Lake Hygrophila (*Hygrophila costata*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, June 2021
Revised, July 2021
Web Version, 8/12/2021

Organism Type: Plant
Overall Risk Assessment Category: Uncertain

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1 Native Range and Status in the United States

Native Range

From Csurhes (2008):

"*H. costata* occurs naturally in North America (Mexico) and Central/South America (Argentina–Corrientes, Entre Rios, Misiones, Salta, Tucuman; Belize; Bolivia; Brazil; Columbia; Costa Rica; Cuba; Ecuador; French Guiana; Guatemala; Guyana; Hispaniola; Honduras; Jamaica;

Nicaragua; Panama; Paraguay; Puerto Rico; Suriname and Venezuela (Standley [*sic*] & Steyermark 1946–1976; Steyermark et al. 1955; Burger 1971; Adams 1972; Cabrera 1977; Liogier 1984; Jorgensen & Leon-Yanez 1999; GRIN 2002)."

From Keener et al. (2021):

"Gulf Swampweed [*Hygrophila costata*] is a native perennial in the Acanthus family (Acanthaceae). It can be found in the southern half of Alabama. Gulf Swampweed is native from the southern United States south through Central and South America, […]"

From UFIFAS (2021):

"Lake hygrophila is a native plant that can occasionally be found in the swamps and wet hammocks of the northern and central peninsula and the central and western panhandle of Florida."

Status in the United States

From Keener et al. (2021):

"Gulf Swampweed [*Hygrophila costata*] is a native perennial in the Acanthus family (Acanthaceae). It can be found in the southern half of Alabama. Gulf Swampweed is native from the southern United States […]"

From UFIFAS (2021):

"Lake hygrophila is a native plant that can occasionally be found in the swamps and wet hammocks of the northern and central peninsula and the central and western panhandle of Florida."

Hygrophila costata is in trade in the United States as an ornamental plant under the synonym *H. lacustris*. According to Tokyuaquatic (2021),it is available for sale for $9.99. Tokyuaquatic is a retailer based in Montebello, California.

Means of Introductions in the United States

Hygrophila costata has not been reported as introduced outside of its native range in the United States.

Remarks

There is conflicting treatment of *Hygrophila costata* and *H. lacustris* in the literature. This assessment follows WFO (2021) in treating *H. lacustris* as a synonym of *H. costata*, however other sources treat the two as distinct species.

According to NPIN (2021), *H. costata* is also know by the common names Gulf Swampweed and Yerba de Hicotea.

Information for this assessment was searched for using the valid name *Hygrophila costata* and the synonyms *H. lacustris*, *H. brasiliensis*, and *H. guianensis*.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to WFO (2021), *Hygrophila costata* is the current accepted name for this species.

From ITIS (2021):

Kingdom Plantae
Subkingdom Viridiplantae
Infrakingdom Streptophyta
Superdivision Embryophyta
Division Tracheophyta
Subdivision Spermatophytina
Class Magnoliopsida
Superorder Asteranae
Order Lamiales
Family Acanthaceae
Genus *Hygrophila*
Species *Hygrophila costata* Nees & T. Nees

Size, Weight, and Age Range

From Csurhes (2008):

"*Hygrophila costata* is a perennial, amphibious marsh plant generally 0.5–1 m tall, but up to 2.5 m tall when scrambling up through taller vegetation."

"Leaves opposite, simple, 3–18 cm long, 1–5 cm wide, […] Flowers bisexual, zygomorphic, white (or light rose), 9–11 mm wide […] The ovary is […] 14–17 mm long. […] Seeds are pale brown, round, flattened, smooth, 0.3–1 mm long (Long 1970; Adams 1972)."

Environment

From Keener et al. (2021):

"It grows in shallow water at the edges of rivers and streams, in swamps, and on the margins of ponds and lakes."

From Csurhes (2008):

"Habitats at risk of invasion include virtually any shallow, freshwater wetlands, particularly muddy and eutrophic wetlands, as well as the banks of creeks and rivers where the native riparian vegetation has been removed or degraded."

Climate

From Weeds Australia (2021):

"[…] predominantly in subtropical, tropical and warm temperate areas (Navie 2004)."

Distribution Outside the United States

Native

From Csurhes (2008):

"*H. costata* occurs naturally in North America (Mexico) and Central/South America (Argentina–Corrientes, Entre Rios, Misiones, Salta, Tucuman; Belize; Bolivia; Brazil; Columbia; Costa Rica; Cuba; Ecuador; French Guiana; Guatemala; Guyana; Hispaniola; Honduras; Jamaica; Nicaragua; Panama; Paraguay; Puerto Rico; Suriname and Venezuela (Standley [*sic*] & Steyermark 1946–1976; Steyermark et al. 1955; Burger 1971; Adams 1972; Cabrera 1977; Liogier 1984; Jorgensen & Leon-Yanez 1999; GRIN 2002)."

Introduced

From Weeds Australia (2021):

"*Hygrophila* [*costata*] has naturalised in south-eastern Queensland and north-eastern New South Wales. It has been recorded in recent years from swampy margins of Lake McDonald in Queensland where it has formed a weedy thicket (Barker 2008 pers. comm.). In New South Wales, it has naturalised in wetland areas near Casino, along Byron Creek near Bangalow, and Burringbar Creek at Mooball (Gorham & Hosking 2003)."

From Csurhes (2008):

"The earliest record of this species in Australia was in 1993 at Lake McDonald near Cooroy, Queensland (Barker 1996)."

"Five naturalised populations have been recorded in Australia, four in Queensland and one in New South Wales.
Queensland Herbarium records are as follows:
• Lake McDonald, 15 km south-east of Cooroy (first collected in 1993). Several thousands of specimens noted at site by 1999.
• Caboolture River, approximately 0.5 km south of Caboolture (collected 7 January 1995). In 1995, this infestation was recorded to be about 50 m long and quite dense (T Bean, Queensland Herbarium, unpubl.).
• Four Mile Creek, Strathpine (Brisbane) (collected 26 November 1996).
• Beenleigh, Hugh Muntz Park (collected May 1997).
Additional infestations in Queensland have been found at:
• Cedar Creek, Mt Tamborine—scattered clumps.
• Albert River (at junction of Cedar Creek)—one small clump.
• Coomera River—a very small infestation.
• Beaudesert.

The New South Wales (Tamworth Agricultural Research Centre) Herbarium record is as follows:
• Casino Wetlands, Queensland Road, north of Casino (collected March 1999). Recorded to exist as 20 patches of varying size (0.5–20 m2)."

Means of Introduction Outside the United States

From Csurhes (2008):

"It is thought that *H. costata* was imported and cultivated in Australia for use as an aquarium plant. The plant is mentioned in several books and websites that feature 'desirable' aquarium plants."

"*Hygrophila costata* has been planted at an unknown number of wetland locations by one or more people to supply the aquarium and pet trade with aquatic plant material. It is suspected that these people harvest the wild plant material as required."

Short Description

From Weeds Australia (2021):

"Hygrophila (*Hygrophila costata*) is an aquatic herb growing to 90 cm high. The stems are four-sided, grooved lengthways and are hairless or moderately to densely hairy. The oval-shaped leaves have very short stalks, tips that end in a short point, and are up to 90 mm long and 20 mm wide. They can be somewhat hairless or sparsely hairy on the upper and lower surfaces, particularly on the veins."

"The flower heads comprise clusters of 10 or more flowers on very short stalks. The outer 'flowers' have five lobes, and are 5.5–6 mm long, with short hairs on the edges and middle vein. The white flowers are tubular, 3.5 mm long, and are comprised of a 2.5 mm long, two lobed upper lip and a 3 mm long, three lobed lower lip."

"The fruit is a narrowly oval shaped capsule, 6-8 mm long, containing about 20 seeds that are more numerous at the base of the capsule (Barker 2008 pers. comm.)."

From Csurhes (2008):

"*H. costata* can grow either fully submerged or above water level on nearby moist ground. Leaves opposite, simple, 3–18 cm long, 1–5 cm wide, oblong to elliptic-lanceolate, narrowed at base to a very short petiole. Stems softly hispid with long pluricellular hairs, rarely branched. Flowers bisexual, zygomorphic, white (or light rose), 9–11 mm wide and produced in cymes in the leaf axils. Four stamens (occasionally two fertile and two sterile); anther sac at same level. The ovary is superior, two-locular and the fruit is a two-valved capsule, 14–17 mm long. Each capsule has 12–18 seeds. Seeds are pale brown, round, flattened, smooth, 0.3–1 mm long (Long 1970; Adams 1972)."

Biology

From Csurhes (2008):

"While it is generally an erect plant when grown in isolation, specimens that are growing close together often have stems that grow along the ground, with roots produced at the point where nodes touch the ground. *H. costata* can grow either fully submerged or above water level on nearby moist ground."

"Flowering and fruit production occurs from December to March (Adams 1972)."

"*H. costata* is readily propagated from cuttings or from severed leaves (Sterba 1967; Kelsey-Wood 1976). Leaves can be left floating on the water surface where they will soon form roots (Sterba 1967)."

From Weeds Australia (2021):

"The sticky seeds can adhere to animals, machinery, and water craft and plants can spread locally via rooting nodes (Thorp & Wilson 1998; Gorham & Hosking 2003)."

"Shoots reach the surface in late spring. During the summer, fragments with numerous adventitious roots break away from the mats. Upon contact with soil they will readily root. During the hot weather of late summer the whole shoot will break off near the root crown. These shoots form large, heavy, floating mats, which can cause severe water flow problems. The whole mat can sink and produce a new colony, or individual pieces can do so. The old root crowns quickly produce new shoots, which grow slowly during the winter (Hall & Vandiver 1990)."

From Keener et al. (2021):

"Gulf Swampweed is an emergent herbaceous perennial."

Human Uses

From Csurhes (2008):

"It is thought that *H. costata* was imported and cultivated in Australia for use as an aquarium plant. The plant is mentioned in several books and websites that feature 'desirable' aquarium plants. For example, the Tropica Aquarium Plants website describes *H. guianensis* as 'most suitable for planting in groups in large aquariums […]"

"*Hygrophila costata* has been planted at an unknown number of wetland locations by one or more people to supply the aquarium and pet trade with aquatic plant material. It is suspected that these people harvest the wild plant material as required."

From Keener et al. (2021):

"Gulf Swampweed is available from nurseries specializing in aquatic plants for aquariums and pools."

Diseases
According to Poelen et al. (2014), *Hygrophila costata* hosts the fungi *Helminthosporium hygrophilae* and *Asteridiella irregularis*.

Threat to Humans
No threats to humans were found for *Hygrophila costata*.

3 Impacts of Introductions
There are records of introduction for *Hygrophila costata*. However, there are no documented impacts of introductions. The following section refers to potential impacts of introductions.

From USDA 2015:

"*Hygrophila costata*, which is native to North and South America, is a Class 2 Regionally Prohibited Weed in New South Wales, Australia (all outbreaks must be reported within 24 hours, eradicated from any sites where it is present, and the plant is prohibited from sale) because *H. costata* displaces native species and interferes with boating and recreational water activities (Gorham and Hosking, 2013)."

From Weeds Australia (2021):

"Hygrophila is a serious weed of waterways in coastal New South Wales and south-eastern Queensland. It grows aggressively, forming dense mats which can displace and out-compete most other native species in shallow water and adjacent damp soils (Thorp & Wilson 1998). It also disrupts habitat for local fauna (Gorham & Hosking 2003)."

From Setter et al. (2017):

"*Hygrophila costata* is a perennial semi-aquatic plant listed as Category 3 Restricted Matter under the Biosecurity Act 2014, Queensland. It has been found growing in many creeks and rivers in Far North Queensland, where it is displacing native vegetation and colonizing/stabilizing otherwise transient sand banks. The impacts of *H. costata* are not yet fully understood but effects on hydrology and species composition are believed to be detrimental."

From Moran and Moscato (2008):

"*Hygrophila* was first noticed at Lake Macdonald [Australia] in 1993. According to distribution maps prepared by Noosa Shire Council in February 2003, the infestation covered 52% of Lake Macdonald's 31.4 km perimeter, in a band approximately 4 m wide (Burrows 2003)."

4 History of Invasiveness
Hygrophila costata was first introduced to Australia in 1993 where several established populations have been reported. Although potential negative impacts are reported from these

populations, verified impacts are currently lacking in the scientific literature. Additionally, *H. costata* is found in the aquarium trade but quantities and duration of trade were not found. The history of invasiveness for *H. costata* is Data Deficient due to a lack of information.

5 Global Distribution

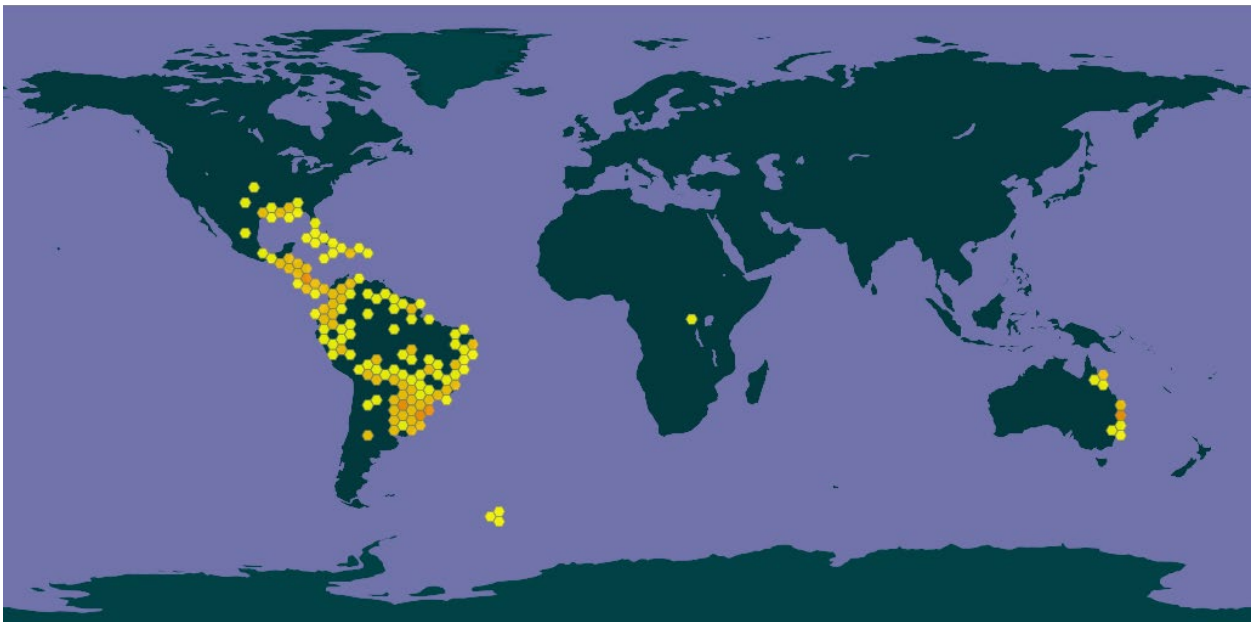

Figure 1. Known global distribution of *Hygrophila costata*. Observations are reported from southeastern North America, Central America, South America, and eastern Australia. Map from GBIF Secretariat (2021). Observations from Kansas, central Texas, and Africa were not included in the climate matching analysis as they are not known to represent establish populations of *H. costata.* Observations reported from the southern Atlantic Ocean were also excluded from the climate matching analysis due to erroneous geographic information.

6 Distribution Within the United States

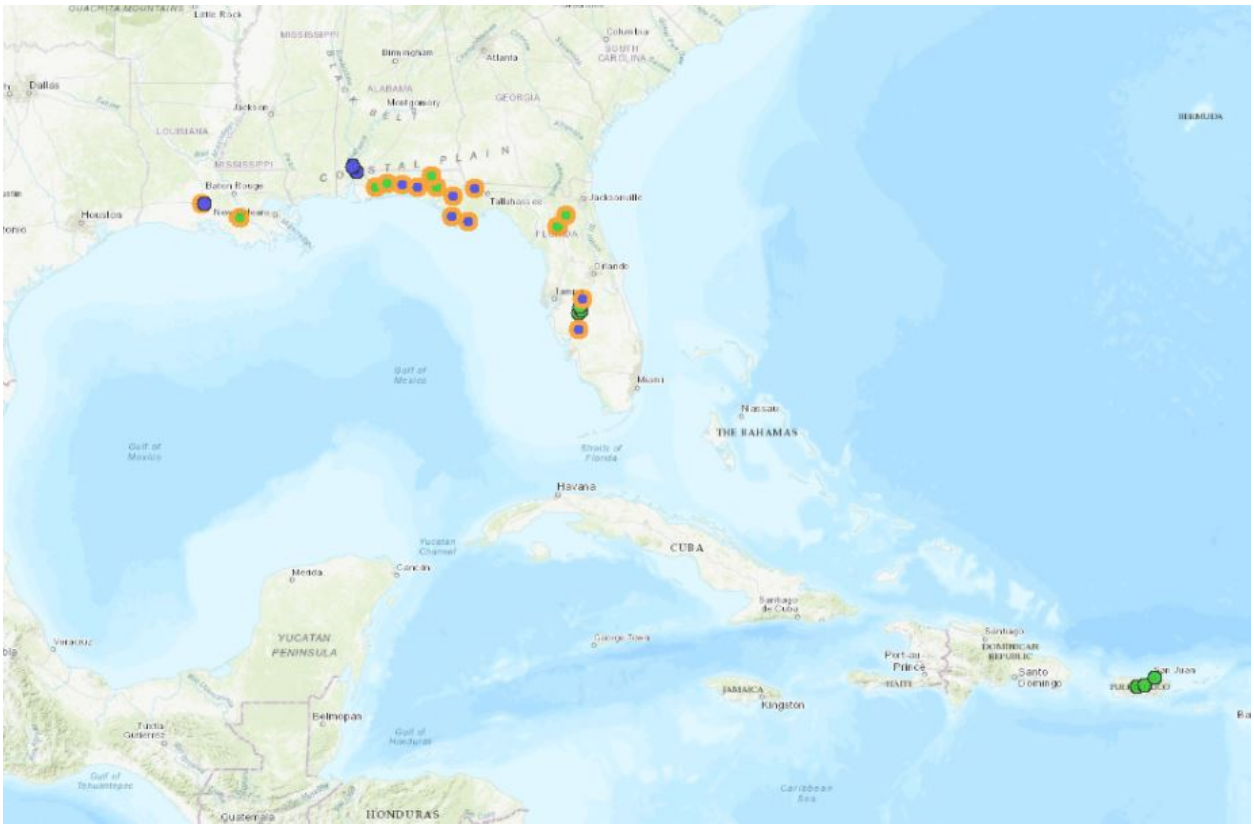

Figure 2. Known distribution of *Hygrophila costata* in the United States. Map from BISON (2021). Locations are found in Florida, Alabama, Lousiana, and Puerto Rico.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Hygrophila costata* was high within its native range in the southeastern portion of the contiguous United States and generally low in northern regions. High matches were found in western Texas, along the Gulf Coast, and along the Atlantic Coast from Florida to Virginia. Medium matches were generally found in the central portion of the United States, the Southwest, northward along the Atlantic Coast, and in southern California. Low matches were found in the Northwest, Rocky Mountains, upper Midwest, and Northeast regions. The overall Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) was 0.302, high (scores greater than or equal to 0.103, are classified as high). Alabama, Arkansas, Arizona, Delaware, Florida, Georgia, Kansas, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, New Mexico, Oklahoma, South Carolina, Tennessee, Texas, and Virginia had high individual Climate 6 scores. California, Colorado, Illinois, Indiana, Missouri, and New Jersey had medium individual Climate 6 scores. All other States had low individual Climate 6 scores.

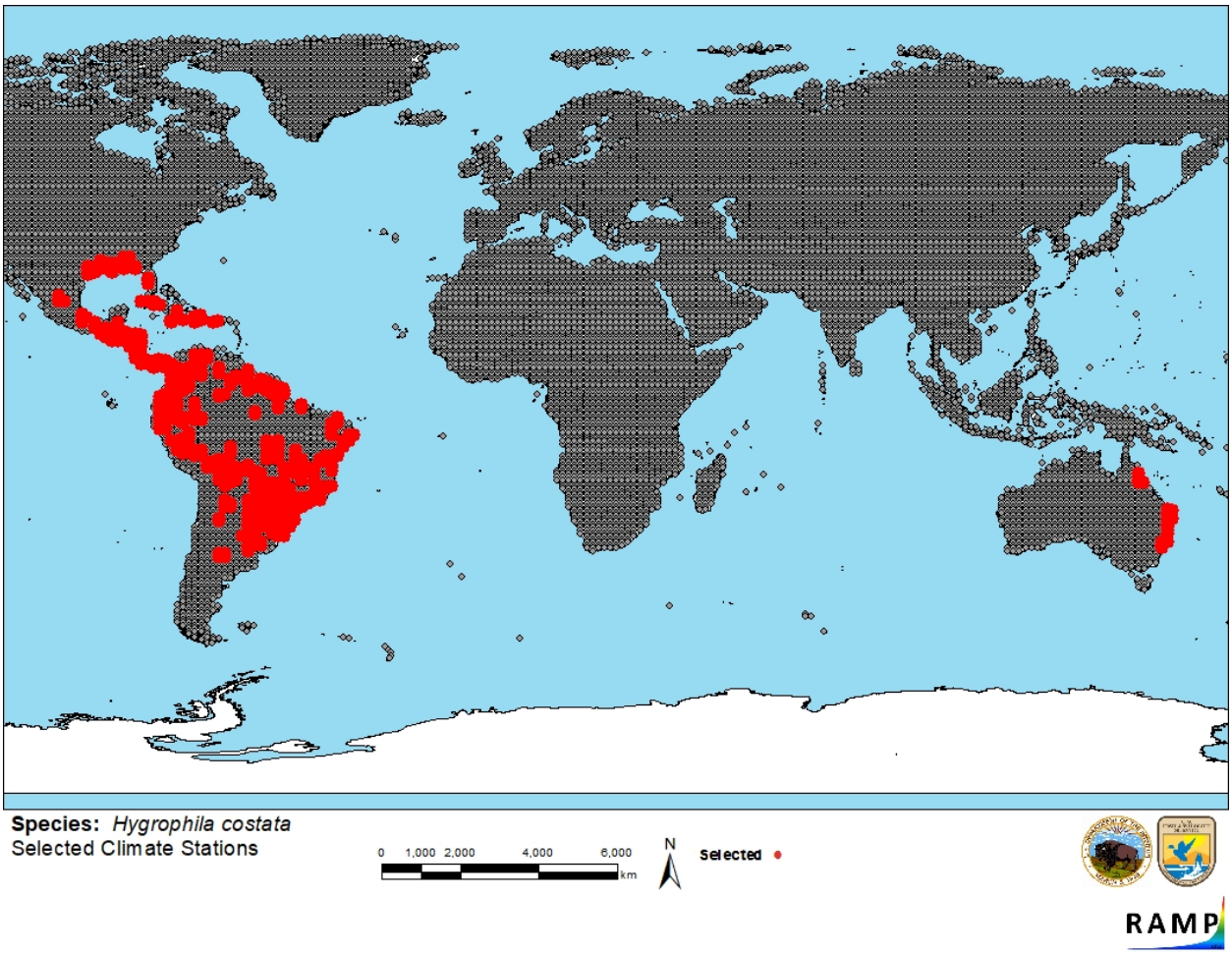

Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations in southeastern North America, Central America, South America, and eastern Australia selected as source locations (red) and non-source locations (gray) for *Hygrophila costata* climate matching. Source locations from GBIF Secretariat (2021). Selected source locations are within 100 km of one or more species occurrences and do not necessarily represent the locations of occurrences themselves.

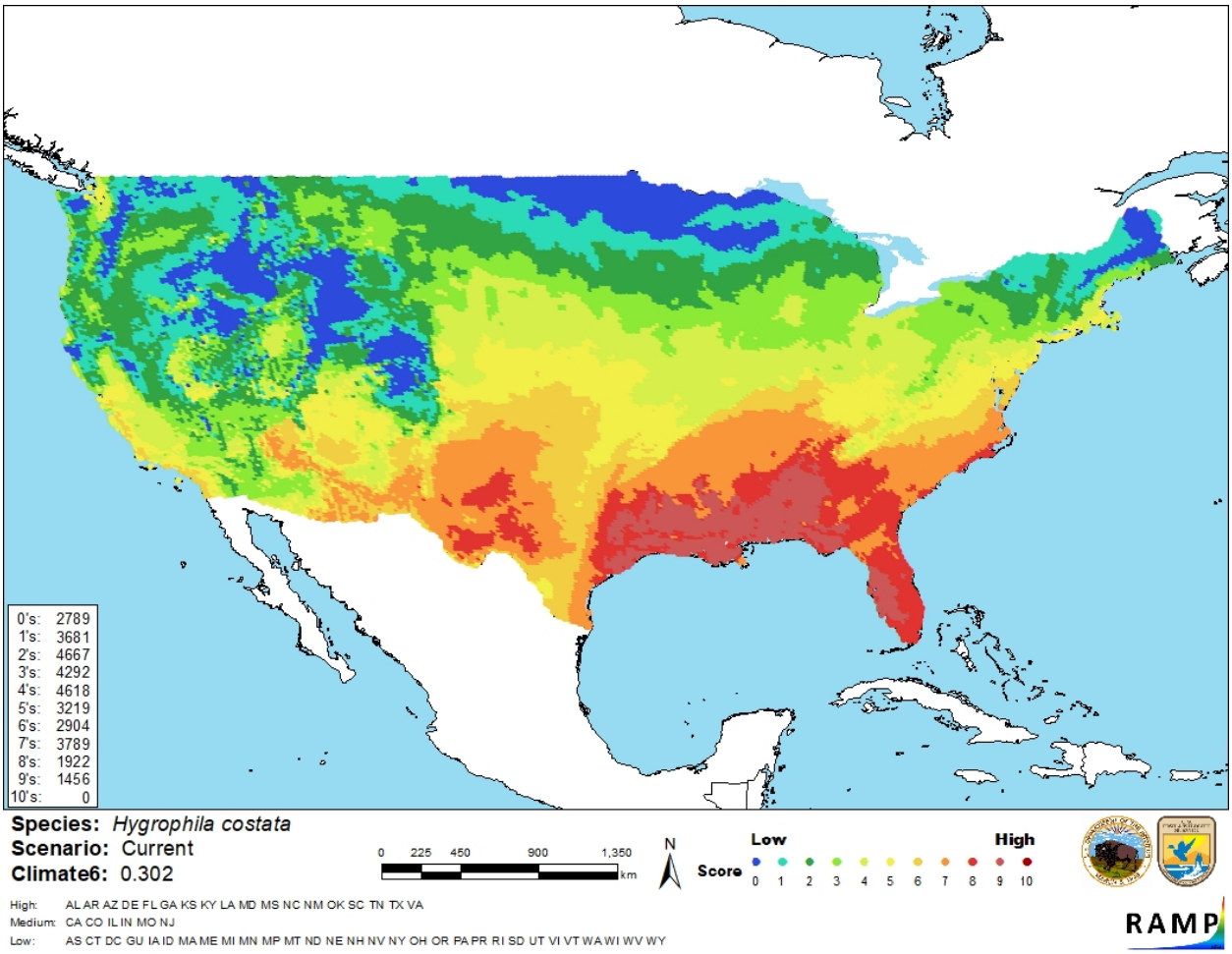

Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Hygrophila costata* in the contiguous United States based on source locations reported by GBIF Secretariat (2021). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

8 Certainty of Assessment

Information about the biology, ecology, and distribution of *Hygrophila costata* is available. However, most information appears to come from this species' introduced range in Australia where it is established. Although potential negative impacts are reported from these established

populations, verified impacts are currently lacking in the scientific literature. Due to a lack of information regarding the impacts of introductions, the certainty of this assessment is Low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Lake Hygrophila, *Hygrophila costata*, is an aquatic plant that is native to the tropical and subtropical regions of the Americas. *H. costata* was introduced to eastern Australia, reportedly via the aquarium trade, where it has been established since the 1990s. Although several sources indicate potential adverse ecological effects from these introductions, verified impacts are currently lacking in the scientific literature. *H. costata* is in trade as an ornamental plant but specifics regarding quantity and duration of trade were not found. The history of invasiveness is thus classified as Data Deficient. The overall Climate 6 score for the contiguous United States was High, with high matches found throughout the Southeast where the plant is native. The certainty of this assessment is Low due to a lack of information regarding the impacts of introductions. The overall risk assessment category is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): Data Deficient**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information:** No additional remarks
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

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11 Literature Cited in Quoted Material

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

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