Guppy grass (*Najas indica*)
Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, August 2020
Revised, January 2021
Web Version, 3/29/2021

Organism Type: Plant
Overall Risk Assessment Category: Uncertain

Photo: Yu Ito. Licensed under Creative Commons Attribution-Share Alike 3.0 Unported. Available: https://upload.wikimedia.org/wikipedia/commons/5/51/Fig._07_Najas_indica.jpg (August 2020).

1 Native Range and Status in the United States

Native Range

From Zhuang (2011):

"Bangladesh; Bhutan; Cambodia; China (Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangsu, Jiangxi, Shandong, Shanghai, Sichuan, Tibet [or Xizang], Yunnan,

Zhejiang); Hong Kong; India (Andaman Is., Sikkim); Indonesia (Lesser Sunda Is., Papua, Sulawesi, Sumatera); Japan; Lao People's Democratic Republic; Macao; Malaysia; Myanmar; Nepal; Philippines; Taiwan, Province of China; Thailand; Viet Nam"

Najas indica is native to Australia (listed under the synonym *N. foveolata*; Western Australia Herbarium 1998).

Status in the United States

No records of *Najas indica* in the wild in the United States were found. *Najas indica* was found in trade in the aquarium industry.

From Buce Plant (2021):

"Najas indica
[…]
$4.99"

Means of Introductions in the United States

Najas indica has not been recorded as introduced or established within the United States.

Remarks

Information for this assessment was searched for using the valid name *Najas indica* and the synonyms *Najas foveolata and Najas kingii* (GBIF Secretariat 2021; World Flora Online 2021).

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to World Flora Online (2021), *Najas indica* is the accepted name for this species.

From GBIF Secretariat (2021):

Kingdom Plantae
Phylum Tracheophyta
Class Lillopsida
Order Alismatales
Family Hydrocharitaceae
Genus *Najas*
Species *Najas indica* (Willd.) Cham.

Size, Weight, and Age Range

From de Wilde (1962):

"Up to c. 40 cm, […]"

Environment

From Zhuang (2011):

"It grows in paddy fields, ponds and lakes. […] Freshwater"

From de Wilde (1962):

"Found in a great variety of habitats, in various biotopes of freshwater, mostly shallow but up to 5 m depth, and c. 1000 m altitude, also found in brackish water of fish-ponds near Djakarta with a salinity of up to 30°/ 00 (SUNIER, l. c.) […]."

Climate

From de Wilde (1962):

"Found in a great variety of habitats […], both in everwet regions and those subject to a dry season."

Distribution Outside the United States

Native

From Zhuang (2013):

"Bangladesh; Bhutan; Cambodia; China (Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangsu, Jiangxi, Shandong, Shanghai, Sichuan, Tibet [or Xizang], Yunnan, Zhejiang); Hong Kong; India (Andaman Is., Sikkim); Indonesia (Lesser Sunda Is., Papua, Sulawesi, Sumatera); Japan; Lao People's Democratic Republic; Macao; Malaysia; Myanmar; Nepal; Philippines; Taiwan, Province of China; Thailand; Viet Nam"

Najas indica is native to Australia (listed under the synonym *N. foveolata*; Western Australia Herbarium 1998).

Introduced

Najas indica has not been reported as introduced or established outside of its native range.

Means of Introduction Outside the United States

Najas indica has not been reported as introduced or established outside of its native range

Short Description

From India Biodiversity Portal (No date):

"Stem to 35 cm long; internodes 2-6 cm long. Leaves 1-2.5 x 0.2-0.4 cm, acicular, margins with 6-18 triangular spines; sheath to 4 mm long, margin entire, apex obtuse, obscurely auricled or with 3-5 spines at the tip. Male flowers: spathe to 2 mm long, apex spiny; pedicel to 1 mm long; perianth-lobes distinct. Ovary to 2 mm long, ellipsoid; style 3 mm long. Fruit to 2 mm long, subterete or trigonous."

From de Wilde (1962):

"Up to c. 40 cm, lower internodes 2-10 cm by (0.6—)0.75—1 -2(—1.7) mm. Leaves (1 l/4 -)2 l/2 - 4 1/2 (-6) cm by (0.3—)0.8—1.2(—1.6)mm, flat to subterete or triangular in section, apex acute to obtuse (blade c. 3 mm below the tip 0.2-0.4(-0.5) mm wide); margin on either side with (l-)5-30(-40) conspicuous spiny teeth, sometimes up to the lower 15 mm of the blade unarmed; dorsal surface sometimes with l-10(-30) spines; spine-cells 0.1-0.25 mm, all (dark) brown; teeth up to as long as half (in the upper part of the blade as long as) the width of the blade; midrib 0.12-0.1 times as wide as the blade; cavities occupying half or almost the entire width of the blade, often with distinct septa. Sheath (2-)2.5-4(-5) by (1.5-)2-4(-6)mm. on either side with (2)5-12(-20) spines, but unarmed on the inner edge of the auricles; auricles absent to (long-, especially in Indian specimens) triangular, truncate to rounded or almost acute, rarely falcate, (0.1-)0.3-0.6(-l) by (0.3-)0.5"l (-1.5) mm, mostly entire, sometimes toothed or lobed, seldom lacerate up to halfway. Flowers mostly solitary."

Biology

From Singh et al. (2010):

"It seems that bioaccumulated Pb is efficiently tolerated by *Najas* plants through activation of antioxidant system and thiolic pathways […]."

From Lata et al. (2009):

"Physiological behavior of *Najas foveolata* A. Br in relation to different saline water concentration of Lake Chilika on analysis revealed that there was a significant increase ($p=0.01$) in various growth parameters (Leaf area, Shoot/root ratio, and Leaf fresh and dry weight, Whole plant biomass) with increasing salinity."

Human Uses

From Zhuang (2011):

"This plant is commonly used in aquariums and as research material (Xiao 2002)."

From Singh et al. (2010):

"Therefore, it appears that due to metal tolerance characteristics with high concentration factor these plants can find use in phytoremediation of aquatic system highly contaminated by Pb."

Diseases

No information available.

Threat to Humans

No information available.

3 Impacts of Introductions

Najas indica has not been reported as introduced or established outside of its native range; therefore, impacts of introductions are unknown.

4 History of Invasiveness

Najas indica has not been reported as introduced or established outside of its native range. The history of invasiveness is classified as No Known Nonnative Population.

5 Global Distribution

Figure 1. Known global distribution of *Najas indica*. Observations are reported from France, Germany, Japan, Australia, Taiwan, Thailand, Indonesia, China, Papua New Guinea, Singapore, and Myanmar. Map from GBIF Secretariat (2020). *N. indica* is reported as native to the Papua province of Indonesia and in Australia so the locations reported in Papua New Guinea are considered valid and were used to select source points for the climate match. Reported locations in France and Germany are considered potentially erroneous as they could not be verified. These points were excluded from climate matching analysis.

No georeferenced observations were found for eastern portions of the species' range (Bhutan, India, and Nepal).

6 Distribution Within the United States

No records of *Najas indica* in the wild in the United States were found.

7 Climate Matching

Summary of Climate Matching Analysis

Climate matching of *Najas indica* with the contiguous United States was generally medium to high on the East Coast, Gulf Coast and in some of the Midwest. Low match was found predominantly in the western states and in coastal New England and Long Island. The overall Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.102, medium (scores between 0.005 and 0.103, exclusive, are classified as medium). The following States had high individual Climate 6 scores: Florida, Illinois, Indiana, Kansas, Maryland, Missouri, North Carolina, New Jersey, Ohio, Oklahoma, Pennsylvania, South Carolina, Virginia, and West Virginia. Medium individual Climate 6 scores were found in Alabama, Arkansas, Delaware, Georgia, Kentucky, Michigan, New York, and Texas. All other States had low individual scores.

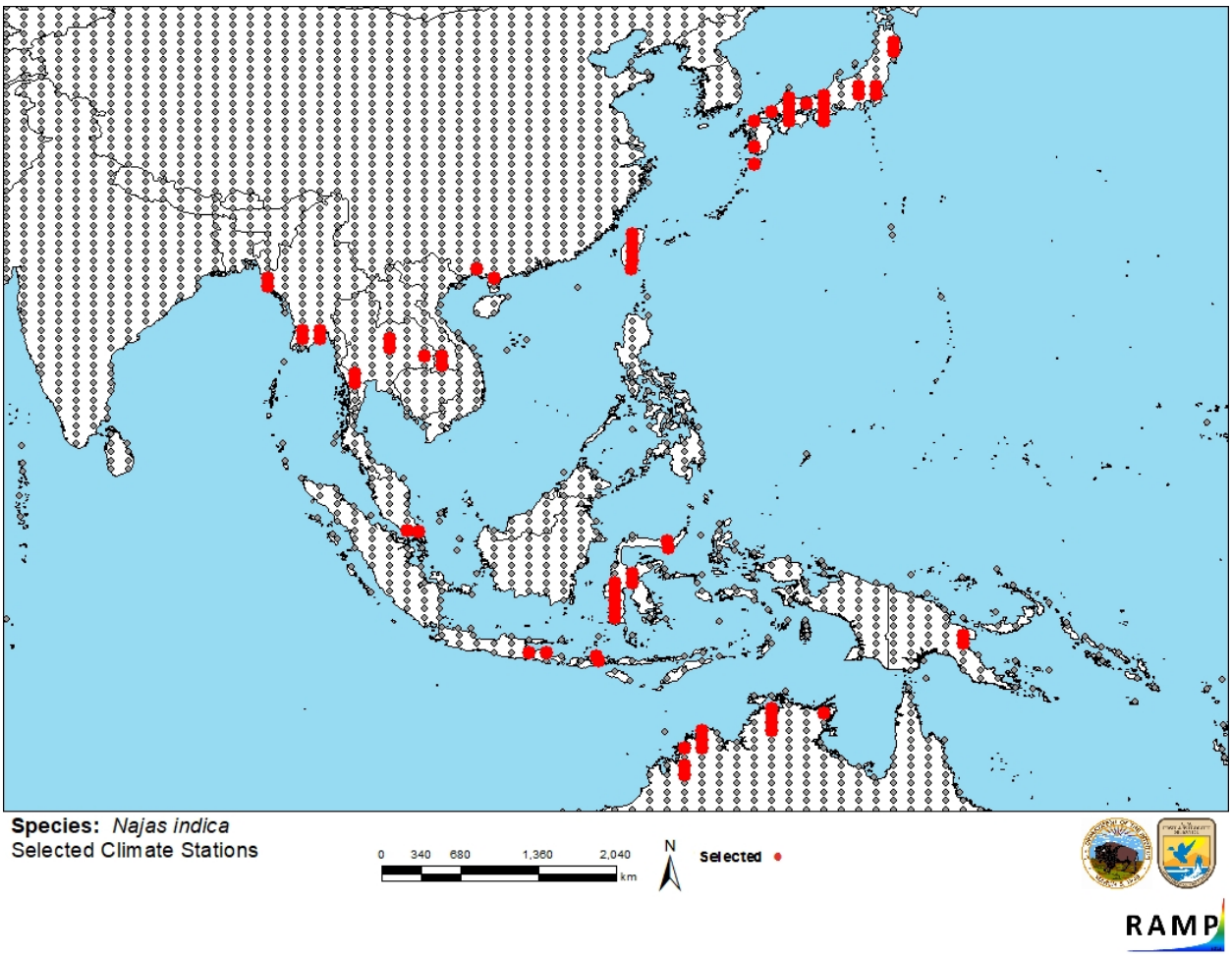

Figure 2. RAMP (Sanders et al. 2018) source map showing weather stations in Asia, Australia, Africa and Europe selected as source locations (red; Australia, Papua New Guinea, Indonesia, Singapore, Thailand, Myanmar, China, Taiwan, and Japan) and non-source locations (gray) for *Najas indica* climate matching. Source locations from GBIF Secretariat (2020). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

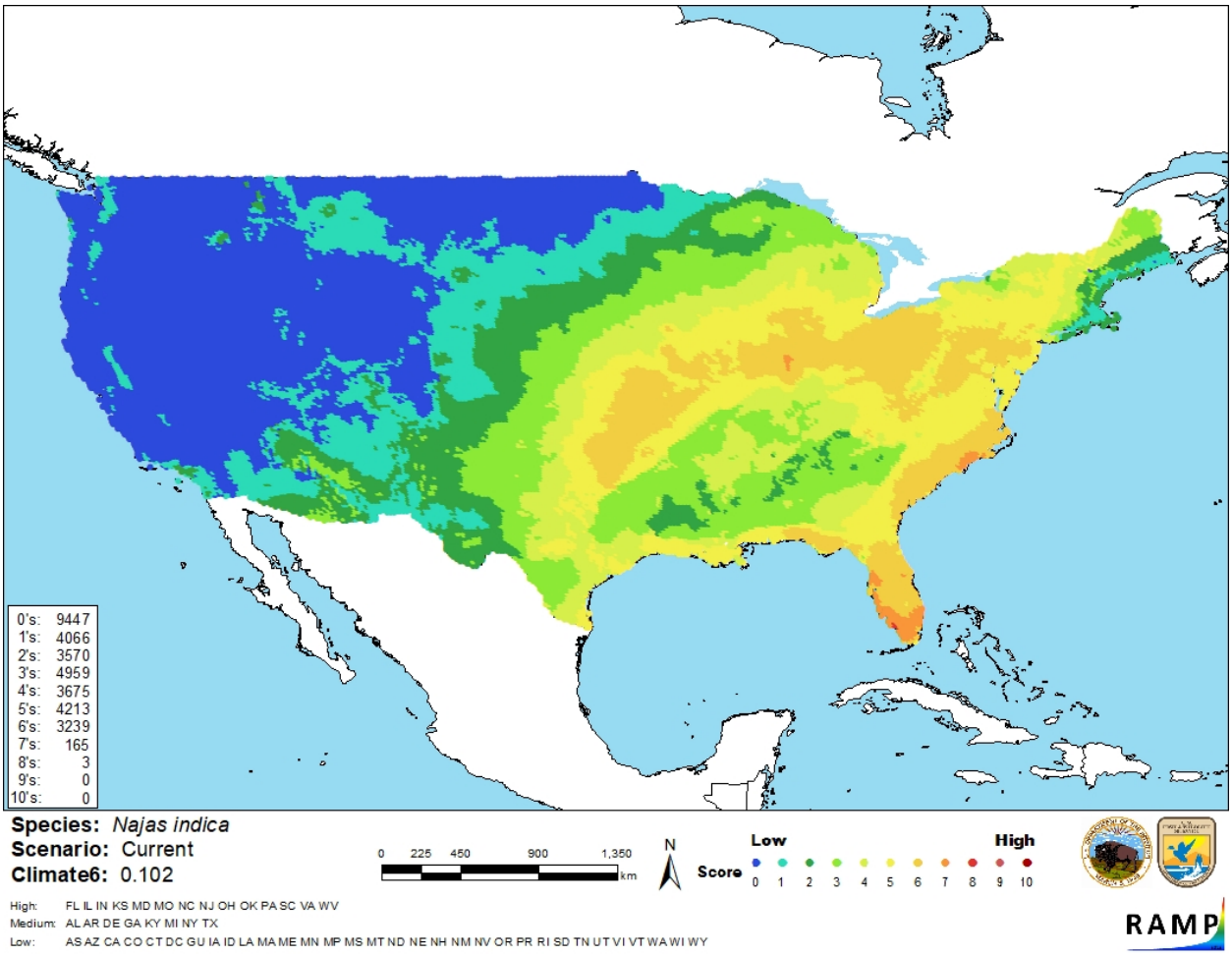

Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *Najas indica* in the contiguous United States based on source locations reported by GBIF Secretariat (2021). Counts of climate match scores are tabulated on the left. 0 = Lowest match, 10 = Highest match.

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

The certainty of this assessment is low. Only limited information was available regarding the biology, ecology, and distribution of *Najas indica*. Since this species has not established outside its native range, there is no information on impacts of introductions. There were no

georeferenced points for the easternmost portion of its range, which reduces certainty in the interpretation of the climate match.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Guppy grass (*Najas indica*) is an aquatic plant found in freshwater ponds, lakes, and paddy fields across southern and Southeast Asia and northern Oceania. It can also tolerate brackish water. *N. indica* is present in the aquarium trade in the United States and has been investigated for its potential use as a phytoremediator. This species has not been reported as introduced or established outside of its native range; therefore, the history of invasiveness is No Known Nonnative Population. Overall climate match with the contiguous United States was medium, with predominant medium to high match in the East (particularly high in the coastal Southeast) and low match in the Western States. Certainty of assessment is low due to lack of information. The overall risk assessment category is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): No Known Nonnative Population**
- **Overall Climate Match Category (Sec. 7): Medium**
- **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.

Buce Plant. 2021. *Najas indica*. Available: https://buceplant.com/products/najas-indica?variant=305041244173 (January 2021).

de Wilde WJJO. 1962. *Najadaceae*. Flora Malesiana. Series 1, Spermatophyta 6:157–171.

GBIF Secretariat. 2021. GBIF Backbone Taxonomy: *Najas indica* (Willd.) Cham. Copenhagen: Global Biodiversity Information Facility. Available: https://www.gbif.org/species/5329388 (January 2021).

India Biodiversity Portal. No date. *Najas indica* (Wild.) Cham. India Biodiversity Portal, species page. Available: http://indiabiodiversity.org/species/show/227803 (August 2020).

Lata N, Vishwakarma K, Dubey V. 2009. Physio-biochemical analysis of *Najas foveolata* A. Br. in relation to salinity. Flora and Fauna 15:73–76.

Sanders S, Castiglione C, Hoff M. 2018. Risk Assessment Mapping Program: RAMP. Version 3.1. U.S. Fish and Wildlife Service.

Singh R, Tripathi RD, Dwivedi S, Kumar A, Trivedi PK, Chakrabarty D. 2010. Lead bioaccumulation potential of an aquatic macrophyte *Najas indica* are related to antioxidant system. Bioresource Technology 101(9):3025–3032.

Western Australia Herbarium. 1998. *Najas foveolata* Magnus. FloraBase – the Western Australia Flora. Western Australia Herbarium, Department of Biodiversity, Conservation and Attractions. Available: https://florabase.dpaw.wa.gov.au/browse/profile/34877 (March 2021).

World Flora Online. 2021. World Flora Online – a project of the World Flora Online Consortium. Available: www.worldfloraonline.org (March 2021).

Zhuang X. 2011. *Najas indica*. The IUCN Red List of Threatened Species 2011: e.T168751A6533825. Available: https://www.iucnredlist.org/species/168751/6533825 (August 2020).

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.

Sunier LC. [Source material did not give full citation for this reference.]

Xiao Y. 2002. *Najas indica* could be used as a experiment material of cytoplasmic flow observation. Middle School Biology:29–30.