

Burhead (*Echinodorus grandiflorus*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, April 2021

Revised, May 2021

Web Version, 8/23/2021

Organism Type: Plant

Overall Risk Assessment Category: Uncertain



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1 Native Range and Status in the United States

Native Range

From Lehtonen (2008):

“Coastal area from the mouth of Rio Negro in Argentina through Uruguay to the state of Paraná in Brazil.”

Status in the United States

From Lehtonen (2009):

“A large semi-aquatic plant, *Echinodorus floridanus*, was described and considered as a rare Floridian endemic only 10 years ago. Recent phylogenetic studies revealed that the new species actually belongs into a South American species, *E. grandiflorus*. This species has been cultivated in Florida as an ornamental aquarium plant at least since the 1980s.”

Wunderlin et al. (2021) report wild populations of *E. grandiflorus* in both Escambia County and Hillsborough County, Florida. Voucher specimens were collected from these populations in 1981 and 2016, respectively.

The United States based retailer Wetplants (2021) offers “*Echinodorus ‘Argentinensis’*” for sale for \$6.56. *E. argentinensis* is synonymized with *E. grandiflorus* (see Remarks). No other examples of current trade in the United States were found.

Means of Introductions in the United States

USDA (1914) includes *E. grandiflorus* in an inventory of plants imported into the United States by the Office of Foreign Seed and Plant Introduction between April and June 1912.

From Lehtonen (2009):

“This only known wild population in Florida most likely originated by escaping from cultivation, or it was intentionally planted.”

Remarks

There is disagreement in the literature over the breadth of the native range for *E. grandiflorus*. This assessment follows the native range described in the most recent peer-reviewed taxonomic work by Lehtonen (2008). In writing this report, every effort was made to include only information pertaining to the species as it was described by Lehtonen (2008).

From Lehtonen (2006):

“Aquatic plants in general are taxonomically difficult due to their structural plasticity and reproductive structures that are often reduced (Sculthorpe, 1967; Soros & Les, 2002), and *Echinodorus* is no exception. Most species of this genus can tolerate both emerged and submersed conditions and plants respond rapidly to water-level changes by producing morphologically different foliage. When this plasticity is combined with the very sparse collections from South America (Nelson et al., 1990; Prance et al., 2000), it is not surprising to have drastically different opinions concerning classification and species delimitation. Thus, despite many taxonomic studies, the phylogeny of *Echinodorus* has remained poorly understood (Haynes & Burkhalter, 1998; Padgett, 2003).”

From Lehtonen and Myllys (2008):

“Species delimitation in the *E. grandiflorus* complex has been controversial (Rataj, 1969; Haynes and Holm-Nielsen, 1986). While Haynes and Holm-Nielsen (1986, 1994) recognized only one species (*E. grandiflorus*) with two subspecies, and Haynes and Burkhalter (1998) two species (*E. grandiflorus* and *E. floridanus*), Rataj (1969, 1975, 2004) has accepted *E. floribundus*, *E. grandiflorus* and *E. longiscapus* as separate species (although he used incorrect names for two of them: *E. grandiflorus* for *E. floribundus*, and *E. argentinensis* for *E. grandiflorus*).”

WFO (2021) includes the following names as synonyms of *E. grandiflorus*: *Alisma grandiflorum*, *Echinodorus argentinensis*, *Echinodorus floridanus*, *Echinodorus pellucidus*, and *Echinodorus pubescens* var. *claussenii*. All names were used in searching for information on this species.

Christenhusz et al. (2018) states *Aquarius grandiflorus* as the accepted name for this species. This name is not addressed in WFO (2021) but was also used to search for information on this species.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to WFO (2021), the current accepted name for this species is *Echinodorus grandifloras* (Cham. & Schltdl.) Micheli.

From GBIF Secretariat (2021):

“Kingdom Plantae
Phylum Tracheophyta
Class Liliopsida
Order Alismatales
Family Alismataceae
Genus *Echinodorus*
Species *Echinodorus grandiflorus* (Cham. & Schltdl.) Micheli”

Size, Weight, and Age Range

From Lehtonen (2008):

“*E. grandiflorus* is intermediate in size (1 - 1.5 m) [...]”

Environment

From NatureServe (2021):

“**Estuarine Habitats:** Forested wetland

Palustrine Habitats: FORESTED WETLAND

Terrestrial Habitats: Forest Edge, Forest/Woodland”

“Located close (e.g. 100 m) to bay; sites have substantial brackish influence with constant fluctuation between fresh and salt water, and slow water drainage. Sand to loamy sand soil, pH around 4.2. [...] 0 - 10 m.”

From Lehtonen (2008):

“Growing at sea level in flowing water along rivers and creeks, most common in river deltas.”

Climate

From Kandus and Malvárez (2004):

“The [Lower Paraná Delta] region [in Argentina] has a temperate climate with a mean annual temperature of 16.7C (minimum: 6C; maximum: 30C) and a mean annual rainfall of 1,073 mm, without seasonality.”

Distribution Outside the United States

Native

There is disagreement in the literature over the breadth of the native range for *E. grandiflorus*. This assessment follows the native range described in the most recent peer-reviewed taxonomic work by Lehtonen (2008).

From Lehtonen (2008):

“Coastal area from the mouth of Rio Negro in Argentina through Uruguay to the state of Paraná in Brazil.”

Introduced

From Nissanka et al. (2018):

“[...] *Echinodorus grandiflorus*, *Echinodorus decumbens* and *Alternanthera sessilis* were detected in natural habitats around some nurseries [in Sri Lanka.] [...] *Echinodorus argentinensis* and *Echinodorus grandiflorus* are emerged plants and they were established in embankments.”

Wang et al. (2021) list *E. grandiflorus* as present in Xinfeng Wetland, Guangdong Province, China. No further information is available on this possible introduction.

POWO (2021) report that *E. grandiflorus* (as *Aquarius grandiflorus*) has been introduced to Venezuela. No further information is available on this possible introduction.

Means of Introduction Outside the United States

From Nissanka et al. (2018):

“During the flooding periods *Echinodorus argentinensis* and *Echinodorus grandiflorus* spread into neighboring environments [in Sri Lanka] through water and established in new areas.”

“Survey indicated that the nurseries used open fields for the cultivation and propagation have penetrated exotic aquatic plants species to the natural environment [in Sri Lanka.] [...] *Echinodorus grandiflorus* [and other nonnative plants] [...] were found within the periphery of the surveyed nurseries.”

Short Description

From Lehtonen (2008):

“Perennial, from horizontal rhizomes, petioles and peduncles glabrous to pubescent, to 180 cm, rhizomes to 15 cm long, 3 cm diam. Leaves emersed, blades oval to ovate, glabrous to stellate pubescent on lower surface, 7 - 13-veined, 15 - 50 cm long, 5.5 - 30 cm wide, pellucid markings present as dots and short lines, apex acute to rounded, base attenuate to shallowly cordate, petiole terete, glabrous to stellate pubescent, usually with a node-like thickening below the blades, up to 120 cm long, 0.3 - 2 cm diam., base with a sheath to 16 cm long. Inflorescence paniculate, of 5-13 whorls, each 7 - 19-flowered, erect, overtopping leaves, proliferating, to 55 cm long, and to 25 cm wide, rachis terete to triangular in cross-section, peduncles terete, glabrous to stellate pubescent, to 140 cm long, 1.2 cm diam., bracts lanceolate, coarse, 1.5 - 4.5 cm long, 6-14 mm wide, 10 - 20-veined, apex acuminate, pedicels spreading in flower and fruit, 1.5 - 6.5 cm long, 1 mm diam. Flowers 3.5 - 5 cm diam., weakly fragrant, sepals erect, 13 - 25-veined, 7 mm long, 5 mm wide, veins without papillae, petals spreading, white, not clawed, overlapping, c. 22 mm long, 20 mm wide, stamens 21 - 35, anthers versatile, c. 2 mm long, filaments c. 1.5 mm long, carpels numerous. Fruit oblanceoloid, 3 - 4-ribbed, glandular, 2-3 mm long, 1 mm wide, glands 2-3, separated by ribs, elongate, beak terminal, erect, 0.2 - 0.5 mm.”

Biology

From NatureServe (2021):

“Associated species include *Taxodium distichum*, *Acer rubrum*, *Pinus elliottii*, *Magnolia virginiana*, and *Nyssa biflora* as dominants, and *Myrica cerifera*, *Sabal minor*, *Persea palustris*, *Smilax walteri*, *Thelypteris palustris*, *Woodwardia areolata*, *Rhynchospora miliaceae*, *Juncus effusus*, *Sagittaria lancifolia*, *Saururus cernuus*, *Cladium jamaicense*, *Arundinaria gigantea*, and *Peltandra virginica* in addition.”

From Lehtonen (2008):

“Flowering and fruiting from November to May in South America, from April to October in USA.”

Human Uses

From Lehtonen (2009):

“*Echinodorus* is one of the most popular ornamental plants in aquaria (Kasselmann, 2001) with a cultivation history dating back into the early twentieth century (Rataj, 1978). After a short boom of production in South America, a large-scale production began in Southeast Asia, Europe, and USA (Lehtonen & Rodríguez Arévalo, 2005). Due to the favorable climatic conditions, Florida became the center of aquatic plant nurseries in the North America (McLane, 1969).”

The United States based retailer Wetplants (2021) offers “*Echinodorus ‘Argentinensis’*” for sale for \$6.56. *E. argentinensis* is synonymized with *E. grandiflorus* (see Remarks). No other examples of current trade in the United States were found.

From Marques et al. (2017):

“*Echinodorus grandiflorus* (Cham. & Schltdl.) Micheli is a native Brazilian species used in traditional practices for the treatment of several conditions such as inflammatory diseases, arthritis and hypertension.”

From Strada et al. (2017):

“*Echinodorus scaber* Rataj and *Echinodorus grandiflorus* (Cham. & Schltdl.) Micheli, Alismataceae, are popularly used to relieve inflammatory complaints and as diuretic.”

Diseases

No information available.

Threat to Humans

No information available.

3 Impacts of Introductions

From Lehtonen (2009):

“[...] despite almost 30 years of existence in Florida, *E. grandiflorus* still inhabits only one relatively small patch [as of 2009].”

Wunderlin et al. (2021) report wild populations of *E. grandiflorus* in both Escambia County and Hillsborough County, Florida. Voucher specimens were collected from these populations in 1981 and 2016, respectively.

The following statement appears to apply to several species and does not single out *E. grandiflorus*:

From Nissanka et al. (2018):

“These plants grow fast suppressing the native species in the area and blocking the water streams creating conditions favourable for water pollution.”

The following quotation discusses potential impacts of *E. grandiflorus*:

From Lehtonen (2009):

“[...] even though *E. grandiflorus* has not been an aggressive invader in Florida, new populations may become repeatedly established via the aquarium pathway, and this would be a risk especially in the more suitable coastal regions of Texas, Louisiana, and Alabama.

Changing climate, or introduction of new genes, for example, through hybridization with native *Echinodorus* species, could trigger more rapid expansion in the future. [...] *Echinodorus grandiflorus* is known to produce offspring in crossings with closely related *E. longiscapus* Arechav. and *E. floribundus* (Seub.) Seub. (Rataj, 1970). *Echinodorus cordifolius* belongs to the same group of closely related species (Lehtonen & Myllys, 2008), thus possibly allowing gene transfer between *E. grandiflorus* and native *Echinodorus* species in Florida. The risk naturally gets higher if more *E. grandiflorus* populations become established via aquarium pathway or range expansion.”

4 History of Invasiveness

Multiple introductions of *Echinodorus grandiflorus* have been attributed to escape of this species from cultivation outside its native range, including in the United States and Sri Lanka. Negative impacts of introduction have not been found for *E. grandiflorus* in the United States to date, but there is concern that the species could have negative impacts of introduction in regions of the country where it has not yet been introduced, or if it were to hybridize with native *Echinodorus* species. In Sri Lanka, nonnative aquatic plants including *E. grandiflorus* have been blamed for competing with native species and blocking waterways, but no species-specific impact information is available. Due to these sources of uncertainty, the history of invasiveness is classified as Data Deficient.

5 Global Distribution

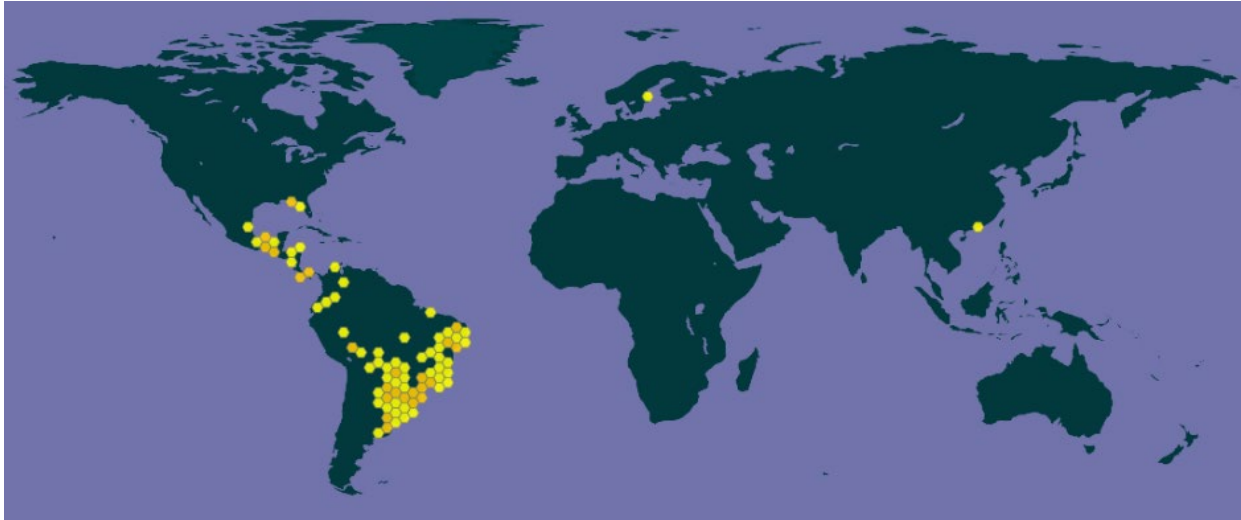


Figure 1. Known global distribution of *Echinodorus grandiflorus*. Observations are reported from South America, Central America, the southeastern United States, southeastern Sweden, and southeastern China. Map from GBIF Secretariat (2021). Following the native range of *E. grandiflorus* described by Lehtonen (2008), the only South or Central American occurrences used in the climate matching analysis were those located in Argentina, Uruguay, or the Brazilian States of Paraná, Santa Catarina, or Rio Grande do Sul. While it has been reported as introduced in Venezuela there is no indication of establishment. There is no evidence that the occurrences reported in China and Sweden represent established populations, so these occurrences were excluded from the climate matching analysis as well.

Nissanka et al. (2018) indicates *E. grandiflorus* has become established in Sri Lanka, therefore source locations will be added in the climate match to represent these populations.

6 Distribution Within the United States

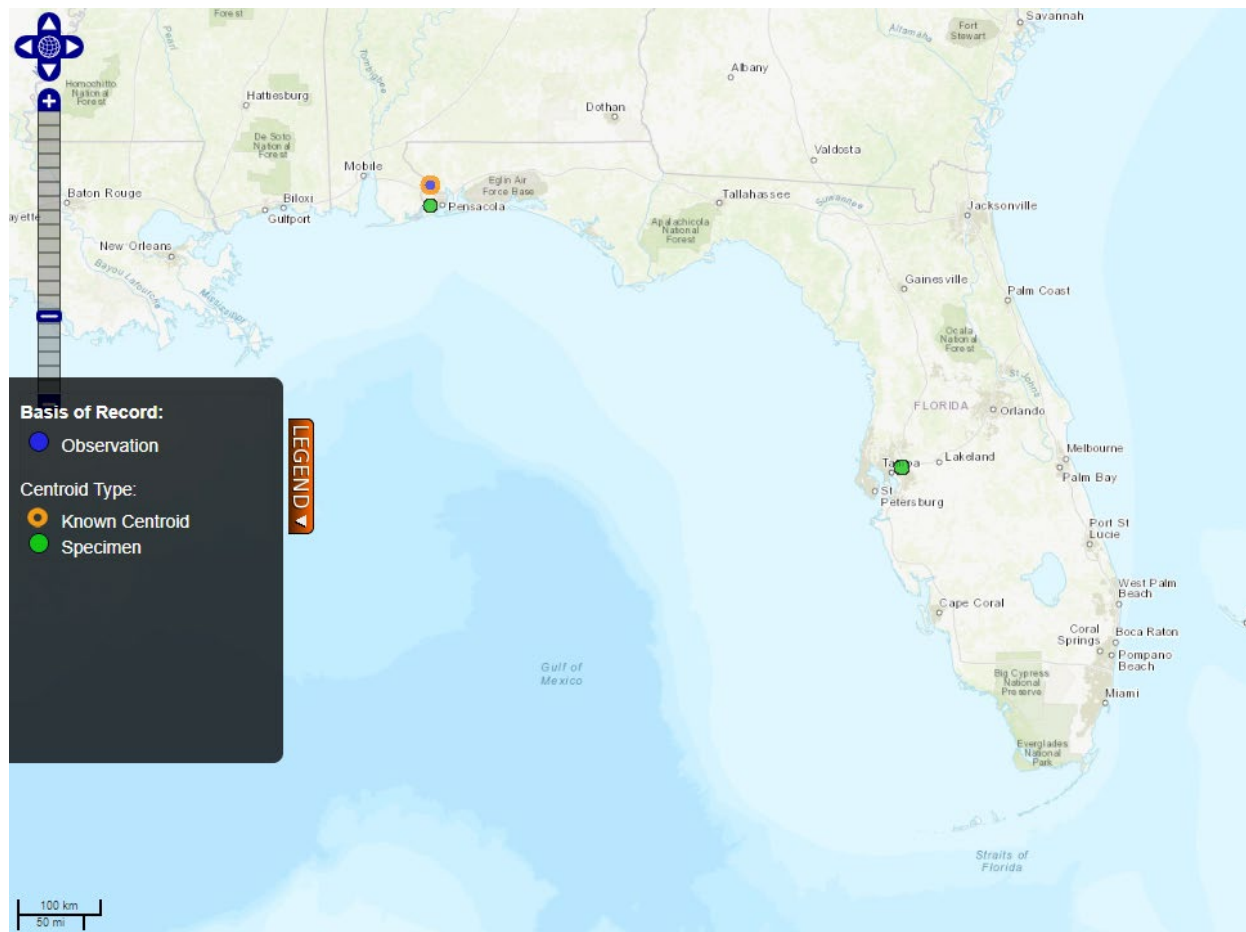


Figure 2. Known distribution of *Echinodorus grandiflorus* in the United States. Map from BISON (2021).

7 Climate Matching

Summary of Climate Matching Analysis

The overall Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.103, indicating a high overall climate match. (Scores greater than or equal to 0.103 are classified as high match.) The climate match was high along the Gulf Coast from eastern Texas to western Florida, in peninsular Florida, and along the Atlantic Coast from Florida to Virginia. Medium match covered much of the eastern United States except for the Northeast and Upper Midwest, which had a low match. All other areas of the contiguous United States had low climate match. The following States had high individual Climate 6 scores: Alabama, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Texas, and Virginia. The following States had medium individual Climate 6 scores: Arkansas, Missouri, New Jersey, and Tennessee. All other States had low individual Climate 6 scores.

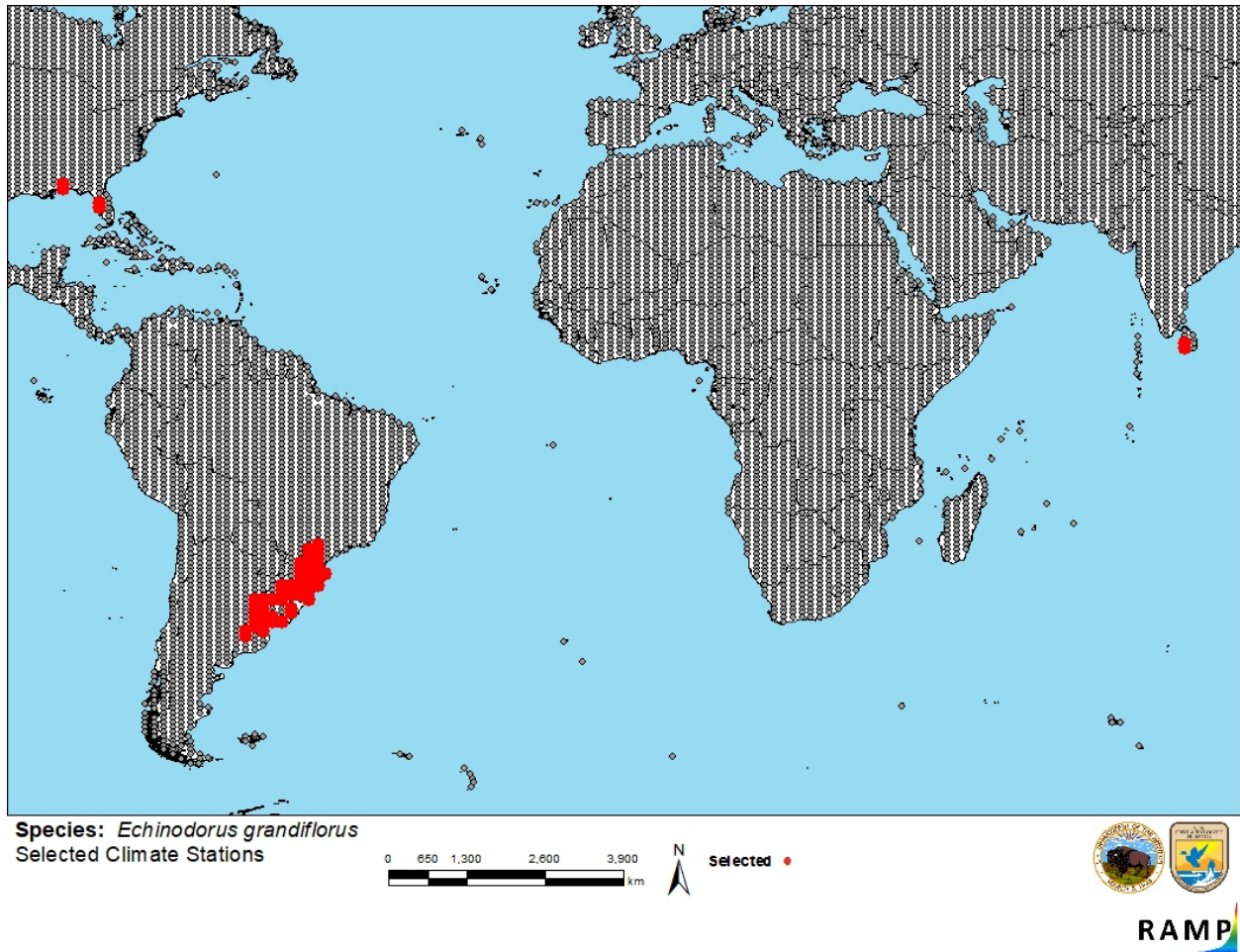


Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations in South America, North America, and South Asia selected as source locations (red; Brazil, Uruguay, Argentina, United States, Sri Lanka) and non-source locations (gray) for *Echinodorus grandiflorus* climate matching. Source locations from Lehtonen (2008), Nissanka et al. (2018), BISON (2021), and 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.

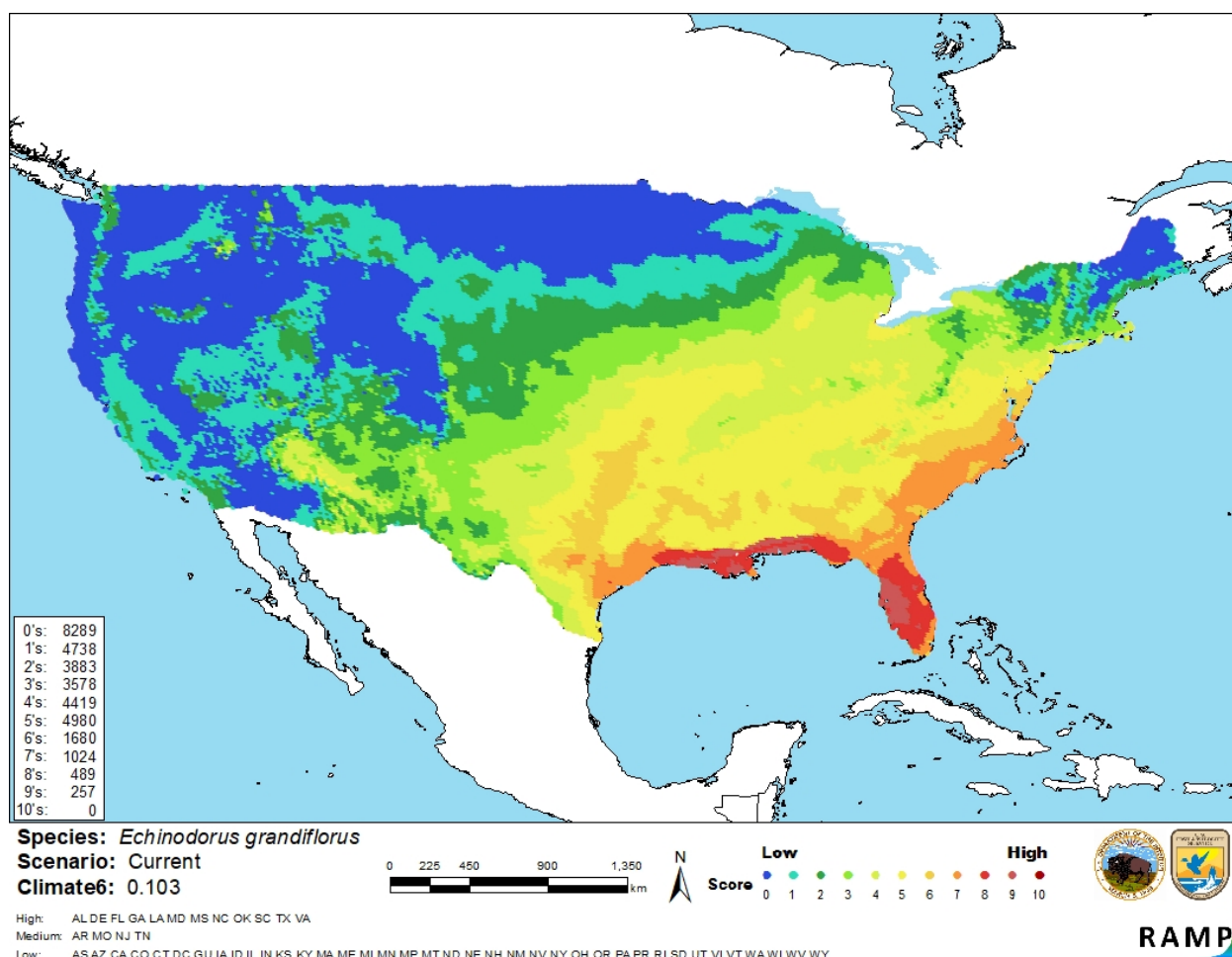


Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Echinodorus grandiflorus* in the contiguous United States based on source locations reported by Lehtonen (2008), Nissanka et al. (2018), BISON (2021), and GBIF Secretariat (2021). Counts of climate match scores are tabulated on the left. 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
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

8 Certainty of Assessment

Information is available on the biology, ecology, and distribution of *Echinodorus grandiflorus*, although changes in accepted *Echinodorus* taxonomy over time can make it difficult to accurately attribute information to individual *Echinodorus* species. Limited information is available on introductions of *E. grandiflorus* outside its native range, including possible

introductions in China and Venezuela mentioned only once in the literature and without any detail about population status or means of introduction. Where *E. grandiflorus* has established outside its native range, information on impacts is regarding potential impacts, and cannot always be attributed to this species alone versus the community of nonnative plants of which it is a part. For these reasons, the certainty of assessment is Low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Echinodorus grandiflorus, Burhead, is an emergent aquatic plant native to southeastern Brazil, Uruguay, and northeastern Argentina. It is popular in the aquarium trade and was imported into the United States as early as 1912, although the plant appears to be scarce in current United States based retailers' catalogs. It is also used in traditional medicines. *E. grandiflorus* has established two populations in Florida, likely through escape from cultivation, and no negative impacts of introduction have been documented to date. However, in Sri Lanka, established *E. grandiflorus* is reported to contribute, along with other nonnative aquatic plants, to blocking waterways and outcompeting native species. The history of invasiveness is classified as Data Deficient because of the lack of species-specific information on impacts in Sri Lanka. The climate match to the contiguous United States is High overall, with the highest matches occurring in peninsular Florida and along the northern Gulf and southern Atlantic coasts. The certainty of assessment is Low due to the ambiguous information on impacts of introduction and taxonomy uncertainty. The Overall Risk Assessment Category for *E. grandiflorus* 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: None**
- **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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