

Roundfruit Blyxa (*Blyxa aubertii*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2023

Revised, May 2023

Web Version, 5/21/2024

Organism Type: Flowering Plant

Overall Risk Assessment Category: Uncertain



Photo: coenobita. Licensed under Creative Commons Attribution 4.0 International. Available: <https://inaturalist-open-data.s3.amazonaws.com/photos/18393352/original.jpeg> (February 2023).

1 Native Range and Status in the United States

Native Range

From Jiang and Kadono (2001):

“[...] distributed from India through South-East Asia northwards to Japan and southwards to northern parts of Australia. *Blyxa aubertii* is also reported from Madagascar and Mozambique in Africa (Cook & Lüönd 1983).”

From POWO (2023):

“Andaman Is. [India], Assam [India], Bangladesh, Borneo [Brunei, Indonesia, Malaysia], Caroline Is. [Federated States of Micronesia, Palau], China South-Central, China Southeast, East Himalaya [Bhutan, India], Hainan [China], India, Japan, Jawa [Indonesia], Korea, Madagascar, Malay[si]a, Maluku [Indonesia], Mozambique, Myanmar, Nansei-shoto [Japan], Nepal, New Guinea, Northern Territory [Australia], Philippines, Queensland [Australia], Sri Lanka, Sumatera [Indonesia], Taiwan, Tanzania, Thailand, Vietnam, West Himalaya [India, Pakistan], Western Australia”

Status in the United States

From POWO (2023):

“Introduced to: Louisiana, Mississippi”

According to USGS (2023), nonindigenous occurrences of *Blyxa aubertii* have been reported in the following States. Range of observation years, watersheds, and population status where reported (one or more watersheds) in parentheses.

- Louisiana (1968-1993; Calcasieu-Mermentau, Upper Calcasieu, Mermentau, Mermentau Headwaters, Louisiana Coastal, Bayou Teche; established)
- Mississippi (1989-2013; Black, Lower Chickasawhay; unknown)

From McNair and Alford (2014):

“Since we found *B. aubertii* in four counties in south Mississippi and it was already known to occur in an equal number of parishes in south Louisiana, we predicted it might have also expanded its range to include parts of Texas and Alabama. While this prediction may still prove true, especially with more extensive surveys, we did not find *B. aubertii* or records of its occurrence in these states [...]”

Blyxa aubertii is available for purchase from vendors in the aquarium trade throughout the United States. For example:

From AzGardens (2023):

“BLYXA AUBERTII RED FORM AQUARIUM PLANT [...] \$6.44”

Regulations

No species-specific regulations on possession or trade were found within the United States.

Means of Introductions within the United States

No information available.

Remarks

From McNair and Alford (2014):

“[...] in vegetative form it might be mistaken for its closest relative in the U.S., *Vallisneria americana*.”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2023):

Kingdom Plantae
Subkingdom Viridiplantae
Infrakingdom Streptophyta
Superdivision Embryophyta
Division Tracheophyta
Subdivision Spermatophytina
Class Magnoliopsida
Superorder Lilianae
Order Alismatales
Family Hydrocharitaceae
Genus *Blyxa*
Species *Blyxa aubertii* Rich

According to WFO (2023), *Blyxa aubertii* is the current valid name for this species.

Size, Weight, and Age Range

From WFO (2023):

“[...] stems 0.5–3 cm long. Leaves basal, 2.5–60 by 0.5–1.2 cm [...]”

“[...] perennial.”

From Jiang and Kadona (2001):

“In Japan, [...] complete their life cycle as annual plants, although Cook and Löönd (1983) have referred to the possibility of a perennial life cycle in permanent water in southern regions.”

Environment

From Beentje and Gupta (2017):

“This species is found in shallow waters and marshes. It is also found in paddy fields, ditches and wells.”

“Bogs, Marshes, Swamps, Fens, Peatlands [...] Permanent Freshwater Lakes (over 8ha) [...] Permanent Freshwater Marshes/Pools (under 8ha) [...] Irrigated Land (includes irrigation channels) [...] Canals and Drainage Channels, Ditches”

Climate

From POWO (2023):

“[...] grows primarily in the wet tropical biome.”

From McNair and Alford (2014):

“[...] tropical and subtropical regions in Asia, and Africa (Wang et al. 2010) [...]”

Distribution Outside the United States

Native

From Jiang and Kadono (2001):

“[...] distributed from India through South-East Asia northwards to Japan and southwards to northern parts of Australia. *Blyxa aubertii* is also reported from Madagascar and Mozambique in Africa (Cook & Lüönd 1983).”

From POWO (2023):

“Andaman Is. [India], Assam [India], Bangladesh, Borneo [Brunei, Indonesia, Malaysia], Caroline Is. [Federated States of Micronesia, Palau], China South-Central, China Southeast, East Himalaya [Bhutan, India], Hainan [China], India, Japan, Jawa [Indonesia], Korea, Madagascar, Malay[si]a, Maluku [Indonesia], Mozambique, Myanmar, Nansei-shoto [Japan], Nepal, New Guinea, Northern Territory [Australia], Philippines, Queensland [Australia], Sri Lanka, Sumatera [Indonesia], Taiwan, Tanzania, Thailand, Vietnam, West Himalaya [India, Pakistan], Western Australia”

Introduced

No records were found of introduction of *Blyxa aubertii* in the wild outside of the United States.

Means of Introduction Outside the United States

No records were found of introduction of *Blyxa aubertii* in the wild outside of the United States.

Short Description

From McNair and Alford (2014):

“*Blyxa aubertii* has septate leaves and roots [...] The leaves of *B. aubertii* have somewhat noticeable midribs and acuminate apices [...] has bisexual flowers and ridged seeds [...]”

From WFO (2023):

“A caulescent, glabrous herb. Leaves radical, grass-like, linear, 10-35 cm long, 5-10 mm broad, setose-acute. entire [sic], 5-7 (-9)-nerved, membranous. Flowers bisexual, solitary. Spathe 4-6 (-10) cm long, lobes obtuse; peduncles as long as or longer than leaves, terete. Sepals linear, (6-) 7-15 mm long, ± cucullate at apex. Petals 1.5-2 cm long. Stamens 3, filaments 3-6 mm long, with c. 1-2 mm long, linear anthers. Ovary as long as spathe, with up to 10 cm long rostrum; styles 6-10 mm long. Fruit [sic] linear, 3-6 cm long. Seeds elliptic, 1-2 mm long, with 8 longitudinal rows of obscure tubercles or smooth, not tailed at the ends.”

Biology

From Haynes (2020):

“Flowering summer-fall.”

“According to Jiang and Kadona (2001), the number of flowers and seeds of *Blyxa aubertii* produced are positively correlated with the size of the plant, with an average of 45.3 seeds per fruit and an average of 92.9 seed set rate (number of mature seeds/total number of ovules). Seeds are also produced by self-pollination. These traits may be adaptive to unstable environments such as rice-fields and irrigation ponds, which experiences variable water level fluctuations.”

Human Uses

From Beentje and Gupta (2017):

“It is cultivated for use as a background aquarium plant. In Viet Nam and Lao People’s Democratic Republic it is used as a vegetable.”

Blyxa aubertii is available for purchase from vendors in the aquarium trade throughout the United States (e.g., AzGardens 2023).

Diseases

No information was found on diseases associated with *Blyxa aubertii*.

Threat to Humans

From Beentje and Gupta (2017):

“No major threats have been reported.”

3 Impacts of Introductions

Although *Blyxa aubertii* has been reported as introduced beyond its native range, the impacts of these introductions are uncertain.

From McNair and Alford (2014):

“While *Blyxa aubertii* apparently continues to naturalize and increase its range in the U.S., we do not consider it a serious threat to native plants, at least not to those found in intact habitats, since *B. aubertii* seems confined to disturbed areas of artificial lakes. Still, we believe more investigation will be needed to elucidate this issue, especially if the species is found inhabiting natural bodies of water.”

No species-specific regulations on possession or trade were found within the United States.

4 History of Invasiveness

The History of Invasiveness for *Blyxa aubertii* is classified as Data Deficient. Although established populations of *B. aubertii* have been found outside of its native range in the southern United States, there was no information found regarding actual impacts of introduction or lack thereof. This species is widely available in the United States via the aquarium trade. However, information on the quantity and duration of trade is unknown.

5 Global Distribution



Figure 1. Known global distribution of *Blyxa aubertii*. Observations are reported from North America (southeastern United States), Madagascar, southern and eastern Asia, Micronesia, and Australia. Map from GBIF Secretariat (2022). The coordinates for the reported occurrences in north-central China, central India, and central Australia did not match the verbal descriptions of the collection locations, so those occurrences were not used to select source points for the climate matching analysis.

No georeferenced occurrences were available for parts of the native range of *B. aubertii* in Bangladesh, Bhutan, India, Mozambique, Nepal, the Philippines, or Tanzania.

6 Distribution Within the United States

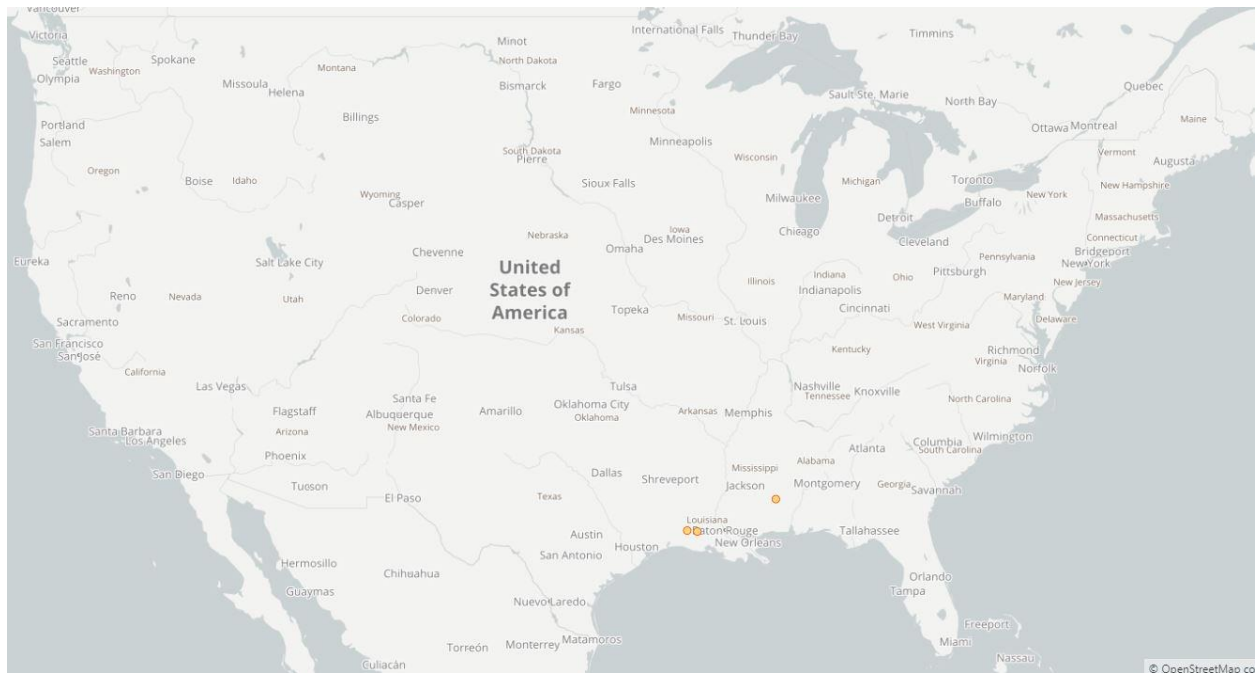


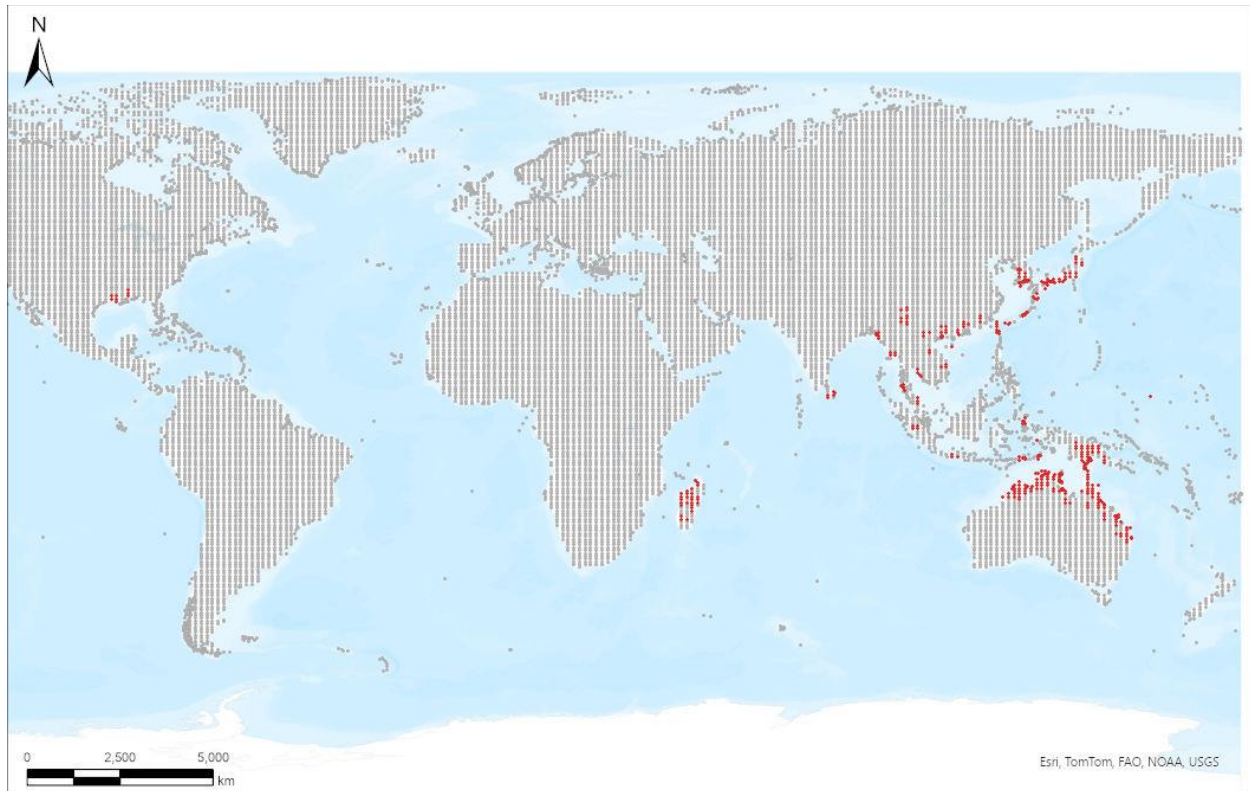
Figure 2. Reported distribution of *Blyxa aubertii* in the United States. Map from GBIF-US (2023). Observations are reported from southwestern Louisiana and southeastern Mississippi.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Blyxa aubertii* in the contiguous United States was highest in the Southeast, particularly along the Gulf Coast. Other areas of high match extended from the Mid-Atlantic region across the southern Midwest and south to Florida and Texas. Low matches were found all along the Pacific Coast and east to the Rocky Mountains, while medium matches were found in the Southwest, Northern Plains, and Great Lakes regions, and in portions of the Northeast. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.481, indicating that Yes, there is establishment concern for this species. The Climate 6 score is calculated as: (count of target points with scores ≥ 6)/(count of all target points). Establishment concern is warranted for Climate 6 scores greater than or equal to 0.002 based on an analysis of the establishment success of 356 nonnative aquatic species introduced to the United States (USFWS 2024).

Projected climate matches in the contiguous United States under future climate scenarios are available for *Blyxa aubertii* (see Appendix). These projected climate matches are provided as additional context for the reader; future climate scenarios are not factored into the Overall Risk Assessment Category.



Species: *Blyxa aubertii*

Selected Climate Stations ●



RAMP

The USFWS makes no warranty for use of this map and cannot be held liable for actions or decisions based on map content. Map image is the intellectual property of Esri and is used herein under license.

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in North America, Africa, Asia, and Australia selected as source locations (red; United States, Madagascar, Sri Lanka, Myanmar, Thailand, Laos, Vietnam, China, North Korea, South Korea, Japan, Taiwan, Indonesia, Timor-Leste, Papua New Guinea, Australia, and the Federated States of Micronesia) and non-source locations (gray) for *Blyxa aubertii* climate matching. Source locations from GBIF Secretariat (2022). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

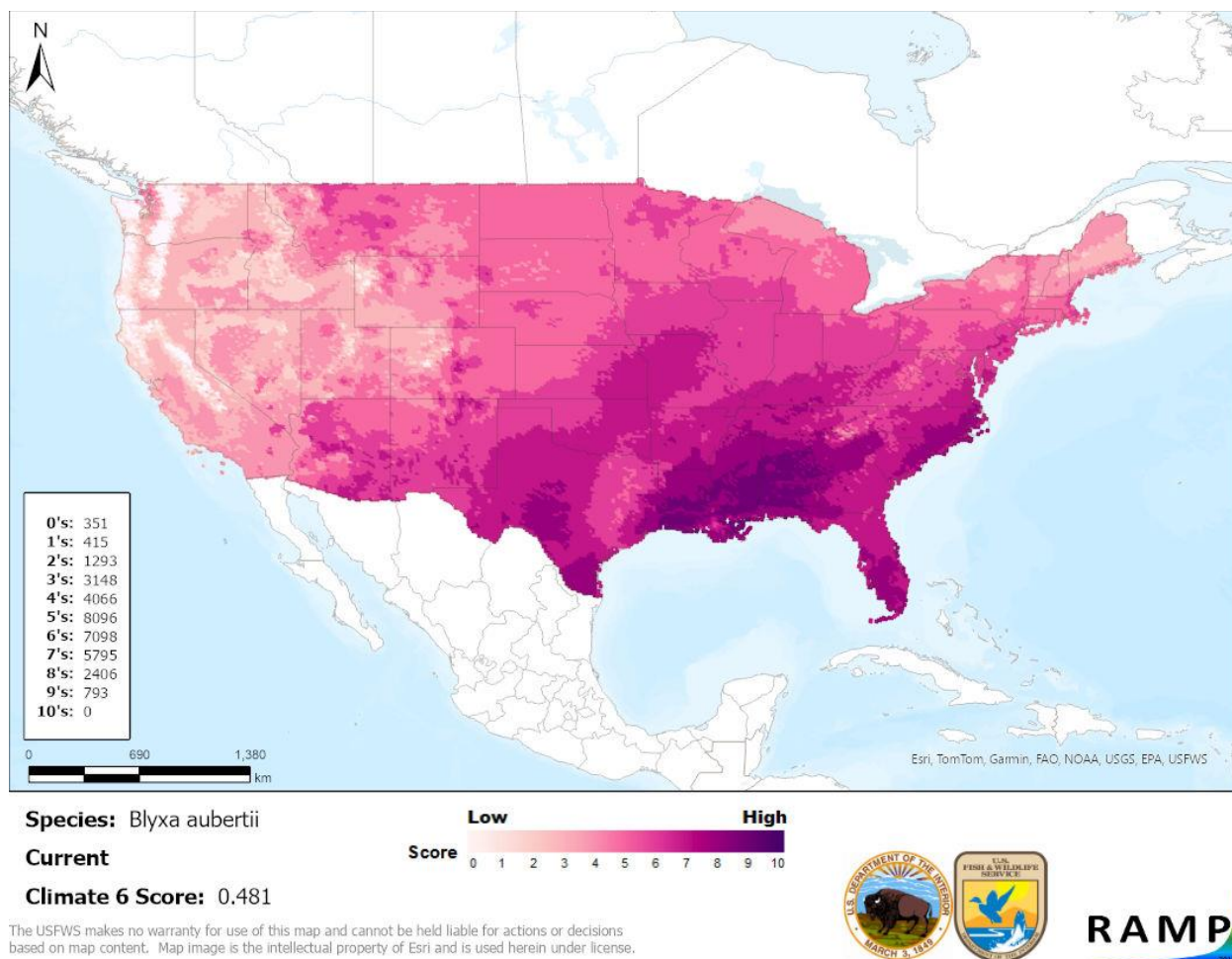


Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Blyxa aubertii* in the contiguous United States based on source locations reported by GBIF Secretariat (2022). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Blyxa aubertii* is classified as Low. Information is available on the biology, ecology, and distribution of *B. aubertii* but no information is available on actual impacts of introduction.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Blyxa aubertii, the Roundfruit Blyxa, is an aquatic flowering plant that is native to Africa, Asia and Australia. *B. aubertii* is commonly found in shallow waters such as marshes, paddy fields and ditches. This species is commonly sold in the aquarium trade and has been introduced and become established in southwestern Louisiana and southeastern Mississippi. The History of Invasiveness for *B. aubertii* is classified as Data Deficient due to a lack of information regarding impacts of introduction. The climate matching analysis for the contiguous United States indicates

establishment concern for this species. The climate match is particularly high along the Gulf Coast, near the known established populations of *B. aubertii*. The Certainty of Assessment for this ERSS is classified as Low due to lack of information regarding impacts of introduction. The Overall Risk Assessment Category for *B. aubertii* in the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (see section 4): Data Deficient**
- **Establishment Concern (see section 7): Yes**
- **Certainty of Assessment (see section 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.

- AzGardens. 2023. *Blyxa aubertii* aquarium plant. Azgardens. Available: <https://azgardens.com/product/blyxa-aubertii-aquarium-plant/> (February 2023).
- Beentje HJ, Gupta AK. 2017. *Blyxa aubertii*. The IUCN Red List of Threatened Species 2017. Available: <https://www.iucnredlist.org/species/168967/84276761> (February 2023).
- GBIF Secretariat. 2022. GBIF backbone taxonomy: *Blyxa aubertii* Rich. Copenhagen: Global Biodiversity Information Facility. Available: <https://www.gbif.org/species/2865952> (February 2023).
- GBIF-US. 2023. Species occurrences: *Blyxa aubertii*. Available: <https://doi.org/10.15468/dl.r7tdcc> (February 2023).
- Haynes RR. 2020. *Blyxa aubertii*. In Flora of North America Editorial Committee, editors. Flora of North America north of Mexico. Volume 22. New York and Oxford: Flora of North America Association. Available: http://floranorthamerica.org/Blyxa_aubertii (May 2023).
- [ITIS] Integrated Taxonomic Information System. 2023. *Blyxa aubertii* Rich. Reston, Virginia: Integrated Taxonomic Information System. Available: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=501003#null (February 2023).
- Jiang M, Kadono Y. 2001. Seasonal growth and reproductive ecology of two threatened aquatic macrophytes, *Blyxa aubertii* and *B. echinosperma* (Hydrocharitaceae), in irrigation ponds of south-western Japan. *Ecological Research* 16:249–256.
- McNair DM, Alford MH. 2014. *Blyxa aubertii* (Hydrocharitaceae) new to Mississippi, USA. *Journal of the Botanical Research Institute of Texas* 8:267–270.

- [POWO] Plants of the World Online. 2023. *Blyxa aubertii* Rich. Plants of the World Online. London: Royal Botanic Gardens, Kew. Available: <https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:431616-1> (February 2023).
- Sanders S, Castiglione C, Hoff M. 2023. Risk Assessment Mapping Program: RAMP. Version 5.0. U.S. Fish and Wildlife Service.
- [USFWS] U.S. Fish and Wildlife Service. 2024. Standard operating procedure: how to prepare an “Ecological Risk Screening Summary.” Version 3.
- [USGS] U.S. Geological Survey. 2023. *Blyxa aubertii* Rich. Gainesville, Florida: U.S. Geological Survey, Nonindigenous Aquatic Species Database. Available: <https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=1106> (February 2023).
- [WFO] World Flora Online. 2023. *Blyxa aubertii* Rich. The World Flora Online. Available: <http://www.worldfloraonline.org/taxon/wfo-0000770592> (February 2023).

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.

- Cook CDK, Löönd R. 1983. A revision of the genus *Blyxa* (Hydrocharitaceae). Aquatic Botany 15:1–52.
- Wang QF, Guo YH, Haynes RR, Hellquist CB. 2010. Hydrocharitaceae. Pages 91–102 in Flora of China. Volume 23. Science Press and Missouri Botanical Garden Press.

Appendix

Summary of Future Climate Matching Analysis

Future climate projections represent two Shared Socioeconomic Pathways (SSP) developed by the Intergovernmental Panel on Climate Change (IPCC 2021): SSP5, in which emissions triple by the end of the century; and SSP3, in which emissions double by the end of the century. Future climate matches were based on source locations reported by GBIF Secretariat (2022).

Under the future climate scenarios (figure A1), on average, high climate match for *Blyxa aubertii* was projected to occur in the Southeast region of the contiguous United States. Areas of low climate match were projected to occur in the Northern Pacific Coast and Western Mountains regions, as well as along the Sierra Nevada. In general, the areas of higher climate match moved northward with time and from SSP3 to SSP5. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.427 (model: MPI-ESM1-2-HR, SSP5, 2085) to a high of 0.576 (model: IPSL-CM6A-LR, SSP3, 2085). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there is establishment concern for this species under future scenarios. The Climate 6 score for the current climate match (0.481, figure 4) falls within the range of scores for future projections. The time step and climate scenario with the most change relative to current conditions was SSP5, 2085, the most extreme climate change scenario. Under multiple time step and climate scenarios, areas within the Northeast saw a large increase in the climate match relative to current conditions. Additionally, areas within the Appalachian Range, Colorado Plateau, Great Basin, Great Lakes, Mid-Atlantic, Northern Pacific Coast, and Western Mountains saw a moderate increase in the climate match relative to current conditions. Under one or more time step and climate scenarios, areas within the Gulf Coast, Northern Plains, Southeast, Southern Atlantic Coast, Southern Florida, and Southwest saw a moderate decrease in the climate match relative to current conditions. No large decreases were observed regardless of time step and climate scenarios. Additional, very small areas of large or moderate change may be visible on the maps (figure A3). These changes in climate match were more pronounced under SSP5 than under SSP3, and at the 2085 time step relative to the 2055 time step.

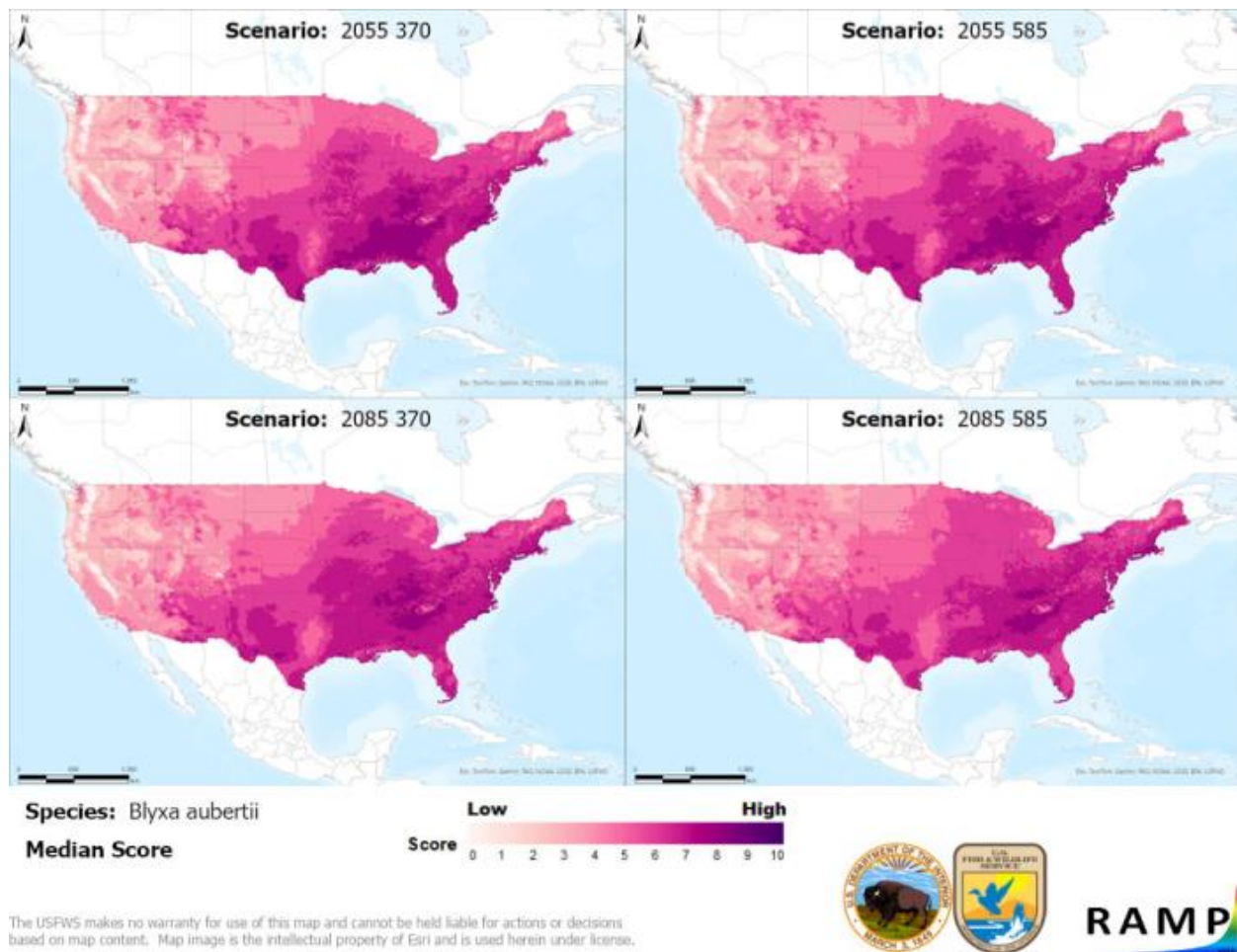


Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Blyxa aubertii* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2022). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

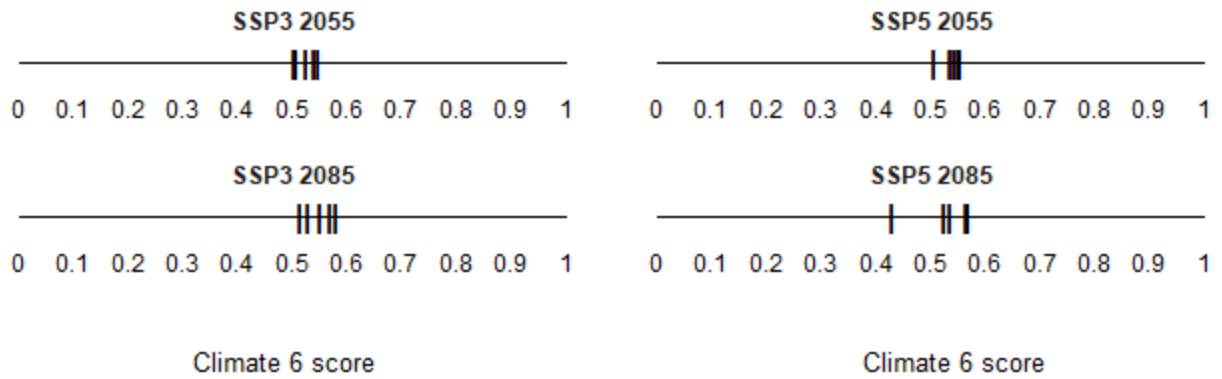


Figure A2. Comparison of projected future Climate 6 scores for *Blyxa aubertii* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0.

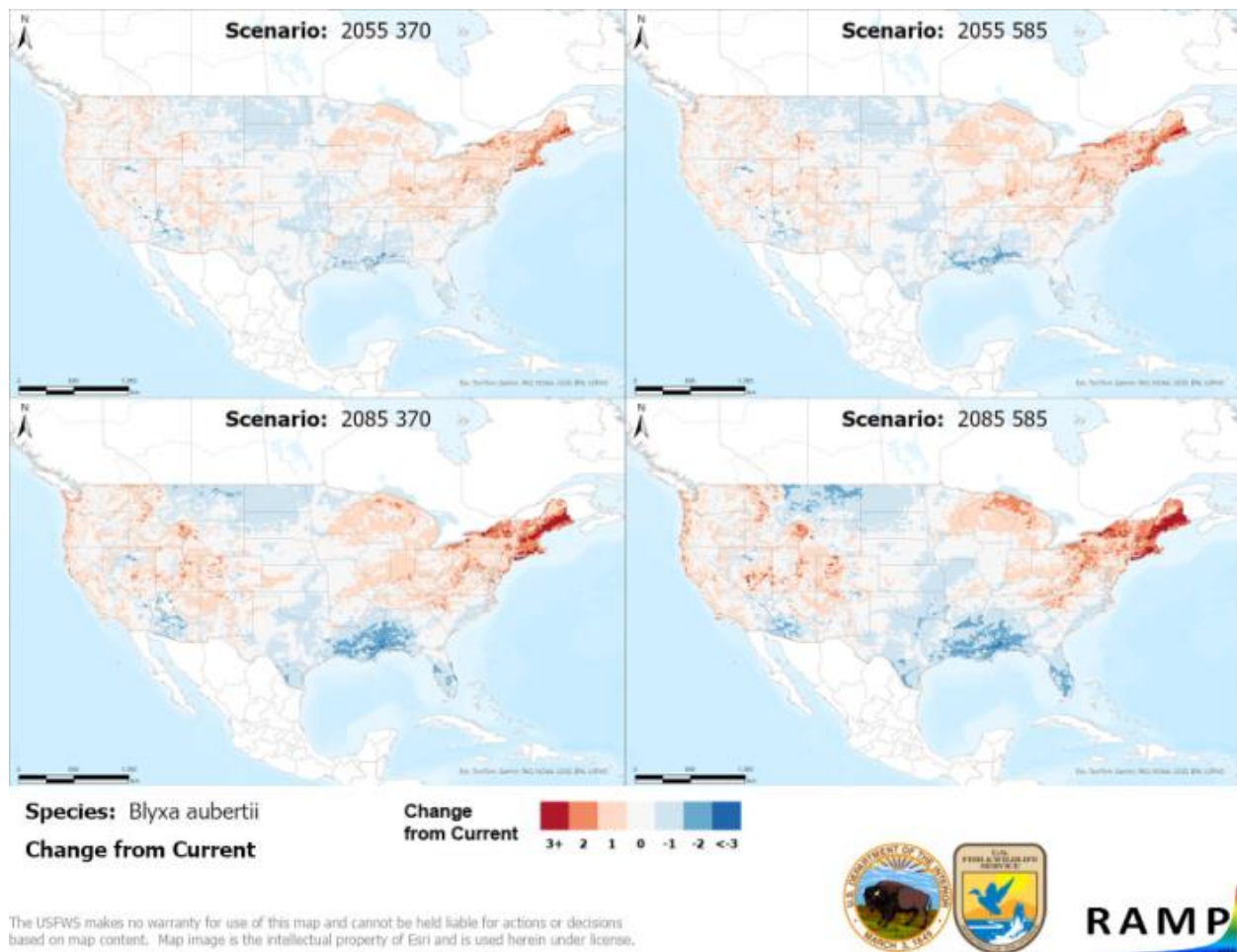


Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Blyxa aubertii* based on source locations reported by GBIF Secretariat (2022). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. Shades of blue indicate a lower target point score under future scenarios than under current conditions. Shades of red indicate a higher target point score under future scenarios than under current conditions. Darker shades indicate greater change.

Literature Cited

- GBIF Secretariat. 2022. GBIF backbone taxonomy: *Blyxa aubertii*. Copenhagen: Global Biodiversity Information Facility. Available: <https://www.gbif.org/species/2865952> (February 2023).
- [IPCC] Intergovernmental Panel on Climate Change. 2021. Climate change 2021: the physical science basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
- Karger DN, Conrad O, Böhner J, Kawohl T, Kreft H, Soria-Auza RW, Zimmermann NE, Linder HP, Kessler M. 2018. Data from: Climatologies at high resolution for the earth's land surface areas. EnviDat. Available: <https://doi.org/10.16904/envodat.228.v2.1>.
- Karger DN, Conrad O, Böhner J, Kawohl T, Kreft H, Soria-Auza RW, Zimmermann NE, Linder P, Kessler M. 2017. Climatologies at high resolution for the Earth land surface areas. Scientific Data 4:170122.
- Sanders S, Castiglione C, Hoff M. 2023. Risk Assessment Mapping Program: RAMP. Version 5.0. U.S. Fish and Wildlife Service.