RWFM-PU-373 10/21

NON-NATIVE, INVASIVE EMERGENT PLANTS IN TEXAS

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INTRODUCTION

Emergent aquatic plants are defined as plants rooted with stiff or firm stems that stand above the water surface. These emergent or shoreline plants can offer many benefits, mainly related to serving as a buffer between terrestrial and aquatic systems, which reduces bank erosion from flooding, wind, and wave action during weather events. They also absorb nutrients from run off before entering the water column.

Non-native species are those who do not naturally occur in an area. However, not all non-native species are invasive species, which have harmful impacts and often spread prolifically and undesirably throughout an environment. Non-native, invasive plant species are introduced into an ecosystem unintentionally or deliberately and may cause environmental or economic harm—or even harm to human health and quality of life. A few major vectors that contribute to the introduction of non-native, invasive aquatic plant species being introduced are contaminated ballast water, plants clinging to a watercraft, aquarium dumping, and release of ornamental water garden plants. The condition of the surrounding ecosystem can play a large role in how quickly a species takes over with wetland areas disturbed by mowing, burning, and excess nutrient loading being the most prone to invasion.

Non-native, invasive emergent species are known to dominant shallow waterbodies or wetland areas, creating monocultures, which can cause a multitude of problems within the aquatic and surrounding ecosystems. Some of the more notable issues include impeding recreational use of waterways, dramatically reducing dissolved oxygen (leading to fish kills), and out-competing native plants.

Millions of dollars each year are allocated toward prevention, early detection, monitoring, and control of aquatic nuisance species—including emergent aquatic plant species. The species covered in this publication are prohibited exotic species in Texas and are illegal to transport, possess, propagate, sell, import, export, or introduce into Texas waters, except as provided by regulatory exception (e.g., for disposal with conditions) or as authorized by a permit (e.g., for research). Violations are a misdemeanor offense. While several other emergent aquatic plants are prohibited, this list highlights species that can be found in Texas at the time of this publication. A complete, current list of prohibited exotic aquatic species can be found on the Texas Parks and Wildlife Department's (TPWD) website (*https://tpwd.texas.gov/huntwild/wild/species/exotic/prohibited_aquatic.phtml*).

Private landowners/property managers do not need to obtain a TWPD exotic species permit when physically removing small amounts of exotic aquatic vegetation that is bagged or dried fully prior to transport for disposal. Plants can also be composted onsite. Any physical removal of aquatic plants for hire or transport of large quantities that cannot be bagged or dried prior to transport requires a permit, even if on private property.

A Nuisance Aquatic Vegetation Treatment Proposal must be submitted to TPWD for approval 14 days prior to treating any native or non-native aquatic plant using any control methods on a public body of surface water, defined as any water body other than an impoundment on private property or an agricultural canal.

General management recommendations are made throughout this publication, but best management practices can differ greatly in each situation, depending on water body characteristics and the extent and severity of the infestation.

ALLIGATOR WEED

Alligator weed (*Alternathera philoxeroides*) is native to South America and can be found across the Southeastern United States and California (Fig. 1). In Texas, alligator weed is commonly found in central to east regions, preferring fresh, slow moving waters. Alligator weed can also tolerate higher salinities in flowing waters. This species initially roots in wet soil on banks, or in shallow water, then grows out into waterways, spreading rapidly during the warmer months.

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Its leaves are bright to dark green, oppositely arranged, and up to 4 inches long with an elliptic to sword shape. Both its leaf and stem texture can be described as succulent-like or smooth, thick, and fleshy. When growing as a shoreline plant, stems are also bright to dark green in color, but will present a reddish-brown coloration the further it grows into the water column.

Figure 1. Alligator weed *(photo by Peggy Romfh).*

The flowers are distinctively small, silver white in color, with a paper-like texture that can be found in clusters (similar to a clover flower). They can be seen blooming April through October, and is easily distinguished from native water willow by its distinctive flower (Fig. 2).

Figure 2. Alligator weed flower *(photo by Peggy Romfh).*

Control

Reproduction

Alligator weed rarely produces viable seeds and instead reproduces rapidly through root systems called stolons, which can develop at each leaf node area where the leaf meets the stems. Any event that causes fragmentation of a plant may result in the spread of fragments, with each fragment capable of establishing root systems and starting a new plant.

Mechanical

Alligator weed can be cut or grazed, but it is difficult to control physically because it can propagate from any stem fragments or from the roots left behind—even from very small portions.

Quick Fact: A key characteristic of alligator weed is its hollow stem. However, this is dependent on the plant's environment. The more submerged a plant is, the hollower the stem. Whereas, plants upland in more dry conditions, may have a solid stem.

Biological

Alligator weed flea beetles (*Agasicles hygrophilia*) have demonstrated effective biological control—particularly in plants further into the water column, but are not commercially available. This species, either in the adult or larvae form, are able to damage the plant by destroying its ability to photosynthesize. Depending on location and environmental conditions, populations may be found in the wild. Even if naturally present, very large quantities are needed for noticeable control and is often best used with other control options as part of an integrated pest management strategy.

Chemical

Chemical control options include the systemic herbicides: bispyribac, glyphosate, imazamox, imazapyr, triclopyr, and florpyrauxifen-benzyl, along with the contact herbicide flumioxazin.

FLOATING HEART

The floating heart (*Nymphoides spp.*) acquired its name from the resemblance of their cordate (or heart-shaped) leaves that float on the water's surface (Fig. 3). These species are commonly found in quiet, flowing rivers, streams, and lakes across the Northeast or Northern U.S. There are also multiple native species in Texas, which its two populations of invasive floating hearts have been found in the Eastern regions of the state. Although these species have floating leaves, they are rooted in the sediment with long leaf stalks and its flowers usually have five petals. Native floating hearts all have white flowers, as does the invasive crested floating heart. Non-native yellow floating hearts have yellow flowers.

There are two species of floating heart that are on the harmful plants of Texas list: crested and yellow. Both species are similar in that they are native to Asia and have heart-shaped floating and alternately arranged leaves, rounded at the leaf base (with the underside of the leaf having a purple coloration). These floating leaves can form dense mats, which limits sunlight into the water. This can reduce beneficial algae species that

Figure 3. Floating heart.

produce large amounts of oxygen and serve as the basis of the food chain for aquatic life. Additionally, this can reduce native submerged aquatic vegetation, which may contribute as a main food source for wildlife—especially waterfowl.

CRESTED FLOATING HEART

Crested floating heart (*Nymphoides cristata*) leaves reach a diameter of up to 3 inches but can establish in water up to 10 feet deep, with petioles or leaf stalks reaching up to 15 feet long (Fig. 4). Also known as "water snowflake," its flowers are 0.5 to 0.75 inches wide, white in coloration, with five petals that appear ruffled down the center, and grow individually on stalks. Native floating hearts lack the white, ruffled crest that runs lengthwise down each petal.

Figure 4. Crested floating heart (*https://plants.ifas.ufl.edu/image-request/*).

YELLOW FLOATING HEART

Yellow floating heart (*Nymphoides peltata*) leaves range in size between 1.2 to 5.9 inches in diameter with slightly wavy margins (Fig. 5). Its flowers are 1 to 1.5 inches wide, yellow, containing five petals each, with fringed edges. Flowers are held individually, or in clusters above the water's surface on a stalk. Seeds are flat, oblong, with winged, hairy margins, and are encapsulated.

Figure 5. Yellow floating heart *(https://plants.ifas.ufl.edu/image-request/).*

Control

Reproduction

Floating heart species reproduce by fragmentation (tubers known as "ramets") and rhizomes. Although both floating heart species produce seeds, viable seed production has not been documented in the U.S. for crested floating heart. Instead, this species grows a cluster of bulbils (or "daughter plants") near the underside of its leaves, which break off to form new plants. Yellow floating hearts can reproduce by seeds, which increases its distribution through water currents and wildlife.

Mechanical

Floating heart species can be cut and the rhizomes can be dug up, but physical control is difficult due to the rapid re-establishment of any remaining root systems or fragments of the plant.

Chemical

Chemical control options include the systemic herbicides: glyphosate, imazamox, triclopyr, fluridone, 2,4-D, penoxsulam, and florpyrauxifen-benzyl, along with the contact herbicide endothall.

BRAZILIAN PEPPER TREE

The Brazilian pepper tree (*Schinus terebinthifolius*) is native to South America and can also be found in the U.S.—primarily in coastal areas along shores and in woody areas with damp soils—such as Alabama, California, Florida, Georgia, Hawaii, and Texas (Fig. 6). It is an evergreen shrub (i.e., small tree that forms dense canopies), which shades out native species and reduced plant diversity. Its bark is gray and smooth, forming long, narrow, and flat ridges. Brazilian pepper tree trunks are typically hidden by drooping branches, but are capable of reaching between 30 to 40 feet in height. Its leaves are alternate and pinnately compound, where leaflets are elliptical shaped, serrated around the edges, and have a red central vein. Brazilian pepper tree flowers are white, 2 to 3 inches wide, and grow in clusters.

Figure 6. Brazilian pepper tree *(photo by Roberto Gaitan).*

Its fruits also grow in clusters and transition from green to bright red in color when ripe, which is usually in winter months (Fig. 7).

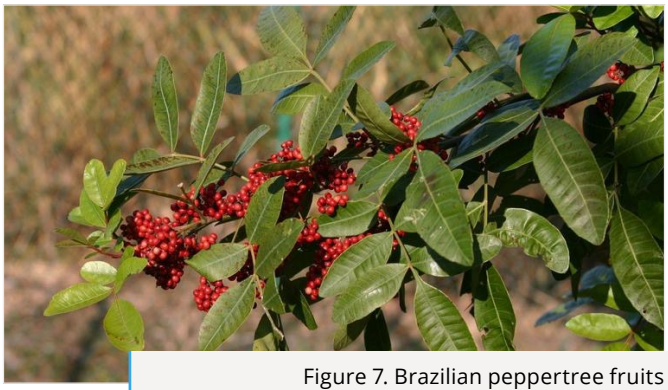

Figure 7. Brazilian peppertree fruits *(https://www.invasive.org/browse/detail.cfm?imgnum=5446228).*

Control

Reproduction

The Brazilian pepper tree has the ability to spread rapidly through its high seed production and rapid germination rates.

Mechanical

The Brazilian pepper tree can be mechanically controlled through digging, plowing, and raking. However, physical control is difficult because it can re-establish from root fragments less than a 0.25 inch. While prescribed fire will prevent seeds from germinated, it will not prevent roots from re-establishing.

Quick Fact: The Brazilian pepper tree is in the same family as poison ivy, poison oak, and poison sumac. Contact with it may irritate the skin.

Biological

Two biological control insects (e.g., Brazilian peppertree thrip and yellow Brazilian peppertree leaf-galler) have shown promise in effectively slowing the growth and fruit production of the Brazilian pepper tree.

Chemical

Chemical control options include the systemic herbicides: glyphosate, triclopyr, and imazapyr. These herbicides are usually directly applied to the leaves in smaller plants or seedlings, and applied using cut stump or basal bark methods in larger plants.

PURPLE LOOSESTRIFE

Purple loosestrife (*Lythrum salicaria*) is native to Europe and distributed in almost every U.S. state, where it is found in both freshwater and brackish water wetlands, ditches, and disturbed wet areas (Fig. 8). This herb is usually found at heights between 2 and 4 feet, but can reach heights of 10 feet. Its square-shaped stem is generally 4 to 6-sided, with hairy texture that helps to retain water. Leaves are opposite or whorled, 2 to 3 inches long, sword-shaped with a rounded or heart-shaped base. Its small (i.e., 0.5 inch), bright magenta or purple flowers, with 5 to 7 petals, are abundantly packed on a spike and can be found blooming during warmer months (e.g., June through September).

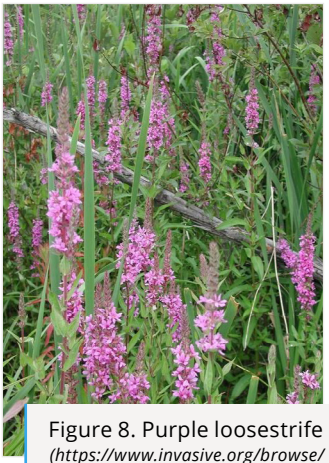

Figure 8. Purple loosestrife *(https://www.invasive.org/browse/detail.cfm?imgnum=5479718).*

Control

Reproduction

Purple loosestrife reproduces from its rootstock and by seeds. Its thick, woody roots can send out 30 to 50 shoots, creating an intertwined web. Once flowers bloom and die, capsules containing small seeds appear in its place. Each plant has the ability to produce up to 2.5 million seeds annually and seeds can lay dormant for several years before sprouting. Seeds may be spread by water or wind, or may be transported in mud by humans and wildlife.

Mechanical

Purple loosestrife can be cut, and the rhizomes can be dug up, but effective physical control is difficult due to the number of seeds produced. Removal of all its rootstock may prevent re-sprouting.

Chemical

Chemical control options include the systemic herbicides glyphosate and triclopyr.

TORPEDOGRASS

Torpedograss (*Panicum repens*) is native to Africa and Asia, but has been introduced and is now found in marshy shores along the Gulf Coast from Florida to Texas (Fig.9).

Torpedograss can grow up to 3 feet tall from sturdy, widely creeping or floating rhizomes, each of which has a namesake torpedo-shaped and pointed-end.

Figure 9. Torpedograss (*https://www.inaturalist.org/observations/48197566*).

Its leaf blades are linear and stiff, sometimes folded, and can have a waxy or white coating (Fig. 10). Flower spikes are 2.8 to 7 inches tall, tinted purple, with erect of ascending branches at the terminally end of the plant.

Figure 10. Torpedograss leaf blades (*https://www.inaturalist.org/observations/48197566*).

Control

Reproduction

This species primarily reproduces through rhizome expansion or fragmentation. While seeds are produced, successful germination is rare.

Mechanical

Torpedograss can be cut and the rhizomes can be dug up. However, physical control is difficult because it can re-establish from remaining roots or rhizomes.

Biological

At this time, there are no known biological controls for torpedograss. However, it may be consumed by grazing animals such as goats and cows.

Chemical

Torpedograss can be controlled using the systemic herbicide glyphosate, but chemical control will only be effective on plants that have large portions above the water's surface.

Quick Fact: **Like most plants, Torpedograss has many common names such as: panic grass, creeping panic, couch panicum, dog-tooth grass, and bullet grass.**

Pesticide use: Herbicides and their application in or near water are regulated in the U.S. by the U.S. Environmental Protection Agency, and in Texas by the Texas Department of Agriculture, Texas Commission on Environmental Quality, and Texas Parks and Wildlife Department (TPWD). Water body controlling authorities may in some cases impose additional requirements. Pesticides should always be applied in compliance with the pesticide label—the **label** is the **law**—and all applicable regulations and only products labeled for aquatic-use should be used in or near water. Surfactants added according to pesticide label requirements can enhance herbicide effectiveness, but surfactants used in or near water must also be approved for aquatic-use.

REFERENCES AND OTHER RESOURCES

More information on aquatic vegetation identification and management, along with other publications, can be found at:

AquaPlant: A Diagnostic Tool for Pond Plants and Algae: *https://aquaplant.tamu.edu/*.

Center for Aquatic and Invasive Plants: University of Florida: *https://plants.ifas.ufl.edu/*.

EDDMapS: Find. Map. Track: *https://www.eddmaps.org/*.

TPWD: Nuisance Aquatic Vegetation Management: *https://tpwd.texas.gov/landwater/water/environconcerns/nuisance_plants/*.

Texas Department of Agriculture: Pesticides Regulatory Program: *https://www.texasagriculture.gov/RegulatoryPrograms/Pesticides.aspx*.

Texas Invasive Species Institute: *http://www.tsusinvasives.org/*.

TCEQ Pesticides General Permit: Am I Regulated?: *https://www.tceq.texas.gov/permitting/wastewater/general/pestgpair*.