

The Quiet Invasion

A Guide to
Invasive Plants
of the
Galveston Bay Area



www.galvbayinvasives.org



**Practical information to
identify and manage
non-native, invasive plants**

For the homeowner, land manager,
and gardening enthusiast in
Harris, Galveston and surrounding counties

2006

List of Species by Scientific Name

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Introduction

Exotic plants are non-native species of trees, bushes, and flowering or non-flowering plants that are cultivated in regions outside of their native range. In other words, exotic plants grown in the Houston-Galveston region are not native to southeast Texas. Exotic plants may originally hail from other parts of the United States or even other areas of the world such as Asia and South America. Many species of exotic plants are popular with gardening enthusiasts because of their beauty, availability, low cost, and ease of cultivation.

Characteristics that make exotic plants popular with homeowners can also lead them to have negative impacts on native flora and fauna. Hardiness and an ability to reproduce and spread can lead some exotic plants to be characterized as invasive. When established in natural habitats, invasive plants can out-compete native plant species and decrease the amount of available habitat for wildlife that depend on native plants for nesting and feeding.

While not all exotics are invasive, some exotic plants are extremely aggressive and can escape from the areas in which they are originally planted. Rhizomes of invasive plants can spread under fences while seeds or plant fragments can be transplanted by the movement of people and equipment, wildlife, water, and wind. Invasive plants can spread to roadsides, vacant lots, agricultural fields, and native habitats such as coastal prairies, wetlands, and riparian forests along bayou banks. Once established in natural habitats, invasive plants can be very difficult and costly to control or eradicate.

The most cost effective way to control the spread of invasive plants that cause damage to native ecosystems and economic losses to humans is to prevent the introduction of invasive plants. Two state regulatory agencies, the Texas Department of Agriculture (TDA) and the Texas Parks and Wildlife Department (TPWD), maintain lists of restricted and prohibited exotic plant species for the State of Texas. Species of exotic plants listed as restricted or prohibited by the agencies cannot be imported, sold, or possessed by individuals without a permit. Violations can be reported to a local TPWD law enforcement office (see list of offices on page 46) and are punishable as a Class C misdemeanor.

Not all of the species included in this field guide are restricted or prohibited in the State of Texas, but those that are, are identified as such in the ensuing pages of the field guide.

Other agencies and organizations act in a nonregulatory capacity to provide information, help local homeowners and land managers control stands of invasive plants, and restore habitat impacted by invasive species. Examples of these organizations include the Texas Cooperative Extension, US Fish and Wildlife Service, Houston-Galveston Area Council, Galveston Bay Foundation, and others.

How to Use This Field Guide

This field guide is intended to help homeowners, land managers, and gardeners living in the Lower Galveston Bay Watershed (Harris, Galveston and surrounding counties) recognize invasive plants, understand the impacts of these species on people and the surrounding environment, choose methods to control established invasives, and choose native plant alternatives. Every species included in this field guide has full color photos for ease of identification as well as physical descriptions of the plant, preferred habitats, geographic distribution, reproduction and growth characteristics, pathways of introduction, and native plant alternatives to be found at or requested from home gardening centers.

Thank you for your interest in preventing the introduction of invasive plants in the Lower Galveston Bay Watershed. Every citizen can do his or her part to protect Galveston Bay and the surrounding watershed by making good choices when choosing plants for use on private or public lands. For information on more invasive plants of the Lower Galveston Bay Watershed visit: www.galvbayinvasives.org/.

Notes on the Use of Chemical Herbicides

Recommendations for chemical herbicides and herbicide application methods are provided for many invasive plant species included in this field guide. When applying chemical herbicides to control invasive plants, great care should be exercised to limit exposure of humans and the environment to potentially dangerous chemicals.

Protective clothing should be worn by persons applying any herbicide. Herbicides should be applied in a targeted and cautious manner that minimizes the impact on nearby humans, pets, livestock, and native plants and animals.

Methods of treatment:

Foliar: Use appropriate dilution of herbicide. Use a broadcast sprayer to apply solution to the leaves of the plant. Note: *Few herbicides exist that control for a specific weed or plant. The majority of herbicides mentioned in this field guide will also affect native non-target vegetation. Thus, use caution to minimize the impact to native plants.*

Cut-Stump: Use an undiluted, full strength herbicide, and apply to cut stump using a paint brush. Add a dye to the herbicide so that it is clear where it has been applied. Note: *in order for cut-stump applications to be effective, they need to take place no more than five minutes after cutting.*

Must-Know Herbicide-Specific Information:

Some herbicides are regulated by the State of Texas and require a permit for use. For more information, see www.agr.state.tx.us/pesticide/compliance/pes_herbicid.htm

Glyphosate: It is a non-selective herbicide (use with care; will affect surrounding native plant populations). Use Rodeo for wetland areas and Roundup for terrestrial areas. According to manufacturer's label, humans and domestic animals should not drink or swim in water treated with Diquat or Glyphosate for one day after treatment.

Imazapyr: Because it can persist in soil for over a year, nearby trees & plants can be affected if not applied properly. In addition, imazapyr is highly mobile in soil, so great care must be taken to avoid ground water contamination.

See more at: www.pesticide.org/imazapyr.pdf

2,4-D: A restricted use herbicide which can only be used by licensed applicators.



▲ Flower stalk and flower of the alligatorweed plant.
Photo courtesy of Robert H. Mohlenbrock, USDA NRCS PLANTS Database, www.forestryimages.org



▲ Foliage of the alligator weed plant; note opposite, non-succulent leaves.
Photo courtesy of USDA ARS Archives, USDA Agricultural Research Service, www.forestryimages.org



▲ Alligatorweed growing from shore to shore of a waterway.
Photo courtesy of Gary Buckingham, USDA Agricultural Research Service, www.forestryimages.org

Scientific Name

Alternanthera philoxeroides

Common Name

Alligatorweed

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture and as a prohibited exotic species by the Texas Parks and Wildlife Department.

Introduction History and Pathways: Introduced to the US from the ballast of ships in 1900.

Native Range: South America

Geographic Distribution: Most common in coastal areas from the Atlantic Coast in Virginia south to Florida, and west to Texas; isolated populations also exist in California. Found in Chambers, Harris and Galveston counties in the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: Grows in high nutrient freshwater aquatic habitats. Prefers to root in shallow water or saturated soils, later extending to open water. Once established, tolerates brackish water, water drawdown, and subsequent dry periods.

Impact: Alligatorweed forms thick mats that crowd out native aquatic vegetation, retard water flow, lower dissolved oxygen levels, and increase sedimentation. Flooding may result from impeded drainage. Can restrict water flow for irrigation; inhibits fishing.

Physical Description: Stems are hairless, often pink, and may be several meters long. Submerged nodes of stems bear roots. Leaves are opposite, simple, sessile, thick, linear-elliptic, up to 9 cm long and 1.5 cm wide, narrowing at the base. Flowers lack petals, are made of small white sepals, and occur in small clusters at the end of a stalk.

Reproductive Characteristics: Blooms in early spring and fruits soon afterward. Reproduction is vegetative; U.S. populations do not produce viable seeds. When fragments containing one node detach, they travel downstream and root.

Growth: Demonstrates extremely vigorous growth both in aquatic and terrestrial warm, moist environments. Between 1963 and 1973, the alligatorweed invasion expanded from 1,200 acres to 11,200 acres in Texas alone.

Control Techniques: Biological control has been very successful using *Agasicles hygrophila*, an aquatic flea beetle; used exclusively to curb alligatorweed populations in most states. Mechanical removal results in numerous fragments which may lead to a population explosion.

Native Species Alternatives:

Pickrelweed	<i>Pontederia cordata</i>
Delta arrowhead	<i>Sagittaria platyphylla</i>
Lizard's tail	<i>Saururus cernuus</i>



▲ **Flowers of the giant reed with pen for size comparison.**
Photo courtesy of Chris Evans, The University of Georgia,
www.forestryimages.org



▲ **Stem identification of the giant reed in early summer.**
Photo courtesy of James H. Miller, USDA Forest Service,
www.forestryimages.org



► **Infestation of the giant reed along a roadside.**
Photo courtesy of James H. Miller, USDA Forest Service,
www.forestryimages.org

Scientific Name

Arundo donax

Common Name

Giant reed, giant cane

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: Introduced as an ornamental in the southwest United States before 1820; later cultivated for erosion control.

Native Range: India

Geographic Distribution: Occurs in the entire southeastern portion of the United States, north to Maryland and Illinois, and west to California. Locally, naturalized populations exist in Galveston and Chambers counties, and along the Navasota River west of Houston.

Habitat Preferences/Requirements: Thrives in moist, well-drained soils with shallow water tables; namely ditch banks, riparian or floodplain areas. Tolerates brackish conditions. Once established, survives periods of extreme drought or excessive moisture.

Impact: A rapid growth rate enables giant reed to overpower native species and form thick stands. Poses problems for groundwater and irrigation water availability. Increases fire risk to developed areas.

Physical Description: One of the largest of the herbaceous grasses, it is erect, tall, cane- or reed-like, with stems typically 0.5-1.5 inches in diameter and hollow. Leaves are alternate, occurring at nodes on the stem 5 to 12 inches apart. Leaves are pale to blue-green, and heart shaped at the base where they are 2-3 inches wide. Leaves reach up to 27 inches or more in length. Flowers occur terminally and are plume-like panicles that are brown to silverish, and reach 10-25 inches in length.

Reproductive Characteristics: Reproduces vegetatively via rhizomes that easily root and sprout; produces no viable seed. Plant fragments are readily transported by water.

Growth: One of the world's fastest growing terrestrial plants, giant reed can grow 2 feet per week, reaching 20 feet in height.

Control Techniques: Mechanical removal is extremely difficult because any root material left behind will re-sprout. If the plant is less than two meters tall, hand pulling may be possible. Use a foliar or cut-culm treatment of 1.5% or 27-40% Glyphosate, respectively. Bioganic is a plant based alternative to Glyphosate, but requires more applications, more cost, with less efficacy. Aquamaster and Rodeo are two brands containing Glyphosate that are approved for use in wetlands.

Native Species Alternatives:

Square-stem spikerush
Sugarcane plumegrass
Powdery thalia

Eleocharis quadrangulata
Saccharum giganteum
Thalia dealbata

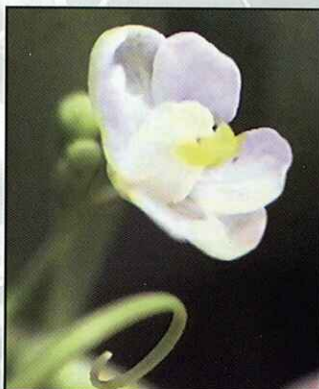


Fruit of the balloonvine.

Photo courtesy of James Manhart, Texas A&M University Herbarium, Digital Flora of Texas Vascular Plant Image Library, www.csdl.tamu.edu/FLORA/imaxxsap.htm.

Flower of the balloonvine.

Photo courtesy of Hugh Wilson, Digital Flora of Texas Vascular Plant Image Library, www.csdl.tamu.edu/FLORA/imaxxsap.htm.



Young foliage of the balloonvine.

Photo courtesy of John D. Byrd, Mississippi State University, www.forestryimages.org



Scientific Name

Cardiospermum halicacabum

Common Name

Balloonvine, love in a puff

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: Brought to the United States as an ornamental vine. Continues to be sold over the internet.

Native Range: Central and South America

Geographic Distribution: Extends from Texas across the Gulf Coast states and north to Michigan and the Northeast. Isolated populations exist within the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: Tolerates a wide range of soil types. Prefers moist, well-drained soils in disturbed or waste areas, as well as thickets in forest edges and riparian areas. Requires plenty of sunlight.

Impact: Thick coverings of this vine will smother and kill native vegetation. Poses a particular threat to riparian trees and shrubs. A destructive weed in soybean fields as well.

Physical Description: A vine with alternate, coarsely toothed compound leaves consisting of 9 leaflets arranged in groups of 3. Flowers grow from leaf axils and are white with four petals. Fruit is a three-sided capsule appearing as an inflated balloon, and is 2.5 inches in length. Young fruit is green, changing to a pale yellow in fall.

Reproductive Characteristics: Reproduces via prolifically produced seed. Blooms in late summer and fruits in early fall. Disperses via wind and animals, especially in high-traffic areas. High potential exists for water dispersal of seeds in coastal areas.

Growth: Balloonvine is a fast grower, quickly reaching 10-12 feet, and is capable of 36 feet, in height.

Control Techniques: Foliar application of a 1-2% dilution of Glyphosate is recommended for smaller vines. A cut stem application of a 100% solution of Glyphosate is recommended for large vines.

Native Species Alternatives:

Crossvine	<i>Bignonia capreolata</i>
Trumpet vine	<i>Campsis radicans</i>
Virginia creeper	<i>Parthenocissus quinquefolia</i>



▲ **Close-up of the elephant ear in cultivation.**
Photo courtesy of Charles T. Bryson, USDA Agricultural Research Service, www.forestryimages.org



▲ **Naturalized elephant ear along the banks of Armand Bayou in Harris County, Texas.**
Photo courtesy of Brenda Weiser, Environmental Institute of Houston, University of Houston-Clear Lake.

Scientific Name

Colocasia esculenta

Common Name

Elephant ear, coco yam, wild taro

Toxicity: Can cause gastrointestinal upset if eaten raw. Sap can irritate sensitive skin.

Prohibited Lists: As of 2006, this species is not listed by the Texas Department of Agriculture or the Texas Parks and Wildlife Department.

Introduction History and Pathways: Grown as a food crop in many parts of the world. Introduced to the United States in 1910 as a substitute crop for potatoes. Later cultivated as an ornamental; numerous varieties continue to be sold.

Native Range: South Asia and India; common in Africa

Geographic Distribution: Occurs in the southeastern United States west to southeast Texas; also found in Puerto Rico and Hawaii (where it is a food crop). Locally naturalized along banks of bayous such as Armand Bayou and lakes including Lake Houston; also found in residential and urban areas within the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: Needs soil that is moist to wet, mildly acidic, and rich in organic material. Found spreading along wetland fringes as well as bayou, ditch, canal, and lake banks.

Impact: Elephant ear invades wetland areas and colonizes lake banks, forming dense growth. Out-competes native species, thus altering natural habitat and ecosystem processes; reduces biodiversity.

Physical Description: Leaves reach 2-3 feet in length and are heart or arrowhead-shaped, green to bluish-black between light-colored primary veins. Leaves emerge basally from an underground stem, or corm. Petioles attach to the middle of the underside of leaf and are green to red, often violet, and can reach 4 feet. The corm is a starchy root reaching 6 inches in diameter and weighing up to 6 pounds. Flowers occur at the apex of a fingerlike flower stalk. Seeds number 2-5 per berry and are generally rare.

Reproductive Characteristics: Reproduces primarily vegetatively, via culm fragmentation and budding at the base of the plant. Disturbance greatly encourages its spread.

Growth: Elephant ear is a fast grower in the presence of warm, wet conditions. The plant will rapidly spread over an area with appropriate wet soil.

Control Techniques: 1% solutions of 2,4-D, Triclopyr, or Glyphosate have provided effective control within 6 weeks of application. In mechanical removal, all care must be taken to keep the plant intact, as remaining fragments will readily germinate.

Native Species Alternatives:

Jack in the pulpit

Arisaema triphyllum

Buttonbush

Cephalanthus occidentalis

Pickrelweed

Pontederia cordata



▲ **Flowers of the Japanese dodder.**
Photo courtesy of James Manhart, Texas A&M University Herbarium, Digital Flora of Texas Vascular Plant Image Library, www.csdl.tamu.edu/FLORA/imaxxsap.htm



▲ **Japanese Dodder on Ligustrum and crepe myrtle in South Houston.** Photo courtesy of Cynthia Heintze, http://texasforests.tamu.edu/images/forest/pest/dodder_tree_hedge1.jpg

Scientific Name
Cuscuta japonica

Common Name
Japanese dodder

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: Discovered in residential areas of Houston near Hobby Airport in 2001 after being introduced to and eradicated from several southern states in the 1970s. Most likely enters as seed in the soil of other imported plants.

Native Range: Asia

Geographic Distribution: Currently only reported in Texas, South Carolina, and Florida. In the Galveston Bay watershed, reported as infesting trees and bushes in suburban areas of Houston.

Habitat Preferences/Requirements: Capable of growing in a wide range of environments; found in fence rows, abandoned land, and residential yards, attacking trees and bushes.

Impact: This parasitic plant threatens native vegetation by killing host seedlings or by making host trees more susceptible to disease. Poses a threat to crops such as alfalfa, asparagus, and tomatoes, in addition to horticultural plants.

Physical Description: A parasitic vine with near non-existent leaves and little chlorophyll. Stems are round, thread-like, and yellow, and twine around the stems of the host plant. Flowers are small (1/8 inches long) and are bell-shaped and cream colored. Fruit is a small capsule containing up to 4 coffee-grain sized seeds which are rough and irregularly ovate.

Reproductive Characteristics: Germinates in the spring near the soil surface. Flowers in late summer and fruits in early fall. A single plant can produce over 2,000 seeds, which remain viable for up to 20 years. Also reproduces via fragmentation and attachment to a new host.

Growth: Grows very rapidly, up to 6 inches per day. As a parasitic vine that penetrates the vascular tissue of its host for water and nutrients, it re-attaches to the host plant as it grows. Once established, its connection to the soil terminates.

Control Techniques: Selective herbicides do not exist, and thus preemergent herbicides, such as Trifluralin along with close mowing, and burning are preferred. Gardeners should plant non-dodder hosts such as grasses or lilies. Do not buy planting seed known to contain dodder seed.

Native Species Alternatives: This is a parasitic plant. There are no native species alternatives. Restore an affected area by replacing plant species killed by Japanese dodder.



▲ Close-up of flowers of the deep-rooted sedge.
Photo courtesy of Richard Carter, Valdosta State University,
www.forestryimages.org

Infestation of the deep-rooted sedge in a ditch.

▼ Photo courtesy of Richard Carter, Valdosta State University,
www.forestryimages.org



Scientific Name
Cyperus enterianus

Common Name
Deep-rooted sedge

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: Most likely introduced via rice agriculture; was first reported in 1990 in the United States; continues to be spread especially along roadsides via mowing, flooding, and soil and equipment movement.

Native Range: South America

Geographic Distribution: Common in all Gulf Coast states and Georgia. Projected to spread as far north as Arkansas and the coastal plains of Virginia. Naturalized in all surrounding Galveston Bay counties, extending as far south as Matagorda and Jackson counties.

Habitat Preferences/Requirements: Thrives in disturbed, inundated soils. Will form monospecific stands in ditches, coastal prairies, low flatwoods, and fallow rice fields. Tolerant to various soil textures (sands to clays).

Impact: Rapidly spreading from disturbed to natural areas. Once established, it out-competes native grasses and sedges, threatening local plant biodiversity. Alters habitat for the endangered Attwater's prairie chicken. A potential pest to rice agriculture.

Physical Description: Grows in robust, loose clumps to up to 40 inches high; leaves are cross-sectionally V-shaped and glossy. Leaf bases are distinctly purplish-black. Culms (stems) are strongly 3-sided. The inflorescence is terminal and consists of 5-11 groups of densely clustered spikelets, which are greenish-white. Culms are connected by thick rhizomes.

Reproductive Characteristics: An aggressive seed producer; large plants can produce 1 million viable seeds/year. Seeds are readily transported by water. Will flower and fruit from June through November. Also reproduces vegetatively via fragmentation and budding of rhizomes.

Growth: Deep-rooted sedge grows very rapidly with a robust root system. Without control, will most likely continue to spread into undisturbed natural areas.

Control Techniques: Glyphosate is expected to achieve 98% control when applied at a rate of 2 quarts per acre. Use a 2% solution on individuals. Mowing at 2 to 4 week intervals suppresses seed production. Machinery should be kept clean to prevent seed spread.

Native Species Alternatives:

Big bluestem	<i>Andropogon gerardii</i>
Sideoats grama	<i>Bouteloua curtipendula</i>
Starrush whitetop sedge	<i>Rhynchospora colorata</i>



Common water hyacinth at the Wallisville Lake Project near the Trinity River. Photo courtesy of Lisa Gonzalez.

Close-up of a flower of the common water hyacinth.

Photo courtesy of Josh Hillman, FloridaNature.org, www.forestryimages.org



Common water hyacinth overtaking open water of the Wallisville Lake Project near the Trinity River.

Photo courtesy of Lisa Gonzalez.



Scientific Name

Eichhornia crassipes

Common Name

Common water hyacinth

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture and a prohibited exotic species by the Texas Parks and Wildlife Department.

Introduction History and Pathways: Introduced in 1884 at a New Orleans expo. Continues to spread via the aquarium plant trade and by boat traffic which fragments and disperses fragments.

Native Range: South America

Geographic Distribution: Naturalized populations exist in Texas and all other Gulf Coast states, in addition to many other states. Found in all counties of the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: Thrives in slow-moving, nutrient-enriched (nitrogen, phosphorus) freshwater. Found in small wetlands, ditches, shallow lakes, slow-moving rivers and canals. Does not tolerate salinity or temperatures below 55 F.

Impact: Alters native vegetation and fish communities by lowering light penetration and dissolved oxygen levels. Impedes boat traffic on rivers and waterways and clogs irrigation canals and intake pumps.

Physical Description: Roots are dark and feathery, only extending into the soil during flowering. Plants float on and extend above the water due to enlarged-bulb-like petioles. Leaves are thick, shiny, bright green, 1-5 inches in width, and are kidney-shaped, or slightly concave. Flowers are conspicuous and lavender, in groups of 8-15 atop a stalk reaching 16 inches. Flowers are 6-petaled, the central lobe of which has a yellow oval-shaped spot. While rarely observed, fruit is a 3-celled capsule, containing many seeds, found in a submerged, withered flower.

Reproductive Characteristics: Primarily reproduces vegetatively, via fragmentation and offshoots of the branching stems. Will also reproduce via seed production in favorable conditions (high temperature and high humidity). Peak flowering occurs in late summer and early fall.

Growth: The plant first develops high root biomass, followed by above-water biomass and daughter plant production. Mats can double in size in 6-18 days and an acre-size mat can weigh more than 200 tons.

Control Techniques: 2,4-D and Glyphosate herbicides are only effective on small populations. Plant harvesting machines/choppers or complete drainage is necessary for large infestations. Care should be taken to control nutrient inputs from the surrounding watershed.

Native Species Alternatives:

Floating heart	<i>Nymphoides aquatica</i>
Delta arrowhead	<i>Sagittaria platyphylla</i>
Floating bladderwort	<i>Utricularia radiata</i>



▲ Close up of Hydrilla infestation on Lake Conroe. Photo courtesy Earl Chilton, Texas Parks and Wildlife Department.

▼ Hydrilla covering the surface of Lake Conroe. Photo courtesy Earl Chilton, Texas Parks and Wildlife Department.



Scientific Name

Hydrilla verticillata

Common Name

Hydrilla, waterthyme, Florida elodea

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture and a prohibited exotic species by the Texas Parks and Wildlife Department.

Introduction History and Pathways: Introduced to Florida via the aquarium trade in Tampa and Miami; first discovered in waterways in 1960. Quickly spread and continues to spread by boat traffic which fragments and disperses plant parts.

Native Range: Southern India for the dioecious form (having male and female flowers on different plants of the same species); Korea for the monoecious form (having male and female flowers on the same plant).

Geographic Distribution: Most common in the southeastern United States, California, and Arizona, but also reported in the Northeast and Washington in the West. Hydrilla exists in Texas reservoirs and waterways from north-central and eastern Texas south to the Rio Grande.

Habitat Preferences/Requirements: Invades both freshwater and brackish water environments. Tolerates water depths from a few inches to more than 20 feet, as well as low to high nutrient environments. Tolerates very low light conditions.

Impact: Dense underwater stands of hydrilla raise water pH and temperature, and lower dissolved oxygen. While the number of fish is often increased, large fish become more rare. Promotes mosquito habitat. Potentially affects hydropower generation by clogging dams.

Physical Description: Rooted in sediments, grows as a submerged underwater plant. Stems branch extensively at the water surface. Leaves are 5/8 inches long, saw-toothed, and yellow-green to green, depending on light exposure. They grow in groups of four to eight in a whorled arrangement around the thin stems. Female flowers (translucent) float on the surface, attached to leaf axils by a thin stalk; male flowers (white to red) break free and float to the surface.

Reproductive Characteristics: Commonly reproduces from fragmented stems which readily regrow, forming new clones of the original plant. New shoots also bud from leaf axils (where petioles attach to the stem) as well as from subterranean tubers.

Growth: Hydrilla can grow up to 1 inch in a day and stems can reach 30 feet in length. Stems grow until they reach the water surface, filling the entire water column.

Control Techniques: Fluridone (slow-acting), Endothall (fast-acting), and copper compounds are all EPA-registered herbicides which require repeated applications. An opaque soil covering is recommended around docks. Mechanical removal encourages spread and is not recommended.

Native Species Alternatives:

White water lily	<i>Nymphaea odorata</i>
Delta arrowhead	<i>Sagittaria platyphylla</i>
Floating bladderwort	<i>Utricularia radiata</i>



Opposite leaves



Flowers



Branches

Leaves of Chinese privet.

Photo courtesy of the Image Archive of Central Texas Plants, University of Texas.

▼ www.sbs.utexas.edu/bio406d/PlantPics_archive.htm



◀ **Japanese privet.**
Photos courtesy of James Manhart, Texas A&M University Herbarium, Digital Flora of Texas Vascular Plant Image Library, www.csd.tamu.edu/FLORA/imaxsap.htm

Scientific Name

Ligustrum japonicum
Ligustrum sinense

Common Name

Japanese privet
Chinese privet

Toxicity: Berries of the genus *Ligustrum* are toxic to livestock and other animals.

Prohibited Lists: As of 2006, these species are not listed by the Texas Department of Agriculture or the Texas Parks and Wildlife Department.

Introduction History and Pathways: Both species were introduced to the United States in the early 1800s; widely cultivated as an ornamental beginning in 1945. Privet is a popular ornamental used in commercial landscaping and is sold in nurseries.

Native Range: Asia

Geographic Distribution: Japanese privet is common in all Gulf Coast states north to Tennessee, Virginia, and Maryland and is present in all counties of the Galveston Bay watershed. Chinese privet is found in the southeastern United States west to Texas, Oklahoma, and Missouri, and as far north as Massachusetts. Chinese privet is scattered across Southeast Texas, and located in Harris, Brazoria, and Galveston counties in the Galveston Bay watershed.

Habitat Preferences/Requirements: Japanese privet tolerates a wide range of moist, but not inundated soils. Thrives in full sun or partial shade. Prefers disturbed areas such as roadsides, or forest edges. Prefers lowland areas and floodplains. Chinese privet has a high preference to wet, disturbed bottomland forest areas, often colonizing the shrub layer along forest edges and fencerows. Shade and flood resistant.

Impact: Japanese and Chinese privet form dense thickets, and can dominate the understory of forests, out-competing nearly all native herbaceous plants.

Physical Description: Japanese privet grows as a shrub to a small tree. Stems and bark are gray-brown and smooth. Leaves are oval, glossy, opposite, and 1.5-4 inches long. New leaves are light green, while mature leaves are a darker green. Flowers are white and abundant in clusters at the end of branches. Fruits are in clusters of blue-black berries and contain 1-4 seeds per berry. Chinese privet has gray-tan branches growing at right angles off multiple trunks. Leaves are oppositely arranged on slender gray-green stems and are green and oval with fine hairs on the underside. Flowers are small and white, 4-petaled, sweet-smelling, and grow in clusters off panicles 4-6 inches long at the end of branches. Fruits are blue-black berries up to 1/4 inches in diameter and contain a hard seed.

Reproductive Characteristics: Seeds of both species are readily dispersed by animals, especially birds. Flowers April to June, and fruit appears in late summer, ripening in the fall. Will also sprout from disturbed roots or cut stumps.

Growth: Growing at 25 inches per year or faster, privet can reach 20-30 feet in height. When uninhibited, its crown may grow up to 25 feet in diameter.

Control Techniques: Plants less than 1 inch in stem diameter should be uprooted. Foliar application: Arsenal AC or Garlon 4 as a 1% or 3% water solution, respectively, are recommended for mid-late summer, and a 3% solution of Glyphosate herbicide is recommended for early summer. Treat cut stumps with 10% Arsenal AC or Velpar L. Care should be taken to avoid native plant species.

Native Species Alternatives:

Yaupon holly	<i>Ilex vomitoria</i>
Virginia sweetspire	<i>Itea virginica</i>
Spicebush	<i>Lindera benzoin</i>



▲ Single stem of the purple loosestrife showing leaves, flowers, and buds.

Photo courtesy of Eric Coombs, Oregon Department of Agriculture, www.forestryimages.org

Flowers of purple loosestrife.

Photo courtesy of John D. Byrd, Mississippi State University, www.forestryimages.org



Scientific Name

Lythrum salicaria

Common Name

Purple loosestrife

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: Brought to the northeastern United States in the early 1800s as an ornamental and medicinal. Rapidly spread west, colonizing wetlands.

Native Range: Europe and Asia

Geographic Distribution: Reported in nearly every state in the United States including Texas, but excluding some southeastern states, New Mexico, and Arizona.

Habitat Preferences/Requirements: Tolerates many kinds of soil, acidic or alkaline, but prefers disturbed organic-rich soil that is exposed. Can thrive in disturbed wetlands with full sun; often found with cattails (*Typha latifolia*) or sedges.

Impact: Purple loosestrife forms dense homogeneous stands, out-competing native vegetation first in wetlands, and later in uplands. Eliminates native food sources for species of waterfowl and cattle.

Physical Description: A stout perennial herb; stems are generally hairy, becoming woody later in the growing season. Leaves are sessile (without petioles) and range from the base to the midsection of the plant, and are green, mildly hairy, narrow, and long. The inflorescence takes up the terminal end of the plant. Flowers have 5-7 petals, are purple, and occur in clusters. Fruit is a small capsule containing around 120 small seeds.

Reproductive Characteristics: A plant may produce 2-3 million seeds per year, which are wind-dispersed. Blooms July through October, and attracts many pollinators including several kinds of bees and butterflies. Also propagates significantly through budding of underground stems.

Growth: A single mature plant is capable of growing up to 9 feet in height. Underground stems which produce new buds can grow up to 1 foot per year.

Control Techniques: Remove small plants including all roots before seed set. Glyphosate is an effective herbicide. Avoid mowing and burning. Avoid "guaranteed sterile" cultivars of purple loosestrife; they are able to cross freely with purple loosestrife.

Native Species Alternatives:

Inland Seaots	<i>Chasmanthium latifolium</i>
Spring spiderlily	<i>Hymenocallis lirusme</i>
Louisiana iris	<i>Iris brevicaulis</i>



◀ Close up of melaleuca flower and leaves.
Photo courtesy of Hawaii's Most Invasive Horticultural Plants - Hawaii DLNR/DOFAW; www.state.hi.us/dlnr/dofaw/hortweeds/



Close up of fruit, woody capsules. ▶
Photo courtesy of the Hawaiian Ecosystems at Risk project (HEAR); www.hear.org

Branches of melaleuca.
Photo courtesy of the Hawaiian Ecosystems at Risk project (HEAR); www.hear.org



Scientific Name

Melaleuca quinquenervia

Common Name

Melaleuca, punktree, cajeput, Australian paperbark

Toxicity: Acts as an irritant to the skin and respiratory system in sensitive people.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture and a prohibited exotic species by the Texas Parks and Wildlife Department.

Introduction History and Pathways: First planted in southern Florida in 1912. Any consequent disturbance encouraged its spread. Was often planted with the intent of draining wetlands.

Native Range: Australia, New Guinea, and Indonesia

Geographic Distribution: Currently only reported in Florida and Louisiana. While not established, has high potential for invasion in the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: Requires moist soil conditions in full sun to partial shade. Prefers wet or intermittently wet subtropical prairies and marshes. Once established, will invade upland pineywoods as well as hardwood bottomlands.

Impact: Melaleuca rapidly colonizes wetlands, turning grassy marshes into forests and displacing nearly all native vegetation. Dramatically changes natural wildlife habitats, fire regimes, and soil hydrology.

Physical Description: The bark of this tree is gray-white and readily peels off the trunk in paper-like sheets. Evergreen leaves are simple, narrow and ovate, and alternately arranged. They are 2-8 inches long and 3/8-1/2 inches wide. Flowers occur in terminal bottlebrush-like clusters of ivory-colored spikes. Fruit is found in groups of 30-70 woody capsules, each containing many tiny seeds.

Reproductive Characteristics: Abundant seed production and dispersal is the primary mode of reproduction. After three years, becomes a prolific seed producer, later reaching as many as 1 million seeds per tree in a year.

Growth: Melaleuca can reach 80 feet in height. Also has the remarkable ability to create a stand of trees 600 feet in diameter, in one year from one tree.

Control Techniques: Requires long-term commitment for eradication. Biological control (snout beetle) is being investigated. Hand pulling of seedlings is effective, control regrowth with herbicide. Note: Herbicide will cause trees to release large quantities of stored seeds.

Native Species Alternatives:

Red mulberry	<i>Morus rubra</i>
Wax myrtle	<i>Morella cerifera</i>
Mexican plum	<i>Prunus mexicana</i>

Single stem of Eurasian watermilfoil showing whorls of compound leaves.
Photo courtesy of Robert H. Mohlenbrock, USDA NRCS PLANTS Database, www.forestryimages.org.



▲ Cluster of stems and leaves of Eurasian watermilfoil at water surface.
Photo courtesy of Alison Fox, University of Florida, www.forestryimages.org



▲ Dense canopy of Eurasian watermilfoil on the surface of a lake.
Photo courtesy of Robert L. Johnson, Cornell University, www.forestryimages.org.

Scientific Name

Myriophyllum spicatum

Common Name

Eurasian watermilfoil

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture and a prohibited exotic species by the Texas Parks and Wildlife Department.

Introduction History and Pathways: Introduced to the United States in the 1940s. By some accounts, it may have been introduced as early as the 1880s. This species is a popular aquarium plant and can be dispersed by movement of boats and trailers.

Native Range: Europe, Asia, and Northern Africa

Geographic Distribution: Present in nearly every state east of the Mississippi River and as well as rivers and streams of the Great Plains and western states. Established in eastern and central Texas, but is not known to be established in the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: Requires a submersed aquatic environment. Tolerates a wide range of salinities and temperatures, but requires plenty of light. Nutrient-rich, slow-moving waters are prone to invasion.

Impact: Eurasian watermilfoil forms thick stands within and above the water column, trapping light and shading out native vegetation. It will stagnate water by increasing pH and temperature, lowering dissolved oxygen, thus promoting mosquito breeding habitat.

Physical Description: Stems are long and slender, often branching near the water surface. Growing tips are often red, and stems generally reach 6-9 feet in total length. Leaves are compound, feather-like, and grouped in whorls of 4 at stem nodes where they consist of several multi-divided leaflets. Flowers, small and pink, appear above the water on terminal red-colored stems and are 1.5-3 inches long.

Reproductive Characteristics: Seed dispersal and germination are not significant means of reproduction. This species propagates by budding from stem fragments or at stem nodes, which later root upon contact with soil; also roots from rhizomes.

Growth: Once established in substrate with temperatures warmer than 60 Fahrenheit, Eurasian watermilfoil rapidly grows toward the water surface. Stems may grow up to 30 feet in length. Regrowth occurs from root crowns in successive years.

Control Techniques: Aquatic herbicides such as Diquat, complexed copper, and Endothall dipotassium salt are effective, while Fluridone is selective. Water level control is also effective. Care should be taken when mechanically harvesting; fragmentation promotes spread.

Native Species Alternatives:

White water lily	<i>Nymphaea odorata</i>
Floating bladderwort	<i>Utricularia radiata</i>
American eelgrass	<i>Vallisneria spiralis</i>



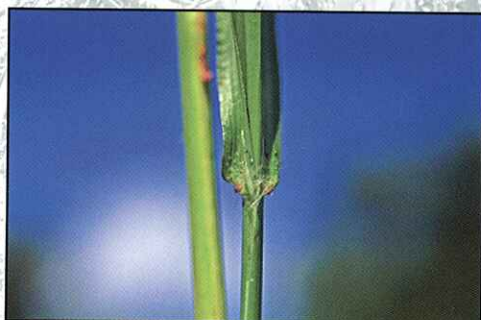
◀ **A cluster of vaseygrass.**
Photo courtesy of Ted Bodner,
Southern Weed Science
Society,
www.forestryimages.org



◀ **Single inflorescence of vaseygrass.**
Photo courtesy of John
D. Byrd, Mississippi State
University,
www.forestryimages.org

Close-up of leaf blade of vaseygrass joining leaf sheath.

Photo courtesy of John
D. Byrd, Mississippi State
University,
▼ www.forestryimages.org



Scientific Name

Paspalum urvillei

Common Name

Vaseygrass

Toxicity: This species is not known to be toxic.

Prohibited Lists: As of 2006, this species is not listed by the Texas Department of Agriculture or the Texas Parks and Wildlife Department.

Introduction History and Pathways: Brought to the U.S. before 1880, attempts were largely unsuccessful at making it a valuable forage crop.

Native Range: South America

Geographic Distribution: Naturalized in the Southeastern U.S. west to Texas, Oklahoma, and Kansas, as well as California and Hawaii. Occurs in all counties of the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: Thrives in well-drained, moist soils. Generally invades disturbed areas in full-sun. Typically found along streams and on the margins of lakes and ponds. Once established, vaseygrass can withstand periods of drought.

Impact: Can invade coastal prairies and wetland fringes, displacing native, wet-prairie grasses. Vaseygrass is potentially invasive in pastures where rotational stocking is employed, and is much less palatable when full grown.

Physical Description: Vaseygrass is a perennial bunchgrass with erect, green culms (stems). Culms are hairless, except at the base where they are thickened, hairy, and purplish. Leaf blades are green, 5-22 inches long, and 0.1-0.5 inches in width. Inflorescence is up to 1 foot in length, and is comprised of 4-30 alternately arranged branches, each about 5 inches long. Seeds occur on one side of the branch.

Reproductive Characteristics: Abundantly produces seeds which are readily wind-dispersed; produces around 970,000 seeds per kilogram of plant biomass. Flowers and seeds are produced from May through November. Seeds ripen unevenly.

Growth: Seedlings of vaseygrass are very vigorous. Erect stems may reach 6 feet in height.

Control Techniques: Foliar application has been shown to be effective using Glyphosate and Imazapyr. If found in pastures, vaseygrass should be grazed heavily to prevent flowering.

Native Species Alternatives:

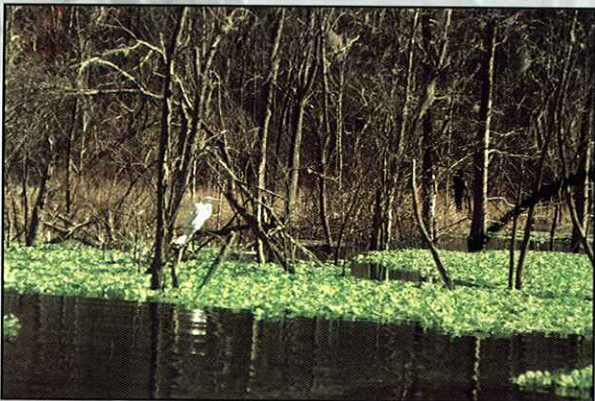
Big bluestem
Inland sea oats
Gulf muhly, gulfhairawn muhly

Andropogon gerardii
Chasmanthium latifolium
Muhlenbergia capillaris



▲ Water lettuce growing among cypress trees at the Wallisville Lake Project near the Trinity River.
Photo courtesy of Lisa Gonzalez.

Infestation of water lettuce in a partially wooded wetland.
Photo courtesy of Richard Carter, Valdosta State University,
www.forestryimages.org



Scientific Name
Pistia stratiotes

Common Name
Water lettuce

Toxicity: Water lettuce produces calcium oxalate crystals. It is harmful when eaten in large quantities. May irritate mouth and throat and can cause nausea, vomiting, and diarrhea.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture and a prohibited exotic species by the Texas Parks and Wildlife Department.

Introduction History and Pathways: Identified in Florida as early as 1765. Disposal of this aquarium plant greatly contributes to its spread. Also used by some cultures for its medicinal qualities.

Native Range: Uncertain, but may be native to Africa and South America due to the existence of water lettuce-associated insects found on those continents. Water lettuce may also be native to Asia based on the existence of ancient medicinal remedies using the species.

Geographic Distribution: Primarily found in California, Arizona, Texas, and the Southeastern United States; also reported in New Jersey and surrounding states; Ohio and Missouri. Found in water bodies of the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: Prefers stagnant, slow-moving freshwater environments. Grows optimally in temperatures from 72-86 Fahrenheit. It is found in wetlands, small ponds, lakes and slow-moving streams. May also be found in rice fields.

Impact: Leaves of water lettuce form extensive mats on surface water. Decreases river flow and which leads to increased sedimentation. Reduces light penetration and dissolved oxygen levels in the water. Alters native aquatic plant, benthic and fish communities. Impedes boat traffic and can clog irrigation canals.

Physical Description: Roots are submerged, extremely feathery, and grow up to 3 feet in length. Leaves grow in lettuce-like rosetts up to 6 inches in diameter and are distinguished by their wavy edges and many longitudinal ridges and veins. They are a light, lime green with velvet-like hairs. Leaf bases, which are stemless, meet underwater. When mature, the roset encloses a very small female flower and whorl of male flowers above. Fruit is a small green berry.

Reproductive Characteristics: Primarily reproduces vegetatively. Lateral stolons (floating stems) extend out from the central axis of the plant to initiate daughter plants. Can also reproduce via water-dispersed seeds.

Growth: Water lettuce grows and spreads very rapidly. Mats of stolon-connected plants can completely cover a small body of water in a short period of time.

Control Techniques: Contact herbicides such as Endothall and Diquat will act quickly, while systemic herbicides such as Rodeo act slowly. Take care to minimize impacts of herbicide application on native species. Decaying plant material may cause dissolved oxygen depletion.

Native Species Alternatives:

American lotus	<i>Nelumbo lutea</i>
White water lily	<i>Nymphaea odorata</i>
Floating bladderwort	<i>Utricularia radiata</i>



▲ Kudzu leaves and flower.

Photo courtesy of David J. Moorhead, The University of Georgia, www.forestryimages.org



▲ Severe infestation of the kudzu plant affecting an entire forest clearing and surrounding trees. Photo courtesy John D. Byrd, Mississippi State University, www.forestryimages.org



◀ Close-up of mature kudzu seed pods.

Photo courtesy of Ted Bodner, Southern Weed Science Society, www.forestryimages.org

Scientific Name

Pueraria montana

Common Name

Kudzu, Japanese arrowroot

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: First brought to the US in 1876 at the Centennial Exposition in Philadelphia. Later widely cultivated as an ornamental, an erosion reducer, forage crop, and nitrogen fixer.

Native Range: China

Geographic Distribution: Range extends north from all Gulf Coast states to Massachusetts and west to South Dakota. Also found in Washington and Oregon. Has been found in the Lower Galveston Bay watershed in Galveston and Liberty counties.

Habitat Preferences/Requirements: Thrives in well-drained soil, and prefers disturbed, sandy eroding soil. Found along roadsides, fences, telephone poles, and abandoned lots, forest clearings and edges, and stream banks.

Impact: Threatens native timberland by eliminating nearly all light availability to trees. An estimated \$500 million is lost nationally every year in control measures and land productivity loss. Carries an Asian bean rust (soybean rust) that threatens soybean agriculture.

Physical Description: This deciduous, leguminous vine has tuberous roots. Leaves are alternate and pinnately compound, made of 3 leaflets, each 3-7 inches long and 2.5-8 inches wide. Leaflets are mildly lobed with pointed tips. Flowers are small and reddish-purple, clustering in spike-like racemes (small flower branches) and have a sweet grape-like smell. Fruit is a flattened, hairy, brown pod containing few seeds, which are hard and oval.

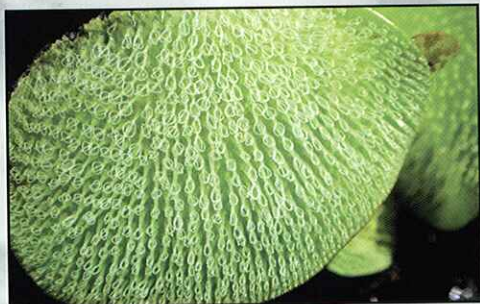
Reproductive Characteristics: Most commonly propagates through rooting at nodes and root fragmentation. Seeds have low viability. Flowers from June to September, and later fruits one seed crop, remaining on the plant until January.

Growth: Can grow up to 1 foot per day and may climb to 100 feet in a growing season. Rapidly grows back from tubers in successive seasons.

Control Techniques: Foliar applications of a 3% solution of Tordon 101 applied between July and October provide good control. Use Transline when protection of surrounding vegetation is desired. For established vines, use the cut-stem Glyphosate application.

Native Species Alternatives:

Crossvine	<i>Bignonia capreolata</i>
Coral honeysuckle	<i>Lonicera sempervirens</i>
Virginia creeper	<i>Parthenocissus quinquefolia</i>



▲ **Hairs of the giant Salvinia form an egg-beater shape at the tips.**
Hairs of common Salvinia are unjoined at the tips. Photo courtesy of Rebecca Davey, Commonwealth Scientific and Industrial Research Organization, www.forestryimages.org

Leaves of the giant Salvinia plant.

Photo courtesy of USDA APHIS Archives, USDA APHIS, www.forestryimages.org



► **Giant Salvinia at the water surface with both live and dead leaves.**

Photo courtesy of Scott Bauer, USDA Agricultural Research Service, www.forestryimages.org



► **A large infestation of giant Salvinia in Mississippi.**

Photo courtesy of Kenneth Calcote, Mississippi Department of Agriculture and Commerce, www.forestryimages.org



Scientific Name

Salvinia molesta
Salvinia minima

Common Name

Giant Salvinia, kariba weed
Common Salvinia, water spangles

Toxicity: These species are not known to be toxic.

Prohibited Lists: These species are identified as noxious plants by the Texas Department of Agriculture and prohibited exotic species by the Texas Parks and Wildlife Department.

Introduction History and Pathways: Common Salvinia was long considered to be native to the US. However, it was most likely introduced to the US in the 1920s. Giant Salvinia is a popular aquarium plant. It was first detected outside of aquarium and landscape cultivation in South Carolina in 1995, was found in Texas in 1997, and rapidly spread to other southern states over the following years.

Native Range: Central and South America

Geographic Distribution: Giant Salvinia has been reported from Virginia to California as well as Hawaii, but the majority of infestations currently exist in Texas and Louisiana. Locally it is found in water bodies in Friendswood, League City, Alvin, Houston, Channelview, Mont Belvieu as well as in the Sheldon Lake State Park. Common Salvinia occurs from South Carolina to East and Central Texas with no known populations in the Houston-Galveston region.

Habitat Preferences/Requirements: Salvinia thrives in high nutrient, warm, slow-moving freshwater. Found in streams, lakes, ponds, ditches, and rice fields. Resistant to periods of low temperature, dewatering, and elevated pH levels. Low tolerance to salinity.

Impact: Dense mats of Salvinia shade out native aquatic species and reduce dissolved oxygen levels in the water. Agricultural water use is impacted as Salvinia obstructs intake pipes for irrigation. Recreational fishing and boating may be hindered by the dense mats.

Physical Description: Salvinia is a rootless, aquatic fern. Emergent groups of leaves (fronds), oblong and flat or semi-cupped, grow in chains and float on the water surface forming dense mats. Leaves grow in pairs and are approximately 1/2 inches wide and 1 inch long. A brown, thread-like leaf hangs underwater; all join at a node along a horizontal, underwater stem. The upper surface of the green leaves is covered with rows of white, coarse hairs, acting as a water repellent. The hairs of giant Salvinia are joined at the tips in an egg beater shape. Hairs of common Salvinia are unjoined at the tips. Fruits (sporocarps) are egg-shaped and grow in chains underwater.

Reproductive Characteristics: While Salvinia may reproduce via spores as other ferns do, U.S. populations more commonly reproduce via budding from both attached nodes or broken stems. As many as five lateral buds can be found at one node.

Growth: Populations can double every one to two weeks in the wild, and small quarter-acre ponds have been completely covered with giant Salvinia in as little as 6 weeks from the point of invasion.

Control Techniques: The best control is to prevent further infestations. Enclose harvested biomass and dispose in upland areas away from water. Herbicides (copper carbonate or Rodeo) are necessary for large populations. Biocontrol (Salvinia weevil) may also be effective.

Native Species Alternatives:

American lotus	<i>Nelumbo lutea</i>
White water lily	<i>Nymphaea odorata</i>
Floating heart	<i>Nymphoides aquatica</i>

Cluster of fruit of the Brazilian peppertree.

Photo courtesy of Stephen D. Hight, USDA Agricultural Research Service, www.forestryimages.org



Stand of Brazilian peppertrees.

Photo courtesy of James P. Cuda, University of Florida, www.forestryimages.org



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Scientific Name

Schinus terebinthifolius

Common Name

Brazilian peppertree

Toxicity: Ripe fruits are toxic if ingested. Known to produce a narcotic effect on native wildlife. Sap can cause skin rashes.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: Sold and distributed in the 1800s in Florida as an ornamental; recognized as a nuisance weed in the 1950s. Sold as an ornamental in Texas. Its importation, sale, and distribution are now restricted. Seeds can be transported by birds and mammals.

Native Range: Brazil, Paraguay, and Argentina

Geographic Distribution: Found in Florida, Texas, California, Hawaii, Puerto Rico, and the Virgin Islands. Locally, established populations have been found on Galveston Island, in Dickinson, and on Virginia Point south of Texas City. Also established along the Lower Texas Coast.

Habitat Preferences/Requirements: Invades disturbed areas such as fallow fields, ditches, drained wetlands, and roadsides. Also invades native pine forests. Has a high tolerance for shade and low tolerance for cold temperatures.

Impact: The Brazilian peppertree forms dense thickets, shading out native grasses, shrubs, and taking over native pine forests. Considered one of the greatest threats to native biodiversity for its dramatic affect on both plant and animal communities.

Physical Description: This broadleaf evergreen small tree or shrub is well-laden with intertwining, drooping branches and foliage. Stems are yellow-green. Leaves are alternate, pinnately compound, and dark green, with 3-13 leaflets, each 1-2 inches long. A turpentine or pepper fragrance is given off upon crushing the leaves. Flowers cluster in small groups and consist of 5 small, white petals with yellow centers. Fruit are small red berries, 1/8 to 1/4 inch in diameter.

Reproductive Characteristics: Plants can mature 3 years after germination and produce a large amount of seeds. Both male and female flowers bloom September through November; fruits December through February. Will also propagate at the base of the plant via adventitious buds (buds that develop in places other than at the end of a twig) sprouting from roots. Seedlings have a high rate of survival.

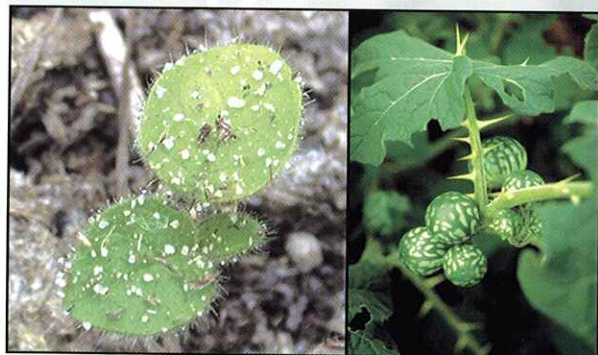
Growth: The Brazilian peppertree can grow to 30 or 40 feet in height with a trunk diameter of 3 feet. Responds to abrupt changes in its environment with heavy growth, acting as an opportunistic pioneer species (the first species to establish in a disturbed area).

Control Techniques: For established trees, apply an herbicide containing Glyphosate or Triclopyr to the cut stump immediately after cutting, or apply Triclopyr with a penetrating oil to basal bark 0.75 feet from the ground. Use foliar applications of herbicide for seedlings.

Native Species Alternatives:

Yaupon holly	<i>Ilex vomitoria</i>
Wax myrtle	<i>Morella cerifera</i>
Mexican plum	<i>Prunus mexicana</i>

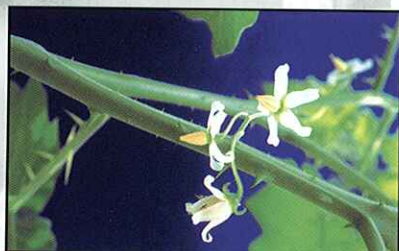
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▲ Tropical soda apple seedling from Jasper County, Texas.
Photo courtesy of Mary Ketchersid.

▲ Cluster of immature fruit of the tropical soda apple with thorns on stem.
Photo courtesy of Charles T. Bryson, USDA Agricultural Research Service,
www.forestryimages.org

Close-up of flowers and developing fruit of tropical soda apple.
Photo courtesy of Charles T. Bryson, USDA Agricultural Research Service, www.forestryimages.org



▲ Mature fruit of tropical soda apple from Jasper County, Texas.
Photo courtesy of Mary Ketchersid.

▲ Mature fruit (with cross-section showing seeds) of tropical soda apple from Jasper County, Texas.
Photo courtesy of Mary Ketchersid.

Scientific Name
Solanum viarum

Common Name
Tropical soda apple

Toxicity: This species is not known to be toxic.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: Introduced by unknown means to southern Florida in the early 1980s. Spreads via seed dispersal by livestock, machinery, and hay.

Native Range: Brazil and Argentina

Geographic Distribution: Most common in the Southeastern U.S. from Florida west to Alabama, and north to Tennessee and Virginia. An established population was discovered in an East Texas (Jasper County) pasture in 2005. No established populations are known to exist in the Houston-Galveston region.

Habitat Preferences/Requirements: High preference for disturbed, sandy loam soil. Thrives in heavily grazed pastures. Also found in ditches, agricultural fields, and can spread to forested areas.

Impact: Tropical soda apple invades pastures and fields, overtaking native grass communities. It carries several viral diseases, and in agricultural systems poses a threat to crops of vegetables which are members of the same family (Solanaceae), such as tomatoes. Foliage and stems are unpalatable to livestock and therefore can reduce feeding capacity of pastures. Thorny stems can prevent livestock from moving into shady areas during periods of high heat.

Physical Description: This herbaceous perennial is generally bushy with thorny stems. Leaves are alternate, simple, triangular, mildly lobed, and covered with fine soft hairs. Flowers are white and 5-petaled, occurring in small terminal clusters. Immature fruit is spherical, 0.8-1.2 inches wide, and green mottled with white spots. Fruits resemble miniature watermelons and turn yellow when mature.

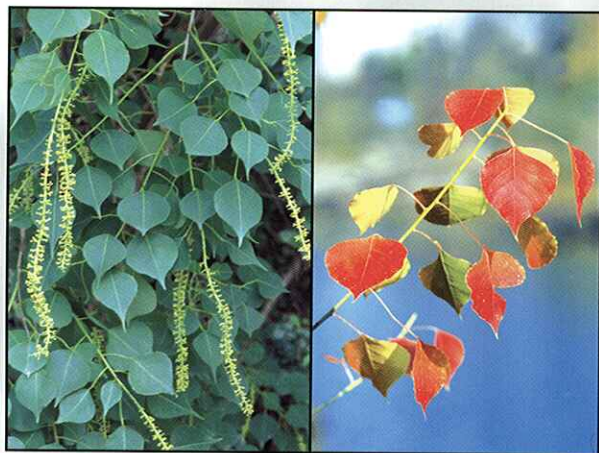
Reproductive Characteristics: Reproduction depends on high seed production (200-400 seeds per fruit, of which 75% may germinate) and animal dispersion typically by cattle, deer, wild hogs, or birds. Scarring of seeds promotes germination. Fruits primarily from September through May; fruits are rarely seen during the summer.

Growth: A fast growing plant, tropical soda apple reaches maturity 3-4 months after germination. Plants that are cut to the ground will readily resprout from an established root system.

Control Techniques: Dispersal of plant material can be prevented through proper cleaning of mowing machinery. Dispersal of seeds can be prevented by mowing tropical soda apple plants before fruits appear. Triclopyr is an effective chemical agent, and bacterial agents have also demonstrated effective control.

Native Species Alternatives:

American beautyberry	<i>Callicarpa americana</i>
Turk's cap	<i>Malvaviscus arboreus</i>
Coralberry	<i>Symphoricarpos orbiculatus</i>



▲ Leaves and flowers of the Chinese tallow tree. Photo courtesy of Ted Bodner, Southern Weed Science Society, www.forestryimages.org

▲ Chinese tallow Autumn foliage. Image courtesy of James H. Miller, USDA Forest Service, www.forestryimages.org

▼ Ripening fruit and popcorn-like seeds of the Chinese tallow tree. Photo courtesy of James H. Miller, USDA Forest Service, www.forestryimages.org



◀ Chinese tallow forest and tallow saplings invading coastal prairie in La Marque, Texas. Photo courtesy of Glenn Aumann, UH Coastal Center.

Scientific Name

Triadica sebifera

Common Name

Chinese tallow tree, popcorn tree

Toxicity: Leaves, fruits, and sap are toxic to livestock, most animals, and humans. Known to cause intestinal distress. Some birds are known to tolerate the fruits.

Prohibited Lists: This species is identified as a noxious plant by the Texas Department of Agriculture.

Introduction History and Pathways: Introduced repeatedly since the late 1700s after Benjamin Franklin brought specimens to the U.S. from a trip to China; cultivated by the USDA in the early 1900s for tallow oil which can be used in soap and candle production. Also planted as an ornamental tree because of its colorful autumn foliage.

Native Range: China

Geographic Distribution: Naturalized across the southeastern U.S. from North Carolina to Texas. Highly naturalized in all counties of southeast Texas, Chinese tallow is recognized as the most invasive plant species of the Lower Galveston Bay watershed.

Habitat Preferences/Requirements: High affinity to coastal prairie, wetlands, banks of waterbodies, and bottomland forests as well as to disturbed areas such as ditches, pastures, and roadsides. Tallow is tolerant of varying light conditions, soil types, flooding, and drought.

Impact: Chinese tallow will transform native habitats into monospecific (single species) tallow forests in the absence of land management practices. Chinese tallow alters light availability for other plant species. Fallen tallow leaves contain toxins that create unfavorable soil conditions for native plant species. Chinese tallow will outcompete native plant species, reducing habitat for wildlife as well as forage areas for livestock.

Physical Description: Leaves are heart-shaped, alternate, 1-3 inches long, and 1-2.5 inches wide. They are medium green until fall when they turn yellow, orange, and red. Petioles are slender and waxy. Flowers occur on long, yellow, spike-like branches that are 2-8 inches long. Fruit is a three-lobed capsule, turning black and falling off when mature, revealing three white waxy seeds resembling popcorn.

Reproductive Characteristics: Can mature in as little as three years and prolifically produces seeds, which are readily transported by water and birds. Flowers mature March through May and fruit ripens August through November. Also propagates via cuttings, stumps, and roots.

Growth: Chinese tallow grows very quickly and vigorously. It rapidly develops a taproot system to help it withstand drought. Individual trees can reach 30-45 feet in height and 3 feet in width.

Control Techniques: Apply a Triclopyr herbicide to basal bark in late summer or early fall (such as 20% Garlon 4 in oil) or, for large trees, apply directly to the stump after cutting down the tree (use Rodeo for trees growing in water). Pull up seedlings by hand. Large land areas can be managed by mowing and the careful use of controlled burns.

Native Species Alternatives:

Eastern redbud	<i>Cercis canadensis</i> var. <i>canadensis</i>
Blackjack oak	<i>Quercus marilandica</i>
Water oak	<i>Quercus nigra</i>

Restricted and Prohibited Species Lists: The species listed by the following agencies are legally classified as exotic, noxious, harmful, or potentially harmful. Listed species may not be sold, distributed or imported in the State of Texas except as authorized by a rule or permit issued by the agencies below.

Texas Department of Agriculture Noxious Plant List, Texas Administrative Code (TAC§19.300)
www.texasinvasives.org/Invasives_Database/Results/TDA_Results.asp

Texas Parks and Wildlife Department Prohibited Exotic Species List
www.tpwd.state.tx.us/huntwild/wild/species/exotic/

USDA Animal and Plant Health Inspection Service (APHIS), US Border Plant Protection and Quarantine Permit Information
www.aphis.usda.gov/ppq/permits/

Contact the following agencies to report an invasive species:

To report prohibited species sales, transport, or possession violations:
 Texas Parks and Wildlife Department Law Enforcement Division:

North Houston, Major Ted Tolle

350 N Sam Houston Pkwy E Ste 285, Houston, TX 77060
 Phone: (281) 931-6471

La Marque, Captain Eddie Tanuz

14037 Delany Road, La Marque, Texas 77568 Phone: (409) 933-1947

South Houston, Captain Albert Lynch

10103 Fondren Rd, Houston, TX 77096 Phone: (713) 779-8977

La Porte, Law Enforcement Communications

117 East Avenue A, La Porte, TX 77571 Phone: (281) 842-8100

To report new aquatic, exotic species found in the wild:

Texas Parks and Wildlife Department, **Dickinson Marine Laboratory**
 1502 FM 517 E, Dickinson, Texas 77539
 Phone: (281) 534-0100

To report a new terrestrial, invasive plant species:

Texas A&M Agriculture Extension Service

Brazoria County, Richard E. Tillman,

21017 County Rd 171, Angleton, TX 77515 Phone: (979) 864-1558
<http://brazoria-tx.tamu.edu>

Chambers County, Charles H. Wakefield,

1222 Main, Anahuac, TX 77514 Phone: (409) 267-8347
<http://chambers-tx.tamu.edu>

Galveston County, William M. Johnson

5115 Hwy 3, Dickinson, TX 77539 Phone: (281) 534-3413
<http://galveston-tx.tamu.edu/>

Harris County, Hurley Miller

3033 Bear Creek Dr, Houston, TX 77084 Phone: (281) 855-5600
<http://harris-tx.tamu.edu/>

Liberty County, Ronald K. Holcomb

2103 Cos St, Liberty, TX 77575-4957 Phone: (936) 336-4558
<http://liberty-tx.tamu.edu>

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