be differentiated by having thorns (most species) and berry fruits.

NOXIOUS WEED LISTINGS: **AP**: AL, FL (Noxious); **WY**: FL



air potato winged yam

Jetbead

Rhodotypos scandens (Thunb.) Makino

SYNONYMS: black jetbead, *Rhodotypos tetrapetalus* (Siebold) Makino

ORIGIN: temperate Asia

GROWTH TRAITS: Small, multi-stemmed, deciduous shrub growing 3-6' (0.9-1.8 m) tall from a creeping root system. Stems are brownish-gray, slender, outward-arching with an open canopy when young, but becoming dense with maturity. Leaves are bright green, opposite, 2-4" (5-10 cm) long and 1-2" (2.5-5 cm) wide, and ovate with a pointed tip. Leaves have doubly-toothed margins, ribbed veins, and a rough surface. Flowers bloom in late spring at the tips of stems. Flowers are up to 2" (5 cm) in diameter, have 4 white petals, and numerous stamens. Each flower produces 4 shiny black, bead-like fruits up to 0.3" (8 mm) in diameter. Fruits often remain on stems through winter.

REPRODUCTION: Spreads by seed and vegetatively by suckering from its creeping root system. Seeds may remain viable for at least two years.

Jetbead a. shrub; b. infestation (a. Kenpei; b. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

Jetbead c. leaves; d. flower; e. fruits (c-f. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

HABITAT: Jetbead prefers moist, well-drained soils in full sun, but can tolerate a wide range of soil conditions and shade. It is a forest invader and an escapee from gardens.

LOOK-ALIKES: Though this species is in the Rosaceae, it differs from others in this family by having 4-petal flowers and opposite leaves. Potential look-alikes in the rose family have 5-petal flowers and alternate leaves. Less related dogwood species, including flowering dogwood (*Cornus florida*) and creeping bunchberry (*C. canadensis*), resemble jetbead with their opposite, deeply veined leaves and similar-looking inflorescences, which are actually multiple small flowers with 4 large, white petal-like bracts. Flowering dogwood is a small tree while creeping bunchberry is a very low-growing subshrub. Both *Cornus* species also differ by producing bright red fruits. Sweet mock orange (also in this guide) is similar with its opposite leaves and 4-petal white flowers with yellow stamens. Sweet mock orange grows taller and its leaves are only weakly toothed and with fewer, shallower veins.

Look-alike: creeping bunchberry (D. Gordon E. Robertson)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species was introduced to the USA in the 1800s as an ornamental.

Sweet mock orange

Philadelphus coronarius L.

SYNONYMS: mock orange, English dogwood

ORIGIN: Eurasia

GROWTH TRAITS: Deciduous, multi-stemmed, rounded shrub growing 8-10' (2.4-3 m) tall by 8' (2.4 m) wide from a suckering root system. Stems are upright initially, but arch and become leggy with age. The reddish-orange bark is exfoliating, sloughing off to reveal light brown bark beneath. Leaves are medium to dark green, opposite, 1.5-3" (4-8 cm) long by 0.5-1.5" (1.3-4 cm) wide, and ovate with a pointed tip. Leaves have slightly toothed margins and curving veins that extend toward the leaf tip rather than the leaf margins. Flowers bloom in late spring/early summer in clusters of 5-7 at the tips of stems. Flowers are fragrant, up to 1.5" (4 cm) in diameter, have 4 white petals, and numerous yellow stamens. Fruits are capsules that turn from green to brown with maturity and open to release numerous small seeds. Fruits often remain on stems through winter.

Sweet mock orange a. plant; b. infestation (a. Dr. Ramses; b. Dow Gardens, bugwood.org)

Sweet mock orange c. leaves and flower; d. flower; e. fruits (c,d. William M. Ciesla, Forest Health Management International, bugwood.org; e. Franklin Bonner, US Forest Service, bugwood.org)

REPRODUCTION: Spreads by seed and suckering from its root system. Seeds may remain viable for at least three years.

HABITAT: Grows best in moist, well-drained soils in full sun, but can tolerate shade and drought once established. It is a frequent escapee from gardens and readily invades open, disturbed areas.

Look-alike: creeping bunchberry (D. Gordon E. Robertson)

LOOK-ALIKES: Flowering dogwood (*Cornus florida*) and creeping bunchberry (*C. canadensis*), resemble sweet mock orange with their opposite, leaves and similar-looking inflorescences, which are actually multiple small flowers with 4 large, white petal-like bracts. Flowering dogwood is a small tree while creeping bunchberry is a very low-growing subshrub. Both *Cornus* species also differ by producing bright red fruits. Jetbead (also in this guide) is similar with its opposite leaves and 4-petal white flowers with yellow stamens. Jetbead grows shorter and its leaves are more deeply veined and doubly-toothed. The exotic pearl bush (*Exochorda racemosa*) has a similar overall appearance. It differs by having alternate leaves with more rounded tips and also 5 petals.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species is a popular ornamental for gardens in temperate regions.

Thunberg's meadowsweet

Spiraea thunbergii Siebold ex Blume

SYNONYMS: Thunberg spirea, baby's breath spirea, breath of spring spirea, spirea

ORIGIN: China, Japan

GROWTH TRAITS: Rounded, deciduous shrub growing 3-5' (0.9-1.5 m) tall and equally wide from a fibrous root system. Stems are dense, slender, outward-arching, and branch predominantly from the base. Stems are light brown and often have a zigzag pattern on their bark. Leaves are pale green, alternate, 1.5" (4 cm) long, thin, and have finely-toothed margins. Flowers bloom in early spring before the plant leafs out. The tiny flowers are 0.3" (0.8 cm) in diameter, have 5 white petals, and appear in numerous clusters of 3-5 flowers each. The fruits are inconspicuous, dry brown capsules that split open when ripe. Fruits often remain on branches through winter.

REPRODUCTION: Spreads by seed, which may remain viable for many years.

Thunberg's meadowsweet a. shrub; b. infestation (a. Аимаина хикари; b. Kenpei)

Thunberg's meadowsweet c. leaves; d. flowers; e. fruits (related *Spiraea* sp.) (c. Wouter Hagens; d. Аимаина хикари; e. James H. Miller, USDA Forest Service, bugwood.org)

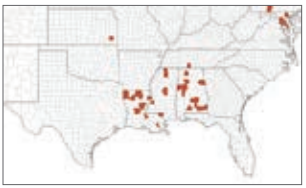
HABITAT: Prefers well-drained soils but can tolerate a wide range of soil types. It grows best in full sun but does well in partial shade in warm climates.

LOOK-ALIKES: Several species of *Spiraea* present in North America closely resemble Thunberg's meadowsweet by growing in similar habitat and having the same overall shape, alternate leaves, and tightly clustered 5-petal flowers. The exotic Japanese meadowsweet (*Spiraea japonica*) differs because of its pink-colored flowers. The exotic bridalwreath spireae (*S. prunifolia*) has larger, more oval-shaped leaves. The native white meadowsweet (*Spiraea alba*) has larger leaves and its flowers occur in large cone-shaped clusters.

Look-alike: white meadowsweet (Homer Edward Price)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species is still popular in the ornamental trade.



Brazilian peppertree

Schinus terebinthifolia Raddi

SYNONYMS: Christmas berry, Florida holly, pink pepper

ORIGIN: South America

GROWTH TRAITS: Evergreen shrub or small tree typically growing 10-30' tall (3-9 m) from a shallow, suckering root system. Most plants have a short trunk hidden in a sprawling thicket of branches. Branches/stems have gray bark and are usually less than 4" (10 cm) in diameter. The compound leaves are alternate, 3-6" (8-15 cm) long, and usually have 7-9 leaflets. Leaflets are arranged opposite each other with a single leaflet at the tip. Leaflets are 1-2.8" (2.5-7 cm) long by 0.4-1.2" (1-3 cm) wide, oval to elliptical with smooth to toothed margins, and have distinct veins. They give off a strong turpentine odor when crushed. Male and female flowers usually appear on separate plants year-round, though most blooming occurs in fall. Both flowers are tiny with 5 white petals and appear in large clustered inflorescences up to 5" (13 cm) long from leaf axils near branch

Brazilian peppertree a. mature plant; b. infestation (a. Stephanie Sanchez, bugwood.org; b. Tony Pernas, USDI National Park Service, bugwood.org)

Brazilian peppertree c. leaf and leaflets; d. flowers; e. fruit (c. Rebekah D. Wallace, University of Georgia; d. James H. Miller, USDA Forest Service; e. USDI National Park Service; c-e. bugwood.org)

ends. Each female flower produces a single dark red, berry-like fruit with a single seed. Some individual plants may live up to 35 years.

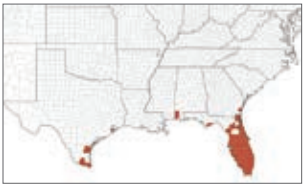
REPRODUCTION: Spreads by seed and by suckering from the root system. Seeds are typically only viable for up to 5 months after dispersal.

HABITAT: Grows best in mesic to wet locations in full sun at low elevations. It is a pioneer of disturbed sites but can move outwards into undisturbed habitats. Cold intolerance prevents its expansion into more temperate regions.

Look-alike: dahoon (Forest & Kim Starr, Starr Environmental)

LOOK-ALIKES: The native dahoon (*Ilex cassine*) is an evergreen shrub with the same height and shape as Brazilian peppertree. Dahoon also has tiny white flowers (separate male and female) and produces numerous red berry-like fruits. Dahoon differs in that its leaves are simple (not compound), are a glossier dark green, and may have tiny teeth at their tips. Dahoon flowers also have only 4 petals. Several native sumac species (*Rhus*) have similar leaves, flowers, and form. Sumacs differ in that their berry-like fruits are hairy.

NOXIOUS WEED LISTINGS: FL (Prohibited Aquatic, Noxious), TX



NOTES: The dried fruits of Brazilian peppertree are used as a spice, sold in gourmet shops in the USA as “pink peppercorn," and are loved by wildlife.

Turkeyberry

Solanum torvum Sw.

SYNONYMS: devil's fig, pea eggplant, susumber, platebrush, prickly solanum, *Solanum ficifolium* Ortega

ORIGIN: tropical South and Central America, Mexico, the Caribbean

GROWTH TRAITS: Evergreen shrub or small tree typically 6.5-10' (2-3 m) tall but occasionally growing ~16' (5 m) tall from weak taproots and well-developed rhizomes. One to several soft-wooded stems sprout from rhizomes, often forming impenetrable thickets. Stems, which turn from green to brown with maturity, have scattered stout, straight or slightly curved prickles. Leaves are alternate, up to 10" (25 cm) long and 3" (7.5 cm) wide, dark green above and lighter below, and may have prickles scattered along the main veins. Leaves vary from elliptical with wavy margins to deeply lobed; all have petioles 0.4-1" (1-5 cm) long. Stems, leaves, and leaf petioles are covered with fine, star-shaped hairs. Flowers occur in large, branched clusters at the ends of branches throughout the year. Flowers are star-shaped with 5 white petals and yellow centers, 1" (2.5 cm) across, and have

Turkeyberry a. plant; b. infestation (a,b. Forest & Kim Starr, Starr Environmental)

Turkeyberry c. leaves with smooth margins and lobed margins; d. flowers; e. immature (green) and mature (yellow) fruit (c,e. Forest & Kim Starr, Starr Environmental; d. Filo gèn')

glandular hairs. Fruits are green berries 0.6" (1.5 cm) across that turn yellow when ripe and contain many seeds. Most plants live less than 5 years.

REPRODUCTION: Spreads by seed and sprouting from its rhizomes. Seeds of many *Solanum* species remain viable for up to 10 years.

HABITAT: Grows well in a variety of habitats. It does best in warm, moist, fertile conditions, but once established it can withstand drought.

LOOK-ALIKES: Several *Solanum* species resemble turkeyberry with their lobed, prickly leaves, 5-petal star-shaped flowers, and berry fruit. Turkeyberry is unique with its small tree form. Smaller look-alikes that resemble young turkeyberry include the native Carolina horsenettle (*S. carolinense*) and the exotic tropical soda apple (*S. viarum*) which have mottled green immature berries and flowers that are either purple-tinged (Carolina horsenettle) or recurved (tropical soda apple).

Look-alike: tropical soda apple (Charles T. Bryson, USDA ARS, bugwood.org)

NOXIOUS WEED LISTINGS: AL, FL (Noxious), NC (A), SC

NOTES: Turkeyberry is cultivated throughout the tropics for its sharp-tasting immature fruits. The fruits are also consumed by cattle, aiding in seed dispersal.

Twoleaf nightshade

Solanum diphyllum L.

SYNONYMS: twin-leaved nightshade, amatillo

ORIGIN: Mexico, Central America

GROWTH TRAITS: Evergreen shrub typically growing 3.3-6.6' (1-2 m) tall from weak taproots and spreading fibrous root system. Stems are generally smooth (sometimes slightly hairy) and have dark brown bark. A diagnostic trait is that leaves grow in pairs from a single node. Each pair is comprised of a larger elliptical leaf up to 3" (7.5 cm) long and a smaller ovate leaf up to 1" (2.5 cm) long. Both leaves are a glossy dark green on the upper surface and a lighter green beneath. Throughout spring and summer, flowers occur in small clusters from the same nodes as leaves, but opposite the leaf pair. Flowers are drooping, up to 0.4" (1 cm) across, and have 5 white recurved petals tinged in violet with yellow centers. Fruits are green berries, 0.4" (1 cm) in diameter, that turn yellow to orange when ripe and contain numerous seeds. In temperate climates, plants may die back in winter and re-sprout from roots in spring.

Twoleaf nightshade a. plant; b. branches with mature fruit (a. © Colleen M Simpson, iNaturalist.org; b. Charles T. Bryson, USDA ARS, bugwood.org)

Twoleaf nightshade c. leaves and immature fruit; d. inflorescence attachment at node opposite the leaves; e. flowers; f. immature (green) and mature (yellow-orange) fruits (c,d. Obsidian Soul; e,f. Charles T. Bryson, USDA ARS, bugwood.org)

REPRODUCTION: Spreads primarily by seed but can also re-sprout from the root system following damage. Seeds remain viable for at least two years; those of many other *Solanum* species remain viable for up to 10 years.

HABITAT: Grows well in a variety of habitats from full sun to full shade. It does best in warm, moist, fertile conditions, but once established it can withstand drought.

Look-alike: tropical soda apple (Charles T. Bryson, USDA ARS, bugwood.org)

LOOK-ALIKES: Some *Solanum* species resemble twoleaf nightshade with their berry fruit and star-shaped flowers with 5 petals. The exotic tropical soda apple (*S. viarum*) is somewhat similar because of its white flowers with recurved petals. Tropical soda apple can be differentiated by its lobed, prickled leaves and mottled berries. Twoleaf nightshade can be differentiated from other potential look-alikes by its unique mismatched leaves that arise in pairs from the same node.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Twoleaf nightshade was introduced to the USA as an ornamental species in the 1960s but quickly naturalized, likely with the aid of birds eating the fruit and dispersing the seeds. Fruits on the otherwise toxic plants are often not edible to humans.

Melaleuca

Melaleuca quinquenervia (Cav.) S. T. Blake

SYNONYMS: broad-leaved paperbark, paperbark, punk tree, white bottlebrush

ORIGIN: Australia, New Caledonia, New Guinea

GROWTH TRAITS: Evergreen tree typically growing 49-80' (15-24 m) tall from a root system that follows a receding water table, producing vertical subsoil roots and thread-like "water roots" that extend from surface roots and submerged trunk portions during flooding episodes. Trees in dense stands have a single, moderately straight trunk while those in open infestations may be multi-stemmed with wide canopies. Branches are ascending on young trees and somewhat drooping on older trees. The corky bark is thick, whitish-orange to brown, and many-layered. Outer layers often become ragged and peel. Leaves are alternate, lance-shaped, leathery, gray-green, and have a camphor-like odor when crushed. Numerous flowers occur on creamy white "bottle brush" inflorescences 1-3" (2.5-8 cm) long. Flowering occurs primarily in fall though some flowers can be observed all year. Capsule fruits are arranged in tight clusters of 30-70; each capsule contains 200-350 tiny

Melaleuca a. tree; b. infestation (a. (Forest and Kim Starr, Starr Environmental, bugwood.org; b. Amy Ferriter, State of Idaho, bugwood.org)

Melaleuca c. leaves and bark; d. flowers, fruits, and foliage; e. seeds (c. Fir0002/Flagstaffotos; d. Forest and Kim Starr, Starr Environmental; e. Tony Pernas, bugwood.org)

brown seeds that are released after interrupting events such as fire, frost, or wind damage. Stems continue growing beyond fruits and produce leaves or additional flowers. Some trees can live more than 100 years.

REPRODUCTION: Spreads by seed and can re-sprout from cut branches and stems. Seeds may remain on trees for 10 years, but are typically only viable for two years in the soil.

HABITAT: Grows in subtropical climates with alternating wet and dry seasons. In the USA, it can be found in moist habitats including sawgrass prairies, freshwater marshes, and cypress and mangrove swamps, as well as the drier zones of pine flatwoods and hardwood bottomlands.

Look-alike: cajeput tree (Eug)

LOOK-ALIKES: The combination of papery bark, aromatic and leathery leaves, bottle-brush flowers, and capsule fruits help differentiate melaleuca from nearly all potential look-alikes in North America. The exotic related cajeput tree (*Melaleuca linariifolia*) is very similar and has been reported in Florida. Cajeput tree only grows up to 33' (10 m) tall and has opposite leaves.

NOXIOUS WEED LISTINGS: AL, FL (Noxious, Prohibited Aquatic), MS (Prohibited Aquatic), NC (A), OK (Prohibited Aquatic), SC, TX

NOTES: This species was intentionally introduced to North America in the early 1900s as an ornamental.

Pagoda tree

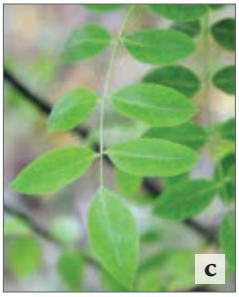
Styphnolobium japonicum (L.) Schott

SYNONYMS: Japanese pagoda tree, Chinese scholar tree, *Sophora japonica* L.

ORIGIN: China, Korea

GROWTH TRAITS: Deciduous tree growing 33-66' (10-20 m) tall and equally wide from a taproot. There is typically one central trunk with numerous upper branches forming a spreading, round canopy. Twigs and branches are smooth and green when young; the bark becomes furrowed and light brownish-gray with age. Leaves are alternate, 6-10" (15-25 cm) long, and divided into 7-17 opposite leaflets with one terminal leaflet. Leaflets are 1-2" (2.5-5 cm) long, ovate, and have smooth margins. Small, pea-like flowers (having a banner, wing and keel, typical of the pea family) are produced in long, loose clusters in late summer. Flowers are creamy white to pale yellow (sometimes pale pink)and slightly fragrant. The fruits are knobby, bean-like pods 3-8" (8-20 cm) long turning from green to brown at maturity. Each pod contains 1-6 seeds and often persists on branches through winter. Some trees may live longer than 60 years.

Pagoda tree a. tree; b. mature bark (a. Krzysztof Golik; b. Amada44)



Pagoda tree c. leaf with leaflets; d. flowers; e. inflorescence; f. leaflets and fruits (c. Amada44; d. A. Gutiérrez & S. Fajarnés; e. © Bob Finkelstein, iNaturalist.org; f. Robert Vidéki, Doronicum Kft., bugwood.org)

REPRODUCTION: Spreads by seed. Seeds may remain viable for at least 3-4 years.

HABITAT: Prefers well-drained, loamy soils and tolerates full sun to partial shade.

LOOK-ALIKES: The tree, leaf, and flower shape resemble other trees in the Fabaceae including the native Eve's necklacepod (*Styphnolobium affine*), Kentucky yellowwood (*Cladrastis kentukea*), and black locust (*Robinia pseudoacacia*). Eve's necklacepod has pinkish flowers and more bead-like pods. Kentucky yellowwood has showier white flowers and shorter, more tapered pods. Black locust also has showier flowers and often has 2 spines at each leaf scar.

Look-alike: black locust (Botaurus)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species was intentionally introduced to North America in the 1800s as an ornamental and subsequently naturalized. Though not obvious from the distribution map at right, this species is present in Washington D.C.

Tungoil tree

Vernicia fordii (Hemsl.) Airy Shaw

SYNONYMS: Chinese wood-oil tree, tung tree, kalo nut tree, *Aleurites fordii* Hemsl.

ORIGIN: China, Myanmar, Vietnam

GROWTH TRAITS: Deciduous tree typically growing 33' (10 m) tall from a shallow, suckering root system. One to a few trunks form a spreading, round canopy. The bark is smooth, thin, and brownish-gray with lenticels initially, developing shallow, reddish-brown, bumpy furrows with maturity. It exudes a milky sap when cut. Leaves are dark green, alternate, 6-10" (15-25 cm) long, and either heart-shaped or with 3 pointed lobes. Leaves have smooth margins, 2 distinctive red glands at their base, and long petioles. The showy flowers are 1-1.5" (2.5-3.5 cm) across and have 5 white petals with red veins. Individual flowers are either male or female but appear together in loose clusters before the leaves emerge in spring. The fruits are produced in autumn; they are spherical, 2-3" (5-7.5 cm) in diameter, green to purple at maturity, and contain 4-5 oily seeds. The average lifespan of an individual tree is 30 years.

Tungoil tree a. tree; b. mature bark (a,b. James H. Miller, USDA Forest Service, bugwood.org)

Tungoil tree c. heart-shaped leaf and 3-lobed leaves; d. glands at leaf base; e. flowers; f. fruit (c-e. Nancy Loewenstein, Auburn University, bugwood.org; f. Kenpei)

REPRODUCTION: Spreads by seed and by suckering from the root system. Seed viability decreases quickly after one year.

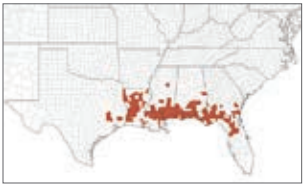
HABITAT: Grows best in open forests with full sunlight, often invading forest edges, rights-of-ways, and urban green spaces. It is not particularly cold tolerant.

Look-alike: southern catalpa (Le.Loup.Gris)

LOOK-ALIKES: The overall tree shape, heart-shaped leaves and white flowers with red veins of tungoil tree resemble the native northern and southern catalpas (*Catalpa speciosa* and *C. bignonioides*). The fruit of both catalpa species differs in being a long, linear pod, and their leaves have an opposite arrangement. The exotic *Paulownia* spp. are also similar, but they have more tubular, purple flowers and opposite leaves.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Tungoil tree was intentionally introduced to North America for the oil in its seed, which was used in the manufacture of varnishes, paints, linoleum, resins, cleaning compounds, and other products. The foliage, sap, fruits, and seeds are poisonous to humans and animals and may cause skin irritation. Seeds may be fatal if ingested.



White leadtree

Leucaena leucocephala (Lam.) de Wit

SYNONYMS: lead tree, coffeebush, horse-tamarind, jumbie-bean, leucaena, sneakytree, vi-vi, white popinac

ORIGIN: Mexico, Belize, Guatemala

GROWTH TRAITS: Fast-growing shrub or small tree typically growing up to 25' (7.6 m) tall from a deep taproot with extensive lateral roots. Older individuals may grow much larger under some conditions. There are one to a few trunks, each 4-10" (10-25 cm) in diameter, multi-branched, and forming an open, rounded canopy. The bark is grayish-brown with shallow, orange-brown vertical fissures. Leaves are alternate and twice-divided, first into 4-9 pairs of opposite sections, each having 13-21 pairs of opposite leaflets. Leaflets are bright green, lance-shaped, 0.3-0.8" (9-21 mm) long, and have smooth margins. The inflorescence is a puffball 0.5-1" (1.2-2.5 cm) in diameter made of 100-180 tiny white flowers. Stamen tips are hairy. Puffballs are produced in clusters of 2-6 in leaf axils or at branch tips throughout the year where moisture is sufficient. Fruits are bean-like pods (each

White leadtree a. plant; b. infestation (a. タクナワン; b. Dan Clark, National Park Service, bugwood.org)

White leadtree c. leaf with twice-divided opposite leaflets; d. inflorescence; e. fruit (c. William M. Ciesla, Forest Health Management International, bugwood.org; d. John Tann; e. Dan Clark, USDI National Park Service, bugwood.org)

puffball yields 5-20) that are flat, brown at maturity, and 4-6" (10-15 cm) long with up to 20 glossy brown, oval seeds. Plants generally live 20-40 years.

REPRODUCTION: Spreads by seed but can re-sprout from roots if the plant is damaged. Seeds are typically viable for 1-5 years, but some may possibly stay viable for 50-100.

HABITAT: Typically found in disturbed, cleared areas, coastal strands, forest outskirts and canopy gaps. It does best in warm temperatures. While it is not frost hardy, it tolerates extensive drought conditions.

Look-alike: mimosa (James Miller, Forest Service, bugwood.org)

LOOK-ALIKES: The combination of twice-divided leaves, puffball inflorescence, and shrub/tree growth help differentiate white leadtree from unrelated look-alikes. Within the same family, the native wild tamarind (*Lysiloma latisiliquum*) differs by growing taller and having wider pods. The exotic mimosa (*Albizia julibrissin*) has pink flowers. Other similar shrubs/trees within the Fabaceae differ from white leadtree by having thorns and/or stamen tips not covered in hairs.

NOXIOUS WEED LISTINGS: FL (Noxious)

NOTES: White leadtree was introduced to the USA in the 1800s as a high protein cattle fodder.

Austrian yellowcress

Rorippa austriaca (Crantz) Besser

SYNONYMS: Austrian fieldcress, *Nasturtium austriacum* Crantz

ORIGIN: temperate Asia, Europe

GROWTH TRAITS: Herbaceous perennial growing 1-3.3' (0.3-1 m) tall from a root system consisting of taproots and rhizomes. Stems are slightly hairy. Upper leaves are alternate, 1-2" (2.5-5 cm) long, lance-shaped, hairless, and can have slightly or very toothed margins. Upper leaves do not have petioles and they clasp the stem. Basal leaves are twice as long (up to 4" or 10 cm long), are deeply lobed, and often have toothed margins. Flowers have 4 petals and 6 stamens, are arranged alternately on short stalks along stem tips, and appear from late spring through summer. Flowers are yellow and up to 0.25" (6 mm) across. Fruits, although rarely produced, are small, spherical and contain numerous seeds.

REPRODUCTION: Though it may spread by seed, fruit production is rare. Most spread is vegetative through aggressive sprouting from the rhizomes.

Austrian yellowcress a. plant; b. infestation (a. Elizabeth Bella, AECOM, bugwood.org; b. 4028mdk09)

Austrian yellowcress c. upper leaves and stems; d. flowers; e. fruits (c. 4028mdk09; d,e. Elizabeth Bella, AECOM, bugwood.org)

HABITAT: Austrian yellowcress frequents moist and disturbed areas along roadsides, fields, pastures, and mud flats.

LOOK-ALIKES: Several other species in this family occur in North America and resemble Austrian yellowcress with their similar leaves and tiny flowers with 4 petals and 6 stamens. The combination of yellow flowers, spherical fruit, clasping leaves, short height, rhizomes, and moist habitat help differentiate Austrian yellowcress from potential look-alikes. The exotic creeping yellow cress (*Rorippa sylvestris*) has similar flowers, roots, and habitat but differs in that its leaves are more finely divided and its fruits are long, thin, and constricted.

Look-alike: creeping yellow cress (SB Johnny)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Austrian yellowcress frequently hybridizes with the exotic creeping yellow cress (*Rorippa sylvestris*). The hybrid is at times considered more invasive than either parent species.

Common nipplewort

Lapsana communis L.

SYNONYMS: nipplewort

ORIGIN: Eurasia

GROWTH TRAITS: Herbaceous winter annual that grows from a large taproot. Rosettes form either in fall and overwinter, or they grow in spring. Stems bolt later in spring and can grow 12-49" (30-125 cm) tall. Stems are greenish-red, rounded, and slightly ridged. Stems branch above the midstem and are generally hairy, though they become less so towards the top. Leaves are alternate, thin, and may have sparse hairs on their upper surfaces with slightly more scattered hairs on their undersides. Leaves have scalloped, wavy margins and a wrinkled appearance. Basal leaves are up to 6" (15 cm) long, broadly triangular, and have two smaller, side lobes along their petioles. Upper leaves are more elliptical, often lack petioles, and decrease in size towards plant tips. The stems and leaves exude a milky sap when damaged. Flower heads are dandelion-like and produced on branched stalks spring through fall. Each flower head is up to 0.5" (1.2 cm) in

Common nipplewort a. plant; b. infestation (a,b. Forest & Kim Starr, Starr Environmental)

Common nipplewort c. basal leaf; d. flower heads; e. seeds (c. T.Voekler; d. Forest & Kim Starr, Starr Environmental; e. Steve Hurst, ARS, USDA-NRCS PLANTS Database)

diameter with 8-20 yellow, notched florets. Flower heads produce numerous golden brown seeds that are 0.1-0.2" (3-5 mm) long, curved, ribbed, bulge slightly at their base, and have no pappus.

REPRODUCTION: Spreads by seed. Most seeds germinate within 2-3 years, but a small number may remain viable for up to five years.

HABITAT: Common nipplewort is a temperate species that can tolerate a variety of soils. It grows best in full to partial sun in areas of disturbance, including gardens, roadsides, waste lots, fields, forest edge, and riparian shores.

Look-alike: mouseear hawkweed (Udo Schmidt)

LOOK-ALIKES: The yellow dandelion-like flower heads and milky sap help differentiate common nipplewort from many unrelated look-alikes. Within the same family, prickly lettuces (*Lactuca* spp.), sowthistles (*Sonchus* spp.), and hawkweeds (*Pilosella* spp.) are very similar. Prickly lettuces and sowthistles have spiny leaves and pappus on their seeds. Hawkweeds are only branched near the tips, have mostly basal leaves, and pappus on their seeds.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Common nipplewort is edible and a popular ingredient in salads, despite its mild bitterness and hairy foliage.

Fig buttercup

Ficaria verna Huds.

SYNONYMS: lesser celandine, pilewort, *Ranunculus ficaria* L.

ORIGIN: Europe, the Mediterranean, temperate Asia

GROWTH TRAITS: Herbaceous, perennial groundcover plant that grows up to 12" (30 cm) tall from thick tuberous roots with tubers and bulblets. Some individuals also produce bulblets in leaf axils. It is a spring ephemeral, sprouting in late winter, flowering in March and April and dying back to its roots by the end of spring. Leaves are produced in a basal rosette and are up to 2" (5 cm) long and wide with wavy margins and long petioles. Leaves are dark green above, lighter below, shiny, thickened, and kidney- to heart-shaped. Flowers are produced individually on long, delicate stalks that rise above the leaves. Flowers typically have 8 (sometimes up to 12) bright yellow and glossy petals and are usually 1" (2.5 cm) in diameter. Each flower produces up to 15 seeds that are hairy and tipped with bristles.

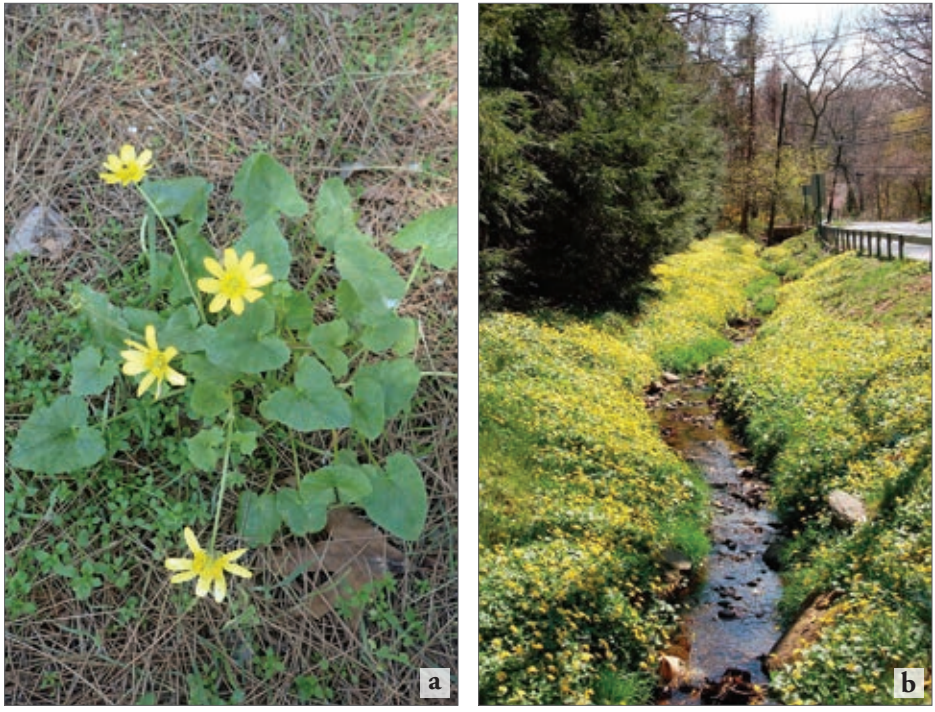


Fig buttercup a. plant; b. infestation (a. Krzysztof Ziarnek, Kenraiz; b. John M. Randall, The Nature Conservancy, bugwood.org)

Fig buttercup c. upper and lower sides of leaves; d. flower; e. fruits; f. bulblets (c. Janie Marlow, NameThatPlant.net; d. Greene Storm, St. John's University; e. Stefan.lefnaer; f. David L. Clement, University of Maryland; c,d,f bugwood.org)

REPRODUCTION: Spreads by seed, tubers, and bulblets. Seeds remain viable for at least 18 months; tuber and bulblet longevity is unknown.

HABITAT: Typically found in moist areas, including forested floodplains, damp meadows, and along streams and ditches.

LOOK-ALIKES: The native marsh marigold (*Caltha palustris*) grows in similar habitat and has similar glossy yellow flowers and kidney-shaped leaves with wavy margins. It differs by having fewer petals (5-9), not producing tubers or bulblets, and growing in clumps instead of a continuous carpet like fig buttercup. Extreme care should be used when managing fig buttercup to ensure it is not the native and rare marsh marigold. The native celandine poppy (*Stylophorum diphyllum*) and exotic celandine (*Chelidonium majus*) also have similar habitat, flowers, and growth form. Both of these potential look-alikes differ by having divided leaves and flowers with only four petals.

Look-alike: marsh marigold (Linda Haugen, USDA Forest Service, bugwood.org)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Fig buttercup was introduced to North America as an ornamental. It is poisonous if ingested raw and potentially fatal to grazing animals.

Maltese starthistle

Centaurea melitensis L.

SYNONYMS: Malta starthistle, Napa thistle, tocalote

ORIGIN: the Mediterranean

GROWTH TRAITS: Herbaceous winter annual that grows from a large taproot. Rosettes form either in fall and overwinter, or they grow in spring. Stems bolt later in spring and can grow up to 3.3' (1 m) tall. Stems are stiff and usually openly branched from near or slightly above the base. Stem leaves are alternate and mostly linear or narrowly oblong. Leaf margins are lightly toothed or wavy, and leaf bases extend down the stems, giving stems a winged appearance. Rosette leaves are typically withered by flowering time (April to July). Flower heads are globe-shaped, up to 0.5" (1.3 cm) in diameter, and have numerous bright yellow florets. Flower heads are covered in somewhat cobwebby bracts tipped with a long central spine (0.5" or 1.3 cm), and a few smaller, purplish side spines. Flower heads produce numerous gray to tan seeds that are up to 0.1" (3 mm) long with deeply notched bases and a tuft of pappus at their tips.

Maltese starthistle a. plant; b. infestation (a. Javier Martin; b. Forest & Kim Starr, Starr Environmental)

Maltese starthistle c. stem leaf and winged stem; d. flower head; e. seeds (c,d. Forest & Kim Starr, Starr Environmental; e. Philmarin)

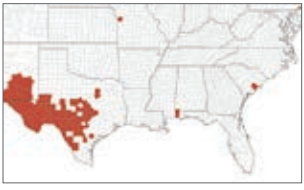
REPRODUCTION: Spreads by seed. Most seeds germinate within 2-3 years, but some may remain viable for up to ten years.

HABITAT: Common nipplewort is a temperate species that can tolerate a variety of soils. It grows best in full to partial sun in areas of disturbance, including gardens, roadsides, waste lots, fields, forest edge, and riparian shores.

LOOK-ALIKES: The stiff, winged stems and flower heads covered in spiny bracts help differentiate Maltese starthistle from unrelated species. Other exotic starthistles are present in North America. Some of these differ by having pink or purple florets. Of the starthistle species with yellow florets, yellow starthistle (*Centaurea solstitialis*) is the most similar to Maltese starthistle. Yellow starthistle has flower heads twice as large with spines twice as long, its spines do not have a purple tinge, and its senesced flower heads shed their spines and retain their cottony centers, which is the opposite of Maltese starthistle.

Look-alike: yellow starthistle (Peggy Greb, USDA-ARS, bugwood.org)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.



NOTES: Seeds easily adhere to animal fur, human clothing, and equipment but are most typically transported in contaminated livestock feed.

Mouse-ear & Orange hawkweed

Pilosella officinarum Vaill. & *P. aurantiaca* (L.) F. W. Schultz & Sch. Bip.

Mouse-ear hawkweed a. plant; b. leaves; c. inflorescence (a. Udo Schmidt; b. Janie Marlow, bugwood.org; c. H. Zell)

Orange hawkweed d. plant; e. leaves; f. inflorescences (d-f. Michael Shephard, USDA Forest Service, bugwood.org)

SYNONYMS: Mouse-ear hawkweed **(MH)**: *Hieracium pilosella* L.; Orange hawkweed **(OH)**: *Hieracium aurantiacum* L.

ORIGIN: Europe (both species)

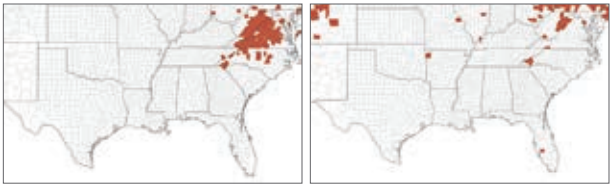
GROWTH TRAITS: Both species are herbaceous perennials with fibrous roots, rhizomes, and stolons. Leaves form a basal rosette in spring; flowering stems bolt throughout summer. Stems and leaves are covered with stiff hairs that can be simple, glandular, and/or star-shaped. The entire plant contains a milky sap. Flower heads are up to 1" (2.5 cm) across with numerous square-edged, notched florets. Bracts are covered in glandular hairs. Seeds are topped by tufts of pappus, resembling dandelion seeds. Stolons extend 4-12" (10-30 cm) and form new rosettes at their tips. Once daughter plants root, the stolons die, and new plants become independent. New plants sprout each year from rhizomes. **MH**: Stems are 4-12" (10-30 cm) tall. Leaves are elliptical, 1-4" (2.5-10 cm) long, and occur only in the basal rosette. Flower heads appear singly on unbranched stems and have yellow florets. **OH**: Stems are 10-24" (25-60 cm) tall and are largely unbranched until the tips, which end in 5-30 flower heads. Leaves are elliptical, up to 5" (13 cm) long, and generally occur only in the basal rosette, though 1 or 2 smaller leaves may occur on the plant stem. Flower heads have reddish-orange florets.

REPRODUCTION: Both species spread by seed, stolons, and short rhizomes. The seeds of both species are typically viable for up to seven years.

HABITAT: Both species tolerate partial shade but grow best in full sun at disturbed sites and are found in pastures, abandoned fields, meadows, and roadsides.

LOOK-ALIKES: Hawkweeds differ from other Asteraceae with their combination of mostly basal hairy leaves, solid stems, dandelion-like flower heads, and milky sap. **MH** differs from **OH** with its yellow florets, smaller size, and unbranched stems. There are several native, exotic, and hybrid hawkweeds in North America. Identification is difficult, which is compounded by the current state of taxonomic flux for members of this group.

NOXIOUS WEED LISTINGS: Neither species is listed as noxious in any southeastern state.



mouse-ear hawkweed orange hawkweed

Wedelia

Sphagneticola trilobata (L.) Pruski

SYNONYMS: Bay Biscayne creeping-oxeye, Singapore daisy, creeping ox-eye, trailing daisy, creeping wedelia, *Wedelia trilobata* (L.) Hitchc.

ORIGIN: tropical South and Central America, Mexico, the Caribbean

GROWTH TRAITS: Herbaceous, fast-growing perennial that forms a dense groundcover from its creeping root system. Stems are 0.5-1' (15-30 cm) long and may root wherever nodes touch the ground; flowering stems ascend and are typically up to 1' (30 cm) tall. Stems are green to red, rounded, and hairy. Leaves are opposite, fleshy, and 1.5-3.5" (4-9 cm) long by 0.8-2" (2-5 cm) wide. Leaves often have short hairs and a pair of lobes on their irregularly-toothed margins. Flowers are daisy-like, bright yellow, and arise singly on stalks year-round. Each flower head is up to 1.5" (3.5 cm) in diameter with numerous tiny yellow florets in the center and 8-13 yellow petal-like florets with toothed tips on the periphery. The base of the flower has many narrow green bracts. Flower heads produce numerous small brown seeds that have no pappus.

Wedelia a. plant; b. infestation (a. J.M. Garg; b. Forest & Kim Starr, Starr Environmental)

Wedelia c. leaves; d. flower head; e. seeds (c. Forest & Kim Starr, Starr Environmental; d. Dan Clark, USDA National Park Service, bugwood.org; e. Steve Hurst, ARS, USDA-NRCS PLANTS Database)

REPRODUCTION: Though it may spread by seed, seed viability is typically low, and most spread occurs vegetatively through stems rooting where they touch the ground.

HABITAT: Wedelia has a very wide ecological tolerance range and can be found in varying conditions, but it grows best in sunny areas with well-drained, moist soil at low elevations. It can be found on beaches and mangrove borders, in fields, open lots, and garbage dumps, and along roadsides, trails, and streams.

Look-alike: beach sunflower (USDA-NRCS PLANTS Database)

LOOK-ALIKES: The combination of its ground-covering form, opposite leaves, and daisy-like yellow flowers help differentiate wedelia from many potential look-alikes. Within the same family, the native beach sunflower (*Helianthus debilis*) is a similar groundcover species with similar leaves and flowers. Beach sunflower's leaves are alternately arranged, and its center florets are dark purple to brown as compared to the yellow of wedelia.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species is popular in the ornamental trade and is commonly spread by the inappropriate dumping of garden waste.

Duck lettuce

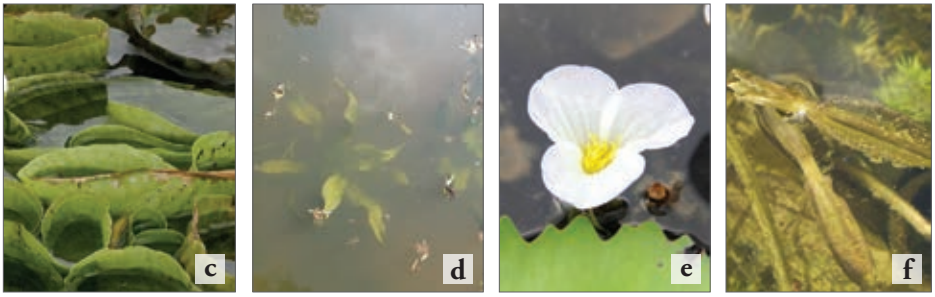
Ottelia alismoides (L.) Pers.

SYNONYMS: water plantain ottelia, *Stratiotes alismoides* L.

ORIGIN: Africa, Asia, Australia

GROWTH TRAITS: Herbaceous, aquatic annual or short-lived perennial that is anchored in the sediment by fibrous roots. Leaves are linear when young, becoming lance-shaped to widely ovate with age. The largest leaves are up to 8" (20 cm) long with petioles ranging from 3-20" (7.5-50 cm) long. Their bases taper towards the petiole. The lower edges of leaves and petioles are sometimes toothed. Upper surfaces of leaves have conspicuous longitudinal ribbing and cross-ribbing, giving the leaves a quilted texture. Leaves are generally entirely submerged, but some leaf edges may be partially emerged depending on water levels. Flowers are produced individually spring through summer and are wrapped within cylindrical structures 0.8-1.6" (2-4 cm) long made of green bracts that have 3 or more ruffled wings (spathes). Flowers are up to 1.2" (3 cm) across with 3 oval, white (sometimes pink) petals and yellow stamens. Though

Duck lettuce a. plant; b. clump (a. 久弘 劉; b. Meneerke bloem)



Duck lettuce c. slightly emerged leaves in profile; d. submerged leaves from above; e. flower; f. beaked fruit (c. J.M.Garg; d. Meneerke bloem; e. Fan Wen; f. Show_ryu)

flowers are typically emergent, they may open fully while still submersed. Fruits are oblong, up to 1.4" (4 cm) long, fleshy, ribbed and beaked. They release up to 2,000 seeds each.

REPRODUCTION: Spreads by seed. Seeds remain viable for up to four years.

Look-alike: *Echinodorus muricatus* (Ude)

HABITAT: Duck lettuce occurs along lake shorelines, marsh ponds, irrigation ditches and stream margins, typically in water ranging from 2"-4.8' (5 cm-1.5 m) deep.

LOOK-ALIKES: The aquatic freshwater habitat, 3-petal white flowers, and oblong leaves resemble many species in North America. Of these, water plantains (*Alisma* spp.) are generally more emergent, have smaller flowers, and narrower leaves. Arrowheads (*Sagittaria* spp.) are also generally more emergent and have arrowhead-shaped leaves. Water trumpets (*Cryptocoryne* spp.) have inflorences consisting of a spadix and spathe, while burheads (*Echinodorus* spp.) produce bur fruits. The quilted leaf ribbing and ruffled wings on flower bracts further differentiate duck lettuce from look-alikes.

NOXIOUS WEED LISTINGS: AL, NC (A), OK (Prohibited Aquatic), SC

NOTES: This species possibly entered North America by hitchhiking with rice seed. Migratory waterfowl are suspected to have contributed to its spread.

European waterstarwort

Callitriche stagnalis Scop.

SYNONYMS: pond water-starwort, common waterstarwort, water chickweed

ORIGIN: Asia, Europe, the Mediterranean

GROWTH TRAITS: Herbaceous, aquatic perennial (sometimes annual) that is anchored in the sediment by slender, linear roots. Stems are flexible, 4-12" (10-30 cm) long, and root from nodes. Leaves are bright green, opposite, thick, and have smooth margins. Floating and emergent leaves are oval to spoon-shaped, up to 0.8" (2 cm) long and nearly as wide, and are often crowded at stem tips. Floating leaves and stems often form dense mats at the water surface. Submerged leaves are typically more linear, up to 0.4" (1 cm) long, and more widely spaced. However, some submerged leaves more closely resemble the shape and size of floating leaves. Flowers are produced throughout summer in the leaf axils of both floating and submerged leaves. Flowers are tiny and have no petals, but have 2-4 small, white, inflated bracts. Fruits are nearly round, up to 0.08" (2

European waterstarwort a. plants; b. infestation (a. © Gerald D. Carr 2017; b. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

European waterstarwort c. floating and emergent leaves; d. flowers and fruit from above; e. flowers and fruit in profile (c-e. © Gerald D. Carr 2017)

mm) long, and have 4 compartments. Each compartment has a tiny wing along its margin.

REPRODUCTION: Spreads by seed and fragmentation. Seed longevity is unknown. Stem fragments root from nodes.

HABITAT: Does best in slowly moving fresh water including ponds and marshes and along the protected banks of streams and lakes.

Look-alike: vernal waterstarwort, submerged (Show_ryu)

LOOK-ALIKES: Multiple species of native and exotic waterstarworts are present in North America, including vernal waterstarwort (*Callitriche palustris*). Due to variability in leaf shape and size, all of these closely resemble European waterstarwort. Fruits are needed for proper identification; fruits of European waterstarwort differ by being nearly round and having tiny wings along the margins of the compartments.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species was likely introduced accidentally to North American seaports via shipping cargo. It was popular in the aquarium trade by the end of the 19th century and likely became established in disjunct populations in the USA via the inappropriate dumping of aquarium contents.

Exotic waterclovers

Marsilea minuta L., *M. mutica* Mett., & *M. quadrifolia* L.

SYNONYMS: cloven fern, pepperwort, water shamrock, dwarf waterclover, Australian waterclover, European waterclover

ORIGIN: Africa, Asia, Australia, Europe

GROWTH TRAITS: Waterclovers consist of a group of very similar and closely related plants. They are aquatic perennial ferns that are anchored in the sediment by slender, branching rhizomes that root at nodes and internodes. Leaves (fronds) arise from rhizomes on slender petioles typically 2-7" (5-18 cm) long, but up to 12" (30 cm) long if the plant is rooted deeply. Leaves may be floating or slightly emerged; emerged leaves may sometimes close at night and reopen with daylight. Each leaf resembles a 4-leaf clover with 4 wedge-shaped leaflets. Each leaflet is 0.25-1" (0.6-2.5 cm) long and wide, typically smooth above, and may have a few short hairs on the underside. Spore-producing structures (sporocarps) are attached to short, branched stalks up to 0.5" (12 mm) long arising from the

Exotic waterclover (*M. quadrifolia*) a. plant with floating and emerged leaves; b. infestation
(a. Krzysztof Ziarnek, Kenraiz; b. Leslie Mehrhoff, University of Connecticut, bugwood.org)

Exotic waterclover (*M. quadrifolia*) c. leaves; d. plant with rhizomes, leaves, and roots; e. branched sporocarps (c. Krzysztof Ziarnek, Kenraiz; d,e. Leslie J. Mehrhoff, University of Connecticut)

bases of leaf petioles. Sporocarps are brown, hairy when young, oval-shaped, and 0.2" (5 mm) long by 0.12" (3 mm) wide. In cold climates, plants often die back to their roots in winter; they may grow year-round at warm locations.

REPRODUCTION: Though sporocarps can be found near the base of leaf petioles, they may remain dormant for decades. The majority of reproduction in the USA is vegetative through rhizomes.

Look-alike: hairy waterclover (©2016 Doug Wirtz)

HABITAT: Waterclovers grow best in shallow, slow-moving waters in semi-shade to full sun in sandy or loamy soils. They can infrequently be found growing terrestrially on muddy ground.

LOOK-ALIKES: Native waterclovers are very similar and are currently the source of much taxonomic confusion. The native hairy waterclover (*Marsilea vestita*) is perhaps the easiest to differentiate with its hairy foliage and unbranched sporocarp stalks. Expert help is likely required for help identifying other *Marsilea* spp.

NOXIOUS WEED LISTINGS: OK (Prohibited Aquatic)

NOTES: Although some differences have been found among the members of this group, the plants show high variability in the field so sporocarps (and sometimes genetic analyses) are needed to tell the three species apart.

Giant salvinias

Salvinia molesta D.S. Mitch., *S. auriculata* Aubl., *S. biloba* Raddi & *S. herzogii* de la Sota

SYNONYMS: watermoss, water fern, floating fern, water spangles

ORIGIN: South America

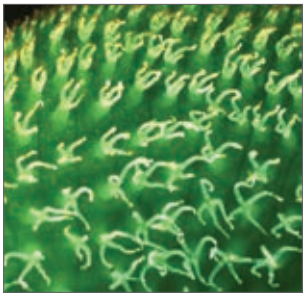
GROWTH TRAITS: Giant salvinias consist of a group of very similar and closely related plants. They are aquatic, free-floating ferns that grow as annuals or short-lived perennials and have no true roots. Horizontal branching rhizomes float just below the surface and bear three leaves (fronds) at each node. Two leaves are floating, and one is submersed and divided into several filaments that resemble (but do not function as) roots. Floating leaves are oval-shaped and up to 1.6" (4 cm) long with smooth margins and distinct midribs. The water repellent white hairs on the upper surface of floating leaves have 4 branches that join back together at the tip, giving them an "egg beater" appearance. Hairs on the undersides of leaves and filaments are unbranched and chestnut-colored. Depending on nutrient and space availability, plants may be slender with small leaves or dense mats with large, crowded, folded leaves. Spore-producing structures (sporocarps) shaped like small eggs are arranged in chains on submersed filaments.

Giant salvinia a. plant with crowded leaves; b. infestation (a. Leslie Mehrhoff, University of Connecticut; b. Kenneth Calcote, Mississippi Dept. of Agriculture and Commerce; a,b bugwood.org)

Giant salvinia c. floating leaves on a non-crowded plant; d. "egg beater" hairs on upper surface of floating leaf; e. senescing plant with rusty floating leaves and filaments with sporocarps (c,e. Leslie J. Mehrhoff, University of Connecticut; d. Mic Julien, CSIRO; c-e bugwood.org)

REPRODUCTION: Though sporocarps can be found on submersed filaments, these species are not known to produce fertile spores in the USA, and all reproduction occurs vegetatively via regular fragmentation of the rhizomes.

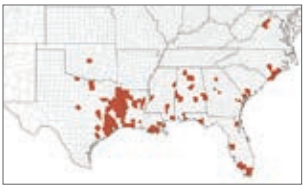
HABITAT: Giant salvinias grow best in still, shallow water with high organic content, and they often form dense mats. They do not tolerate saline environments.



Look-alike: common salvinia branching hairs on leaf surface (Mic Julien, CSIRO)

LOOK-ALIKES: There are at least four exotic species known as giant salvinia present in the USA, of which *S. molesta* is the most common. Sporocarps are generally needed to tell them apart. The exotic and invasive common salvinia (*Salvinia minima*) is half the size of the giant salvinias, and its upper leaf hairs are free near the tips, while the upper leaf hairs of giant salvinias come together at the tips. Native mosquitoferns (*Azolla* spp.) may superficially resemble giant salvinias. Mosquitofern plants are much smaller, typically less than 1" (2.5 cm) wide, and have numerous tiny, overlapping leaves.

NOXIOUS WEED LISTINGS: AL, AR, FL (Prohibited Aquatic), MS (Noxious), NC (A, Aquatic), OK (Prohibited Aquatic), SC, TN, TX, VA (State-Listed)



NOTES: The photos and distribution map pertain to *Salvinia molesta*.

Roundleaf toothcup

Rotala rotundifolia (Buch.-Ham. ex Roxb.) Koehne

SYNONYMS: dwarf rotala, pink sprites

ORIGIN: India, Southeast Asia

GROWTH TRAITS: Fast-growing herbaceous perennial that can grow fully submersed, as an emerged aquatic, and as a terrestrial on shores of drained water bodies. All forms are rooted to the substrate with numerous branched stems growing 1-2.3' (0.3-0.7 m) long and forming creeping clumps by regularly rooting at stem nodes. Stems are soft and green, turning reddish with high light exposure, and have opposite leaves. Submersed leaves are green to reddish, narrow, lance-shaped, and up to 0.9" (2.2 cm) long. Emergent leaves are green, round, 0.4-0.8" (1-2 cm) long, and attach to the stem without petioles. Flowers are produced in clumped spikes at the ends of emergent stems in spring and early summer. Each flower has 4 small, bright pink petals. Fruits are small capsules that split at maturity to release 15-20 seeds each. Plants grow year-round in

Roundleaf toothcup a. plants; b. infestation (a. Robert Vidéki, Doronicum Kft., bugwood.org; b. Colette Jacono, University of Florida Center for Aquatic and Invasive Plants)

Roundleaf toothcup c. leaves and stems; d. flowers; e. flowers and maturing fruit (c,d. Robert Vidéki, Doronicum Kft., bugwood.org; e. Ruff tuff cream puff)

warm climates. In temperate regions, plants die back to roots and may re-sprout the following spring.

REPRODUCTION: Spreads by seed and fragmentation. Seed longevity is unknown, but seeds of other Lythraceae are viable for three to many years. Stem fragments root from nodes.

HABITAT: Does best in warm, humid climates in wet soils and full sun, but can survive in colder climates and tolerates limited shade.

Look-alike: lowland rotala (Patrick J. Alexander, USDA-NRCS PLANTS Database)

LOOK-ALIKES: Though many other aquatic species may have emergent pink flowers and/or opposite leaves, roundleaf toothcup can be differentiated by having dissimilar emergent and submersed leaves and 4-petal flowers. The native lowland rotala (*R. ramosior*) and exotic Indian toothcup (*R. indica*) differ by having flowers that occur in leaf axils rather than at stem tips. The exotic purple loosestrife (*Lythrum salicaria*) grows much taller, has large lance-shaped leaves, and 5-7 petals on each flower.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species is popular in the aquarium and water gardening trades and is frequently a contaminant of rice seed.

Swamp morning glory

Ipomoea aquatica Forssk.

SYNONYMS: water spinach, water morning glory, Chinese water spinach, water-convolvulus, *Ipomoea reptans* auct.

ORIGIN: tropical Asia

GROWTH TRAITS: Herbaceous annual or perennial vine with stems growing up to 10' long (3 m) from a fibrous root system. Vines are rounded, hollow, and root at the nodes. Leaves are alternate, 2-6" (5-15 cm) long, and have long petioles. Leaves are more or less arrowhead-shaped, though their bases often vary. Cut stems and leaf petioles exude a milky sap. Flowers appear in leaf axils throughout summer and are funnel-shaped with fused petals, 1" (2.5 cm) or more across, and vary in color from white to pink to pale purple. Fruits are round, brown capsules containing 2-4 brown seeds.

REPRODUCTION: Spreads by seed and fragmentation when stem fragments root at the nodes. Seed longevity is unknown, but seeds of related *Ipomoea* species can remain viable for over 30 years.

Swamp morning glory a. plant; b. infestation (a,b. Forest & Kim Starr, Starr Environmental)

Swamp morning glory c. leaves; d. flowers; e. seeds (c,d. Forest & Kim Starr, Starr Environmental; e. Julia Scher, USDA APHIS PPQ, bugwood.org)

HABITAT: Swamp morning glory is a weed of warm climates and is susceptible to cold temperatures. It requires moist soil and full sun and is a weed of muddy stream banks, freshwater lakes, marshes, and rice paddies. It can grow terrestrially in these conditions, as well as spreading out over the water surfaces to form dense mats with other vegetation.

LOOK-ALIKES: The vining habit combined with white to purple funnel-shaped flowers help differentiate this species from unrelated look-alikes. Several native and exotic morning glory species occur in North America and can be distinguished by their differences in flower color, leaf shape, and root structures, and their solid (rather than hollow) stems. The weedy field bindweed (*Convolvulus arvensis*) is terrestrial, has a rhizomatous root system, solid stems, and smaller leaves. The exotic sweet potato (*Ipomoea batatas*) has larger flowers (1.25-2.75" or 3-7 cm across), solid stems, and sweet potato tuber roots.

Look-alike: field bindweed (Rachel Winston, MIA Consulting)

NOXIOUS WEED LISTINGS: AL, AR, FL (Noxious), LA, NC (A), OK (Noxious, Prohibited Aquatic), SC, TX, VA (State-Listed)

NOTES: Swamp morning glory is intensively grown and frequently eaten throughout Southeast Asia.

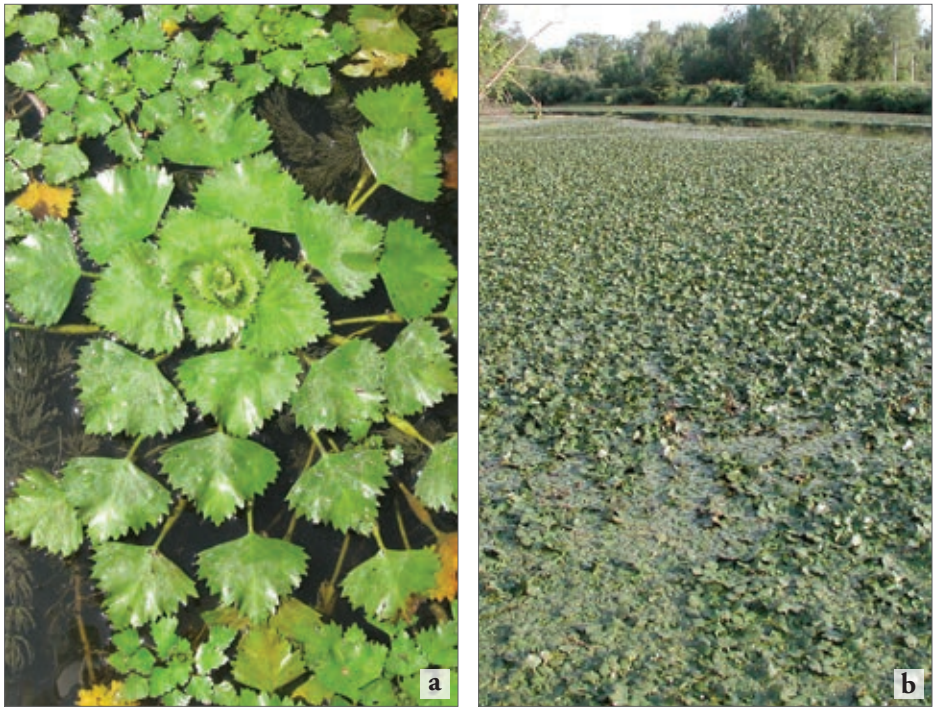
Water chestnut

Trapa natans L.

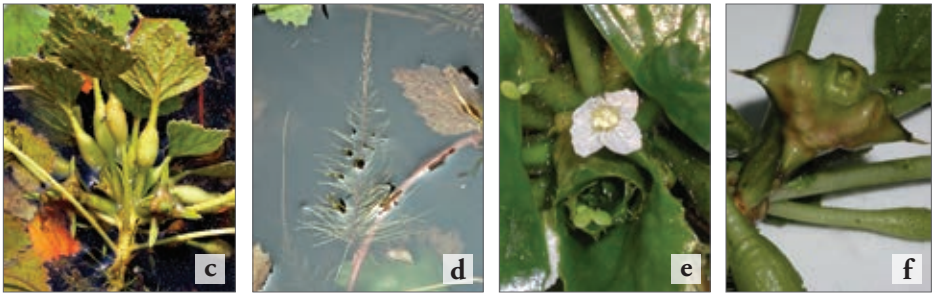
SYNONYMS: European water chestnut, water nut, water caltrop

ORIGIN: Europe, Asia

GROWTH TRAITS: Herbaceous, aquatic annual that is anchored in the sediment by slender, linear roots. Stems are flexible, 3.3-15' (1-4.6 m) long, and root from nodes. Floating leaves are arranged in rosettes (several rosettes per stem) forming dense mats often three layers deep. Floating leaves are triangular, strongly toothed, and up to 2" (5 cm) wide; they have short, stiff hairs and large, inflated petioles. Submerged leaves are alternate or opposite, finely divided, up to 6" (15 cm) long, and grow all along the stem. Flowers are produced individually in rosette centers from summer to the first frost. Flowers have 4 small, white petals. Fruits are up to 1.2" (3 cm) across, nut-like with 2-4 sharp horns, and develop underwater. Frost kills plants, and decomposition is rapid. Fruits sink to the sediment and germinate in spring.



Water chestnut a. floating rosettes; b. infestation (a. Elena Dyatlova~ukwiki; b. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)



Water chestnut c. floating leaves and swollen petioles; d. submerged leaf; e. flower; f. young fruit (c. Karelj; d. Krzysztof Ziarnek, Kenraiz; e,f. Leslie J. Mehrhoff, University of Connecticut, bugwood.org)

REPRODUCTION: Spreads by seed and fragmentation. Seeds can remain dormant in the sediment for up to 12 years, provided they do not dry out. Rosettes are easily detached and carried to new locations where they root and reproduce.

HABITAT: Water chestnut has a warm temperate distribution. It grows best in full sun in slow-moving and nutrient-rich waters. It has also been found in freshwater portions of estuaries and exposed mud flats.

LOOK-ALIKES: The combination of toothed triangular floating leaves, feathery submerged leaves, and 4-petal white flowers help differentiate water chestnut from most other aquatic look-alikes. The exotic mosaic plant (*Ludwigia sedioides*) has toothed floating leaves, but they are diamond-shaped and its flowers have 4 yellow petals.

Look-alike: mosaic plant (Meneerke bloem)

NOXIOUS WEED LISTINGS: AL, FL (Prohibited Aquatic), NC (A, Aquatic), SC

NOTES: This species was intentionally introduced to North America in the late 1800s as an ornamental and subsequently naturalized. It is cultivated globally for its nutritious fruit, and is an important food crop in China and India. The horned fruits readily penetrate skin and shoes and are a safety hazard for humans and other animals.

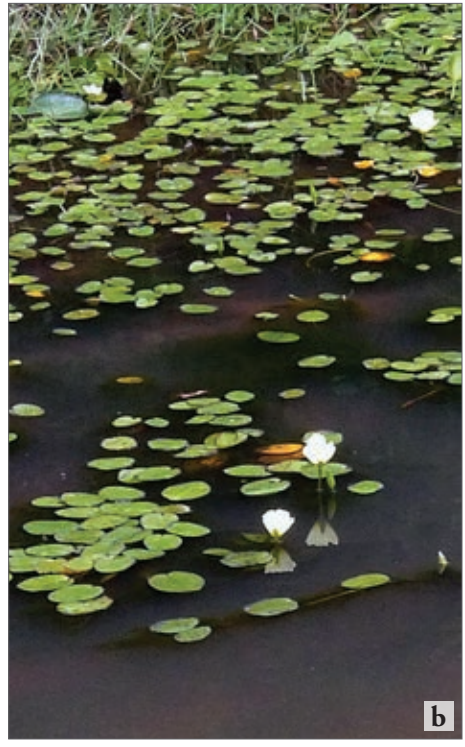
Waterpoppy

Hydrocleys nymphoides (Humb. & Bonpl. ex Willd.) Buch.

SYNONYMS: *Stratiotes nymphoides* Willd.

ORIGIN: Central America, South America

GROWTH TRAITS: Herbaceous, deciduous, aquatic perennial that is anchored in the sediment by slender, linear roots. Leaves grow on long petioles, 6-16" (15-40 cm) long, and may float or be slightly emergent. Leaves are shiny dark green, thick, round with heart-shaped bases, and 2-4.7" (5-12 cm) across. The plant sends out stolons that can float on water and produce new foliage and submerged roots from nodes. Stolon roots will anchor when they come in contact with sediment. Flowers appear throughout summer on long stalks, up to 12" (30 cm) long, emerging from the stolons. Flowers are up to 2.5" (6.5 cm) across with 3 pale yellow, wedge-shaped petals, orangish centers, and numerous purple or brown stamens. Each flower typically lasts only one day. Fruits are beaked capsules up to 0.6" (1.5 cm) long that split longitudinally to release



Waterpoppy a. plants; b. infestation (a. Fan Wen; b. Alex Popovkin, Bahia, Brazil)

Waterpoppy c. leaves; d. leaf stalks and roots; e. flower (c. Daderot; d. Alex Popovkin, Bahia, Brazil; e. Rüdiger Kratz, St. Ingbert)

several small, horseshoe shaped-seeds. In cold climates, plants die back to the roots and stolons in winter and sprout again in spring.

REPRODUCTION: Can reproduce by seed but most spread is via fragmentation as stolon pieces break apart, root, and form new plants.

HABITAT: Waterpoppy grows best in full sun, but it tolerates partial shade. It is a frequent invader of slow-moving freshwater creeks, lakes, and swamps.

LOOK-ALIKES: The floating thick, round, and heart-shaped leaves of waterpoppy resemble those of native and exotic floatinghearts (*Nymphoides*) and water lilies (*Nymphaea*) species. Floatinghearts have leaves more distinctly heart-shaped, and their flowers have 5 petals. Water lilies typically have much larger leaves and numerous petals.

Look-alike: yellow floatingheart (Krzysztof Ziarnek, Kenraiz)

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: Waterpoppy is a popular plant in the water garden and aquarium trades. It frequently escapes gardens and naturalizes after aquarium contents are dumped.

Woolly frogsmouth

Philydrum lanuginosum Banks ex Gaertn.

SYNONYMS: woolly waterlily, frogmouth, *Garciana cochinchinensis* Lour., *Philydrum cavaleriei* H. Lév.

ORIGIN: Asia, Australia

GROWTH TRAITS: Herbaceous, emergent aquatic perennial that is anchored in the sediment by a fibrous root system with short rhizomes. Stems grow in tufts (clumps) up to 1.6-6' (0.5-1.8 m) tall and are green initially, but may turn reddish with age. The erect leaves are attached basally and are 2-ranked (arranged in two rows in the same plane, on opposite sides of the stem). Leaves are linear, growing 1-2.3' (30-70 cm) long by 0.8" (2 cm) wide, and are thickened, flat, spongy, and usually hairy. Flowers are produced in long, thin, woolly spikes from spring through fall (but most frequently in summer). Flowers are 2-lipped and up to 0.6" (1.5 cm) long with yellow petals and one stamen; each rests on a bract nearly as long as the flower, and each lasts only one day. The fruits

Woolly frogsmouth a. plants with green foliage; b. infestation of plants with reddish stems (a. Harry Rose; b. Anthony Koop, USDA, bugwood.org)

Woolly frogsmouth c. leaves; d. inflorescence with two open flowers; e. fruits (c. Bridget Lassiter, NCDA&CS, bugwood.org; d. Harry Rose; e. Lyn Allison, Friends of Westgate Park)

are capsules that turn reddish with maturity and open to release hundreds to thousands of dust-like seeds. This plant may behave as an evergreen in warm, tropical climates, but often dies back from frost in colder regions.

REPRODUCTION: Spreads by seed and sprouting from its short rhizomes. Seed longevity is unknown, but seeds germinate rapidly upon dispersal.

HABITAT: Grows best in full to partial sun in waterlogged soils such as freshwater wetlands, marshes, streams, swamps, rice fields, and margins of streams and lakes but can survive prolonged periods in standing water up to 2' (0.6 m) deep.

Look-alike: yellow flag iris (Jörg Hempel)

LOOK-ALIKES: The exotic yellow flag iris (*Iris pseudacorus*) is similar with its yellow flowers, flat and spongy leaves, overall height, and habitat. It differs with its much larger, showier flowers and its wider leaves. Some native species of rush (*Juncus*) also resemble woolly frogsmouth, but can be differentiated by their round stems, reduced leaves, and clusters of non-showy flowers.

NOXIOUS WEED LISTINGS: Not listed as noxious in any southeastern state.

NOTES: This species is a recent introduction. It was first reported in North Carolina in 2016, though the population may have been present for up to 18 years at that site. It has since been reported at other sites in the southeastern USA.

Glossary

Term	Definition
achene	A small, one-seeded fruit that does not split at maturity
alternate	Where leaves appear singly at stem nodes, on alternate sides of the stem
annual	A plant that completes its life cycle in one year and then dies
awn	A hair- or bristle-like appendage extending from florets of many grasses
axil	The angle between the upper side of a leaf or stem and the stem or branch that supports it
banner	The upper petal of a pea flower (Fabaceae)
basal	Located at the base of a plant or plant part
biennial	A plant that flowers and then dies in its second year
bolting	Plant stage at which the flower stalk begins to grow
bract	A small, leaf-like structure below a flower
bulbil	A small bulblike structure, often in the axil of a leaf or at the base of a stem, that may form a new plant
bulblet	A bulb arising from another bulb and acting as a thick storage organ
compound leaf	A leaf consisting of two or more leaflets borne on the same leaf stalk
corm	Rootstock with a fleshy, swollen stem base that is usually underground and stores food reserves
cormel	Smaller tuberous offshoots of corms
crown	Location where a plant's stems meets its roots
deciduous	Sheds its leaves annually
density	Number of individuals per unit area (e.g. plants, stems, or leaves)
divided	Synonym for compound leaf

Term	Definition
elliptical	Shaped like a flattened circle, symmetrical, tapering equally both to the tip and the base
erect	Grows upright and vertical as opposed to prostrate (spreading on the ground)
exotic	Not native
floret	One of the small, closely clustered flowers forming the head of a composite flower in the sunflower family or the flowering unit of a grass spikelet, consisting of the flower and its two enveloping bracts
flower head	A special type of inflorescence consisting of a receptacle and numerous florets that actually look like one flower. Typical of plants in the sunflower family
forb	Herbaceous plant (does not have solid woody stems)
herbaceous	Does not have solid woody stems
hyperaccumulator	A plant capable of growing in soils with very high concentrations of substances (usually metals or toxins), absorbing these substances through their roots, and concentrating extremely high levels of the substances in their tissues
inflorescence	The flowering part of a plant
involucre	A circle of bracts under an inflorescence
lag phase	First stage of a typical plant invasion during which populations remain at low levels for several years. Plants often become abundant during the next phase
leaflet	A leaf-like part of a compound leaf. Though it resembles an entire leaf, a leaflet is not attached to the main plant stem or branch as a leaf is, but rather on the leaf stalk
lenticels	Raised pores in the stem of a woody plant that allow gas exchange between the atmosphere and the internal tissues
ligule	A thin outgrowth at the junction of leaf and leafstalk of many grasses and sedges and some other species

Term	Definition
lobed	A leaf with shallow or deep, rounded segments, as in a thistle rosette leaf
native	A plant that originated in the geographic area of discussion
node	Part of the stem of a plant from which a leaf, branch, or root grows
ochrea (pl. ochreae)	A saucer-shaped structure that sheathes the stems of certain plants, formed from united stipules or leaf bases
opposite	Where leaves appear in twos at stem nodes, on opposite sides of the stem
ovate	Shaped like an egg, with the base wider than the tip
pappus	A tuft of hairs, scales, or bristles at the base of an achene in flowers of the sunflower family
perennial	A plant that lives for more than two years
petiole	Leaf stalk that attaches the leaf to a plant stem
prostrate	Grows flat along the ground as opposed to growing erect (upright)
receptacle	Part of the stem to which the flower is attached
recurved	Curved backward or downward
rhizome	A modified stem of a plant that grows horizontally underground, often sending out roots and shoots from its nodes
rosette	A compact, circular, and normally basal cluster of leaves
samara	An achene fruit with a flattened, papery wing
scarification	Cutting the seed coat using abrasion, thermal stress, or chemicals to encourage germination
senescence	Final stage in a plant's life cycle
sepal	Typically green segments occurring beneath flower petals that protect the flower in bud and petals when in bloom. Some may resemble petals

Term	Definition
serrated	Toothed with asymmetrical teeth pointing forward as in the cutting edge of a saw
sheath	A tubular or rolled part of an organ, e.g. the lower part of the leaf in most grasses
spadix	Inflorescence with several tiny flowers clustered on a narrow, fleshy stem
spathe	Leaf-like curved bract, typically surrounding a spadix
stamen	The pollen-producing reproductive organ of a flower
stolon	Stem which grows at the soil (or water) surface or just below ground that forms adventitious roots at nodes, and new plants from buds (also called runner)
sporocarp	A fruiting body containing spores
taxonomy	The classification of organisms in an ordered system that indicates natural relationships. The science, laws, or principles of classification; systematics
toothed (margin)	Saw-like leaf margin with somewhat regular teeth on the edge that may be different in size. Also called serrated
tussock	Tuft or clump of growing bunchgrass
umbel	An inflorescence which consists of a number of short flower stalks which spread from a common point, somewhat like umbrella ribs. They can be simple or compound (the single flowers are replaced by many smaller umbels called umbellets)
variegated	Plant foliage having leaves that are edged or patterned in a second color, especially white as well as green
whorled	Where multiple leaves or flowers radiate outward from a single stem node
winter annual	A plant that germinates in autumn, lives through the winter, and produces seed and dies in the following season

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English to Metric Conversions (Length)				
Symbol	**When You Know**	**Multiply By**	**To Find**	**Symbol**
in or ”	inches	2.54	centimeters	cm
ft or ’	feet	0.305	meters	m
yd	yards	0.914	meters	m