South American Spongeplant (*Hydrocharis laevigata*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, May 2025
Revised, June 2025
Web Version, 2/19/2026

Organism Type: Flowering Plant
Overall Risk Assessment Category: High

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1 Native Range and Status in the United States

Native Range

From CABI (2016):

"*L. laevigatum* [*Hydrocharis laevigata*] originates from freshwater habitats of tropical and subtropical regions in Mexico, Central and South America and the Caribbean. It is native to Mexico, Brazil, Antigua, Cuba, Dominican Republic, Guadeloupe, Martinique, Montserrat, Puerto Rico, St. Lucia, Trinidad, Costa Rica, El Salvador, Guatemala, Nicaragua, Panama, French Guiana, Guyana, Suriname, Venezuela, Argentina, Chile, Paraguay, Uruguay, Colombia, Ecuador and Peru (Bove, 2016; USDA-ARS, 2016). There are however contradictory reports on

whether it's native to Chile or not. According to the USDA-ARS (2016) it is native to Chile however Hyde et al., (2016) state that *L. laevigatum* is not present in Chile."

According to POWO (2026), *H. laevigata* is native to Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Leeward Is. (southern Lesser Antilles), Mexico, Nicaragua, Panamá, Paraguay, Peru, Puerto Rico, Trinidad-Tobago, Uruguay, Venezuela, and Windward Is. (northern Lesser Antilles).

Status in the United States

According to POWO (2026), *H. laevigata* is native to Puerto Rico.

According to USGS (2026), *H. laevigata* is introduced to and established in Pacific County, Washington.

From CABI (2016):

"The species has been introduced to California, USA and has escaped into greater waterways including areas surrounding Redding and Arcata, the Sacramento River delta and the San Joaquin River and ponds and irrigation canals. *L. laevigatum* is now present in 12 counties in California (Calflora, 2016; Encyclopedia of Life, 2016)."

"Although *L. laevigatum* is now regulated and subject to eradication in California (USDA-APHIS, 2013), it's still grown and sold by the aquatic nursery plant trade (Hrusa et al., 2002) […]"

Hydrocharis laevigata is present in live trade in the United States (e.g., Aquasabi 2025; GetAnyPlant.com 2025).

Regulations

Hydrocharis laevigata is regulated under the name *Limnobium laevigatum* in California (CDFA 2021), Oregon (ODA 2022), and Washington (Washington State NWCB 2023). Please refer back to state agency regulatory documents for details on the regulations, including restrictions on activities involving this species. While effort was made to find all applicable regulations, this list may not be comprehensive. Notably, it does not include regulations that do not explicitly name this species or its genus or family, for example, when omitted from a list of authorized species with blanket regulation for all unnamed species.

Means of Introductions within the United States

From USDA APHIS (2013):

"Propagules are dispersed by water and birds, and as hitchhikers on watercraft (Akers, [2010])."

From CABI (2016):

"*L. laevigatum* was intentionally introduced to North American waterways through use in aquariums and aquascapes (Encyclopedia of Life, 2016)."

Remarks

The taxonomic authorities used in this Ecological Risk Screening Summary are defined in a Standard Operating Procedure (USFWS 2024), which can be found online (https://www.fws.gov/node/415801). This report follows the chosen taxonomic authority for plants (World Flora Online; WFO 2025) in treating *Hydrocharis laevigata* as the accepted scientific name for the subject taxon. This species recently underwent a taxonomic name change from *Limnobium laevigatum* to *Hydrocharis laevigata* and therefore much of the literature and information from databases still references the species as *Limnobium laevigatum.* This assessment used both scientific names when searching for information regarding this species.

This ESS was previously published under the name *Limnobium laevigatum* in March 2021. Revisions were completed to incorporate new information and conform to updated standards.

From CABI (2016):

"Common names for this species include South American spongeplant and Amazon or smooth frogbit (Encyclopedia of Life, 2016)."

From Garcia-Murillo (2023):

"It should also be noted that there may exist some problematic records for South America. For example, although [Zuloaga et al. 2008] stated that the species is native to the Southern Cone, this assertion is questionable in the case of Chile, as [Martín et al. 2021] indicates that the country's oldest herbarium specimen dates back to 1954. The same is likely true for Argentina: while the species' native range is thought to extend across most of the country, it certainly appears to be invasive in the southernmost regions of Argentina, where it has recently appeared for the first time [Pérez and Seewald 2019]."

From CABI (2016):

"In New South Wales, Australia, this species is listed as a Prohibited Weed (NSW Department of Primary Industries, 2016). This means that it must be eradicated from land."

Mention of commercial products in this Ecological Risk Screening Summary does not entail endorsement by the U.S. Federal Government.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From WFO (2025):

Kingdom Plantae
Subkingdom Viridiplantae
Infrakingdom Streptophyta
Superdivision Embryophyta
Division Tracheophyta
Subdivision Spermatophytina
Class Magnoliopsida
Superorder Lilianae
Order Alismatales
Family Hydrocharitaceae
Genus *Hydrocharis*
Species *Hydrocharis laevigatum* (Humb. & Bonpl. ex Willd.) Byng & Christenh

According to WFO (2025), *Hydrocharis laevigata* (Humb. & Bonpl. ex Willd.) Byng & Christenh is the current accepted name for this species.

The following synonyms of *Hydrocharis laevigata* from WFO (2025) were used to search for information for this report: *Limnobium laevigatum*, *Hydrocharis laevigatum.*

Size, Weight, and Age Range

From DiTomaso et al. (2013):

"[…] about 2 ft tall […]"

"Seeds appear to survive for at least 4 years."

Environment

From CABI (2016):

"*L. laevigatum* originates from freshwater water habitats […] It occurs in rivers, ponds, lakes, canals and other aquatic habitats (Cook and Urmi-König, 1983). In Puerto Rico it is reported to grow in shallow ponds, sluggish shaded rivers, fresh-water ditches and swamps at or near sea level (USDA-APHIS, 2013)."

"In Brazil *L. laevigatum* occurs in a wide range of habitats from the Amazon Rainforest, Caatinga (xerophilous thorny forest and scrub of the drylands of north-eastern Brazil), Central Brazilian Savanna, Atlantic Rainforest, Pampa (grasslands from Southern Brazil) and Pantanal (periodically flooded grasslands by the rivers Paraná and Paraguay in Central-Western Brazil) (Bove, 2016)."

“Cold temperatures are more likely to limit its distribution. It grows in full sun, but in Puerto Rico it is also reported to grow in shady streams (Acevedo-Rodriguez and Strong, 2005; USDA-APHIS, 2013). The preferred water temperature is between 15-28°C and the preferred water’s acidity is between 6-8 pH. Although it originates from fresh water habitats, it also grows in slightly saline waters and even outcompetes other species in this environment (Perryman, 2013).”

Climate

From CABI (2016):

“*L. laevigatum* originates […] in the tropics and subtropics. The USDA-APHIS (2013) reports on a minimum annual precipitation of 250 mm. But as an aquatic plant, precipitation is probably not a direct limiting factor. […] In South America this species has been recorded at altitudes of more than 2,000 m (Acevedo-Rodriguez and Strong, 2005).”

Distribution Outside the United States

Native

From CABI (2016):

“*L. laevigatum* originates from fresh water habitats of tropical and subtropical regions in Mexico, Central and South America and the Caribbean. It is native to Mexico, Brazil, Antigua, Cuba, Dominican Republic, Guadeloupe, Martinique, Montserrat, Puerto Rico, St. Lucia, Trinidad, Costa Rica, El Salvador, Guatemala, Nicaragua, Panama, French Guiana, Guyana, Suriname, Venezuela, Argentina, Chile, Paraguay, Uruguay, Colombia, Ecuador and Peru (Bove, 2016; USDA-ARS, 2016). There are however contradictory reports on whether it’s native to Chile or not. According to the USDA-ARS (2016) it is native to Chile however Hyde et al., (2016) state that *L. laevigatum* is not present in Chile.”

According to POWO (2026), *H. laevigata* is native to Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Leeward Is. (southern Lesser Antilles), Mexico, Nicaragua, Panamá, Paraguay, Peru, Puerto Rico, Trinidad-Tobago, Uruguay, Venezuela, and Windward Is. (northern Lesser Antilles).

Introduced

Kadono (2004) includes *H. laevigata* (as *Limnobium laevigatum*) on a list of “species which have been observed in the wild but may be of temporal occurrence” in Japan.

From Howard et al. (2016):

“There is no doubt that *L. laevigatum* is well-established in the Zambezi River [Zimbabwe and Zambia], downstream from Lake Kariba and on the edge of the lake, as well as in at least two peri-urban water bodies in Harare, Zimbabwe.”

From Garcia-Murillo (2023):

"Based on the scientific literature and the GBIF database, *H. laevigata* is known to occur in six European countries: Belgium, Hungary, The Netherlands, Poland, Spain, and Sweden."

"[…] at present, the only naturalised *H. laevigata* populations in Europe are in Hungary and Spain […]"

"It was observed [in Hungary] that the *H. laevigata* populations became established near hot springs (temperatures = 21–23 °C), which do not freeze in the winter. Recently, Dr. Riezing (pers. comm.) has indicated that these populations in northern Hungary have persisted, likely because of mild winter conditions and the warm water temperatures."

"On the Iberian Peninsula, the species seems to have rapidly expanded its range. Since 2018, it has been found at three locations that are quite distant from each other. The first published record for this species (as *Limnobioum laevigatum*) was associated with a reservoir near Madrid [Corro et al. 2019]. A few years later, it was observed in a stream next to a dam near Córdoba [Martínez-Sagarra et al. 2021]. Finally, it was also reported to occur in the Guadaira, a tributary of the Gualdalquivir, near Seville [García Murillo et al. 2021] […] There are no indications that *H. laevigata* has disappeared from any of these locations in Spain."

Islamy et al. (2024) report *H. laevigata* (as *L. laevigatum* or "frogbit") from the Brantas River, East Java, Indonesia, at a density of 17.5 individuals per square meter.

From Csurhes and Davies (2025):

"*Hydrocharis laevigata* was first recorded as 'naturalised' in Queensland in March 2011 (at Wellington Point, Redland City Council, southeast Queensland) […] The weed has become a serious concern for the Barron Gorge Hydroelectric Power Station [northeastern Queensland] as it threatens to disrupt operations and electricity generation (FNQROC 2023). Scattered populations exist elsewhere in Queensland, such as at Granite Creek, west of Cairns […]"

"Elsewhere in Australia, it has naturalised in Western Australia, New South Wales and the Northern Territory."

VicFlora (2026) also reports *H. laevigata* as naturalized in the State of Victoria, Australia.

POWO (2026) reports *H. laevigata* as introduced into Taiwan. No further information was found regarding status in Taiwan.

Means of Introduction Outside the United States

From Howard et al (2016):

"It is likely that original introductions of *L. laevigatum* [in Zimbabwe and Zambia] have occurred through aquariums, as there is a well-developed trade and use of this species as an attractive and useful plant (e.g. aquarium plant websites)."

"*Limnobium laevigatum* has become a favourite freshwater aquarium plant, which may explain the recent spread of this South American species to parts of North America (Gaimari and O'Donnell 2009), Japan (Perryman 2013), Eastern Australia (The Atlas of Living Australia 2015), and now Africa. The link between the spread of this species and the freshwater aquarium trade, as a likely pathway for invasion, was noted after *L. laevigatum* was discovered in an urban waste water drain, in 2003, in a suburb of Perth, Western Australia (SERCUL 2013)."

Short Description

From CABI (2016):

"*L. laevigatum* is a floating or emergent aquatic herb. Leaves are subcircular, floating, glabrous and glossy above, with a thick layer of air-filled spongy tissue beneath, base rounded or shallowly cordate. Juvenile plants grow in rosettes of floating leaves that lie prostrate upon the water surface. A distinguishing character of the juvenile plant is the presence of spongy aerenchyma tissue upon the underside of the leaf. Mature plants grow up to 50 cm tall and have emergent leaves borne on petioles that are not swollen or inflated like the spongy leaf stalks of water hyacinth. The plant produces stolons which bear ramets which may be the main source of new plants where flowers are unknown."

"Flowers are small, white, and unisexual. Female flowers have an inferior ovary. The fruit is a fleshy, berry-like capsule 4–13 mm long and 2–5 mm in diameter, borne on a recurved pedicel, developing in mud or under water. The fruit contains up to 100 seeds. The seeds are 1 mm long, ellipsoid, and hairy (Cook and Urmi-König, 1983; Encyclopedia of Life, 2016)."

From Willis et al. (2018):

"Sponge plant can be difficult to identify as possesses three distinct growth patterns including: 1) a seedling stage mimicking duckweed (*Lemna* sp. and *Landoltia* sp.), 2) a rosette stage that looks similar to immature fragrant water lily (*Nymphaea odorata* Aiton), and 3) a stalked emergent stage often mistaken as water hyacinth [*Eichhornia crassipes* (Mart.) Solms] [Anderson 2011]. A key identification attribute of sponge plant is aerenchyma located on the underside of the leaf. Aerenchyma of seedling and rosette growth forms are obvious, although the mature emerged obovate leaves predominantly only have aerenchyma where the petiole and blade initially connect."

Biology

From CABI (2016):

"*L. laevigatum* can reproduce sexually through flower pollination and seed production (Encyclopedia of Life, 2016). The species is monoecious (there are separate male and female flowers on the same plant) (Acevedo-Rodriguez and Strong, 2005) and plants are autogamous (pollen from male flowers pollinate female flowers on the same plant). After pollination the pedicel of female flowers bends downward, forcing the fruit to develop in the water or in the mud (Cook and Urmi-König, 1983). The seeds can germinate underwater (Cook and Urmi-König, 1983). The survival time of seeds is not known. But at a pond in Redding, California

seedlings of this species were appearing despite populations being almost completely suppressed for three years. This suggests that there may be a seed bank (Akers, 2010). It can also reproduce vegetatively through fragmentation of stolon segments which connect rosettes (Cook and Urmi-König, 1983)."

"*L. laevigatum* often forms sub-communities with *Eichhornia azurea* (Murphy et al., 2003) and often grows and floats with *Eichhornia crassipes* (Howard et al., 2016)."

"The juvenile plants of *L. laevigatum* have a great capacity for distribution because they are small, can float and are easily carried along by water currents (Encyclopedia of Life, 2016) and water surface winds (Howard et al., 2016). Seeds, seedlings (which develop in water) and entire plants are all dispersed by water (Lowden, 1992). There are reports of the seeds being spread by wind (Anderson and Akers, 2011).

Human Uses

From CABI (2016):

"*L. laevigatum* is used in aquariums and aquascapes (Encyclopedia of Life, 2016) and is grown and sold by the aquatic nursery plant trade in many parts of the world. Putzke (2009) reports on use of aquatic macrophytes such as *L. laevigatum* for cultivation of the mushroom, *Pleurotus ostreatus* in wetlands."

"It has been reported that *L. laevigatum* has a potential role in bioremediation, the use of organisms to remove or neutralise pollutants from a contaminated site (Aponte and Pacherres, 2013)."

Diseases

No information was found on diseases associated with *Hydrocharis laevigata*.

Threat to Humans

From CABI (2016):

"The dense mats of *L. laevigatum* have been reported to obstruct waterways, which reduces the quality or availability of irrigation water (DiTomaso, 2010). Observations in California confirm that vegetative mats consisting of *L. laevigatum* move with the current and pile up wherever there is an obstruction. The plants therefore accumulate in infrastructure for moving water and will likely jam weirs, dams, gates, and siphons, as well as being pulled into pumps where they will jam and damage the machinery. During high water, the plants may increase flood risk by piling against obstructions and clogging the channel (Akers, 2010). In South America, its native range, *L. laevigatum* also forms dense mats which have been reported to disrupt thousands of kilometres of drainage canals dug for transporting timber (Fernández et al., 1990). The economic cost of this species in its introduced and native range is unknown."

From Csurhies and Davies (2025):

“The weed has become a serious concern for the Barron Gorge Hydroelectric Power Station as it threatens to disrupt operations and electricity generation (FNQROC 2023).”

3 Impacts of Introductions

From CABI (2016):

“*L. laevigatum* can from [sic] dense mats across waterbodies (with up to 2,500 plants m-2 recorded). This can dramatically change the habitat structure, limit access by other species (e.g. some aquatic birds) and block light to the aquatic community below (Akers, 2010). As a result this can decrease the biodiversity in an area (Akers, 2010). Other impacts seem likely, but have not yet been documented for this species. A pest report from California suggests that the floating mats will probably alter many ecosystem processes such as carbon and nutrient cycling. It is likely that high organic inputs into water bodies will also reduce oxygen levels in the systems (Akers, 2010).”

“The dense mats of *L. laevigatum* have been reported to obstruct waterways, which reduces the quality or availability of irrigation water (DiTomaso, 2010). Observations in California confirm that vegetative mats consisting of *L. laevigatum* move with the current and pile up wherever there is an obstruction. The plants therefore accumulate in infrastructure for moving water and will likely jam weirs, dams, gates, and siphons, as well as being pulled into pumps where they will jam and damage the machinery. During high water, the plants may increase flood risk by piling against obstructions and clogging the channel (Akers, 2010). In South America, its native range, *L. laevigatum* also forms dense mats which have been reported to disrupt thousands of kilometres of drainage canals dug for transporting timber (Fernández et al., 1990). The economic cost of this species in its introduced and native range is unknown.”

From Garcia-Murillo (2023):

“While the impacts of this species have yet to be fully described, past observations [Cook and Urmi-König 1983; APHIS 2013; Ruiz-Merino et al. 2022; Van de Witte 2022] indicate that the floating rosettes block light from reaching the water below, indirectly fostering anoxic conditions. *H. laevigata* can thus reduce the abundance and diversity of aquatic plants and animals (e.g., fish, phytoplankton, submersed plants) by rendering water bodies unsuitable for other organisms.”

Hydrocharis laevigata is regulated under the name *Limnobium laevigatum* in California (CDFA 2021), Oregon (ODA 2022), and Washington (Washington State NWCB 2023). See section 1.

4 History of Invasiveness

The History of Invasiveness for *Hydrocharis laevigata* is classified as High. *H. laevigata* has a long history of introduction through intentional aquarist introductions and natural dispersal within its invaded range. The species has been introduced and become established beyond its native range in the United States, Australia, Zambia, Zimbabwe, Indonesia, Spain, and Hungary.

It has also been introduced but is unknown if established in Japan and Taiwan. Once introduced, this species readily disperses and reproduces naturally. There are documented negative impacts of introduction for this species: *H. laevigata* creates dense vegetative mats that reduce water quality, biodiversity, and cause economic impacts to humans.

5 Global Distribution

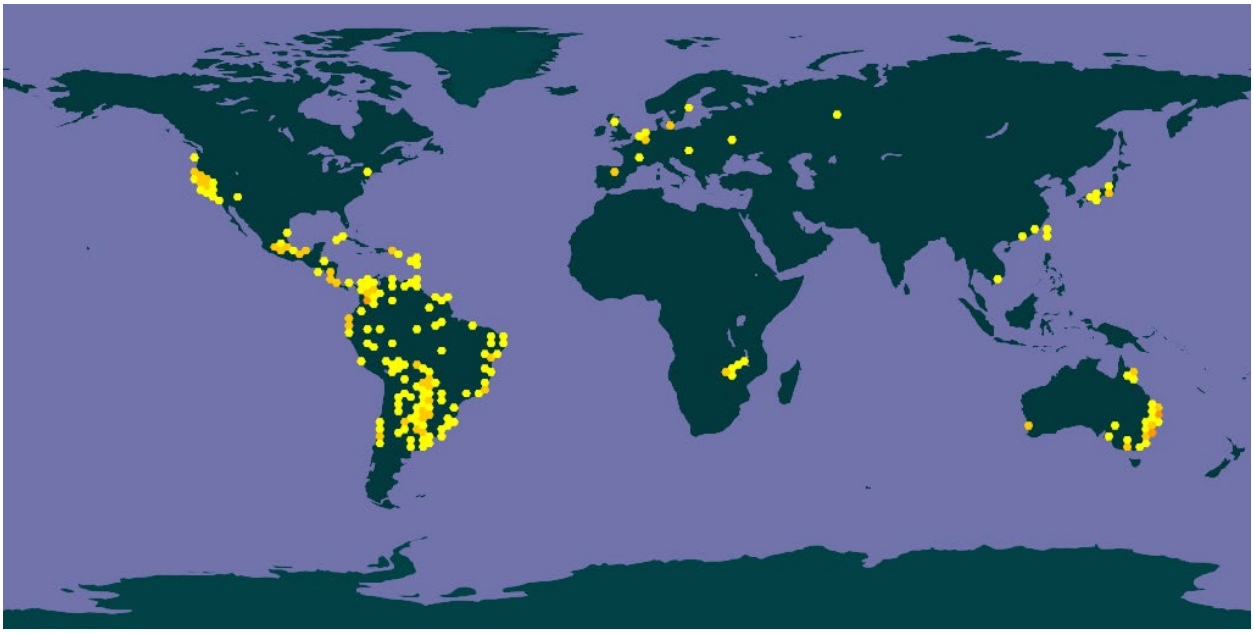

Figure 1. Reported global distribution of *Hydrocharis laevigata*. Map from GBIF Secretariat (2023). Observations are reported from South America (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Paraguay, Peru, Suriname, Uruguay, Venezuela), Central America and the Caribbean (Costa Rica, Cuba, El Salvador, Guadeloupe, Honduras, Martinique, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago), North America (United States [Arizona, California, New York, Washington], Mexico), Africa (Malawi, Zambia, Zimbabwe), Europe (Belgium, France, Germany, Hungary, Netherlands, Russia, Spain, Sweden, Ukraine, United Kingdom), Asia (China, Indonesia, Japan, Taiwan, Vietnam), and Australia. Reported observations in south-central Australia, Belgium, China, France, Germany, Japan, Malawi, Netherlands, Russia, Sweden, Taiwan, Ukraine, United Kingdom, parts of the United States (see section 6), Vietnam, and northern Zambia are not known to represent established populations and therefore those observations were not used to select source points for the climate matching analysis. Additionally, the population in Hungary is established in hot springs; because these conditions do not represent the ambient climate of the area, the Hungarian observations were not used to select source points for the climate matching analysis.

Additional occurrences in Indonesia were available for the climate matching analysis from Islamy et al. (2024).

6 Distribution Within the United States

Figure 2. Reported distribution of *Hydrocharis laevigata* in the United States. Map from USGS (2026). Yellow points represent established nonnative populations of *Hydrocharis laevigata* and orange points represent other reported occurrences. Only established populations and points in the native range (including Puerto Rico; POWO 2026) were used to select source locations for the climate matching analysis.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Hydrocharis laevigata* to the contiguous United States was highest in California, where the species is already established. Other areas of high match included the Pacific Northwest, Great Basin, Southwest, Southern Plains, Southeast, and much of the Mid-Atlantic region. Medium matches covered the remainder of the contiguous United States except in far north-central and northeastern areas and in parts of the Rocky Mountains, where the climate match was low. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.739, 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 *Hydrocharis laevigata* (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.

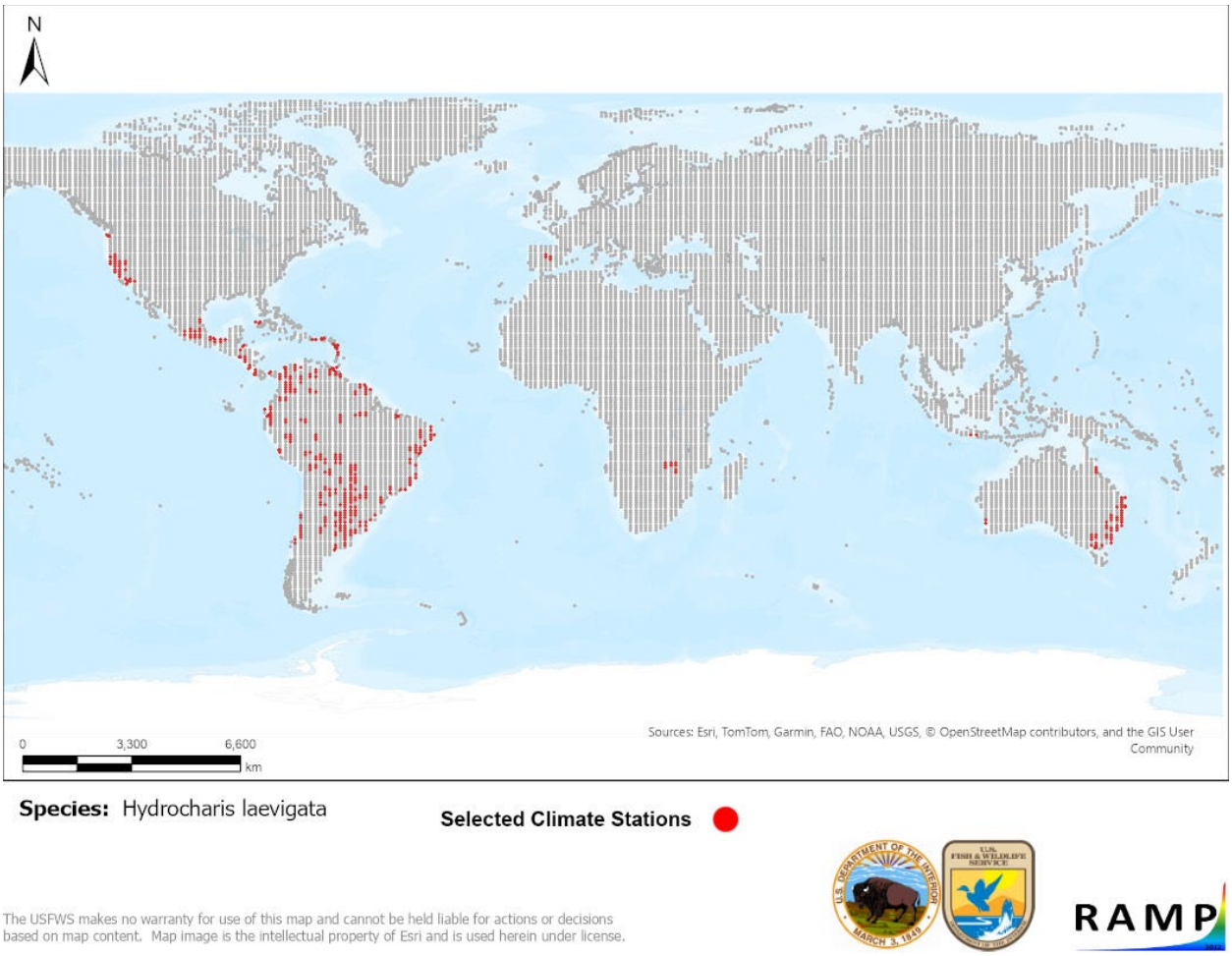

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations throughout the world selected as source locations (red; Argentina, Australia, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, French Guiana, Guadeloupe, Guyana, Honduras, Indonesia, Martinique, Mexico, Montserrat, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Saint Lucia, Spain, Suriname, Trinidad and Tobago, United States, U.S. Virgin Islands, Uruguay, Venezuela, Zambia, and Zimbabwe) and non-source locations (gray) for *Hydrocharis laevigata* climate matching. Source locations from GBIF Secretariat (2023) and Islamy et al. (2024). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

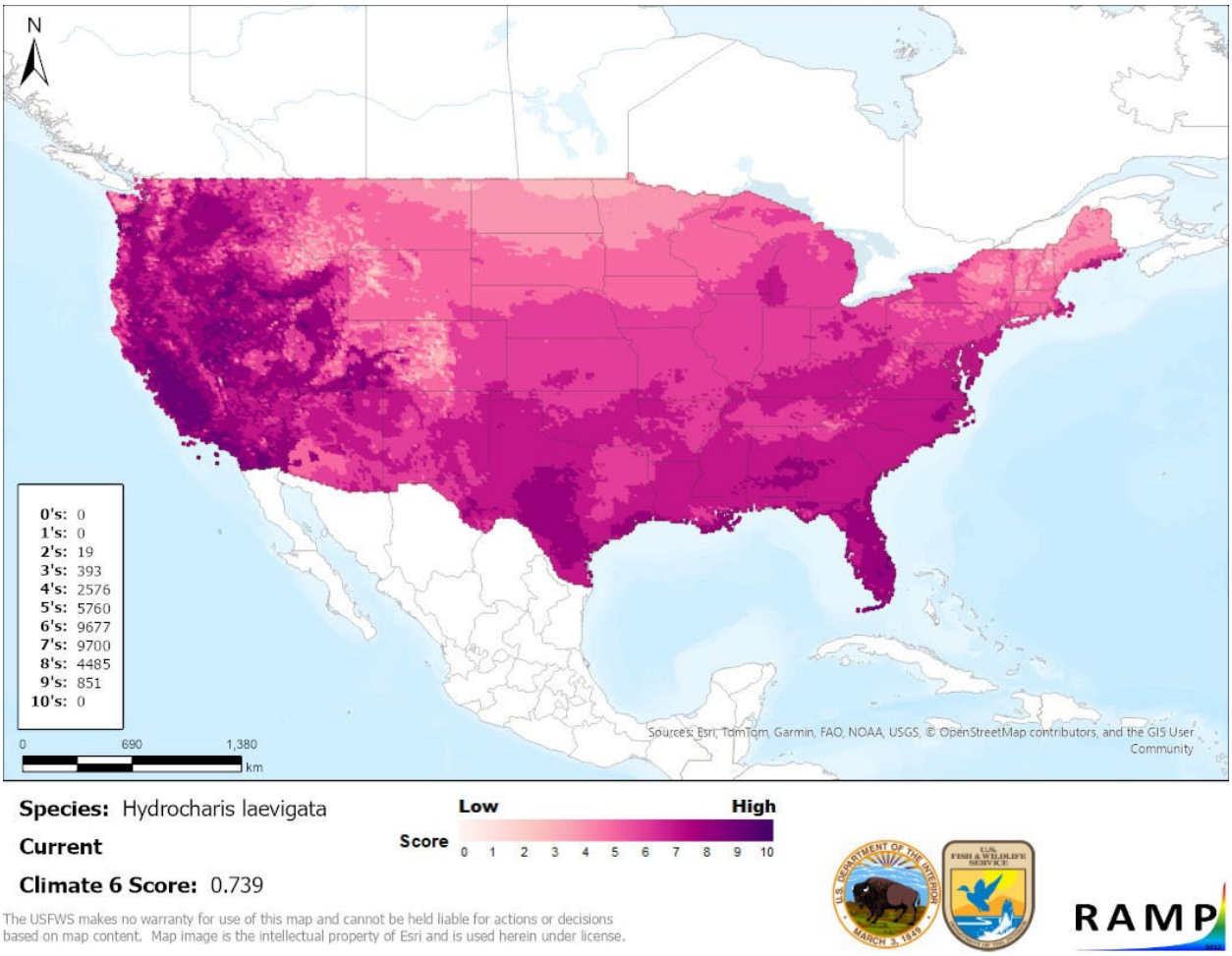

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Hydrocharis laevigata* in the contiguous United States based on source locations reported by GBIF Secretariat (2023) and Islamy et al. (2024). Counts of climate match scores are tabulated on the left. 0/Pale Pink=Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Hydrocharis laevigata* is classified as Medium. There is ecological and biological information available on *H. laevigata*. Georeferenced locations across its reported range are available for climate matching. There is information on impacts from established populations. However, most information on impacts comes from scientific databases and unpublished reports instead of peer-reviewed literature, which decreases certainty of the assessment.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Hydrocharis laevigata, South American Spongeplant, is a floating, freshwater aquatic herb native to Mexico, Central and South America and the Caribbean, including Puerto Rico. *H. laevigata* is commonly traded around the world for aquariums and aquascapes and reportedly

has a potential role in bioremediation. It has been introduced to and become established in many areas, including California and Washington in the United States, multiple regions of Australia, and in Indonesia and southern Africa. There are documented impacts from these introductions including obstruction of waterways, reduced water quality, and decreased biodiversity. *H. laevigata* is regulated in three U.S. States. The history of invasiveness is classified as High. The climate matching analysis for the contiguous United States indicates establishment concern for this species, with a medium to high match across much of the country. The certainty of assessment is Medium because much of the information on impacts comes originally from non-peer-reviewed sources. The Overall Risk Assessment Category for *Hydrocharis laevigata* in the contiguous United States is High.

Assessment Elements

- **History of Invasiveness (see Section 4): High**
- **Establishment Concern (see Section 7): Yes**
- **Certainty of Assessment (see Section 8): Medium**
- **Remarks, Important additional information: None**
- **Overall Risk Assessment Category: High**

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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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 (2023) and Islamy et al. (2024).

Under the future climate scenarios (figure A1), on average, high climate match for *Hydrocharis laevigata* was projected to occur in California, the Great Basin, Great Lakes, Southern Atlantic Coast, and Southern Florida regions of the contiguous United States. Little to no low match was projected to occur under any of the scenarios, although the extent and intensity of high match declined from time step 2055 to time step 2085, and from SSP3 to SSP5 at time step 2085. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.488 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.840 (model: MRI-ESM2-0, 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 (0.739, 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 both 2055 scenarios and under SSP3, 2085, areas within the Southwest saw a large increase in the climate match relative to current conditions. Additionally, primarily under time step 2085, areas within the Colorado Plateau, Great Lakes, Northeast, Northern Plains, and Western Mountains saw a moderate increase in the climate match relative to current conditions. Under the SSP5, 2085 scenario, areas within California, the Colorado Plateau, Great Basin, and Gulf Coast saw a large decrease in the climate match relative to current conditions. Areas within the Mid-Atlantic, Northern Pacific Coast, Southeast, Southern Atlantic Coast, Southern Florida, Southern Plains, Southwest, and Western Mountains saw a moderate decrease in the climate match relative to current conditions under multiple scenarios. Additional very small areas of large or moderate change may be visible on the maps (figure A3).

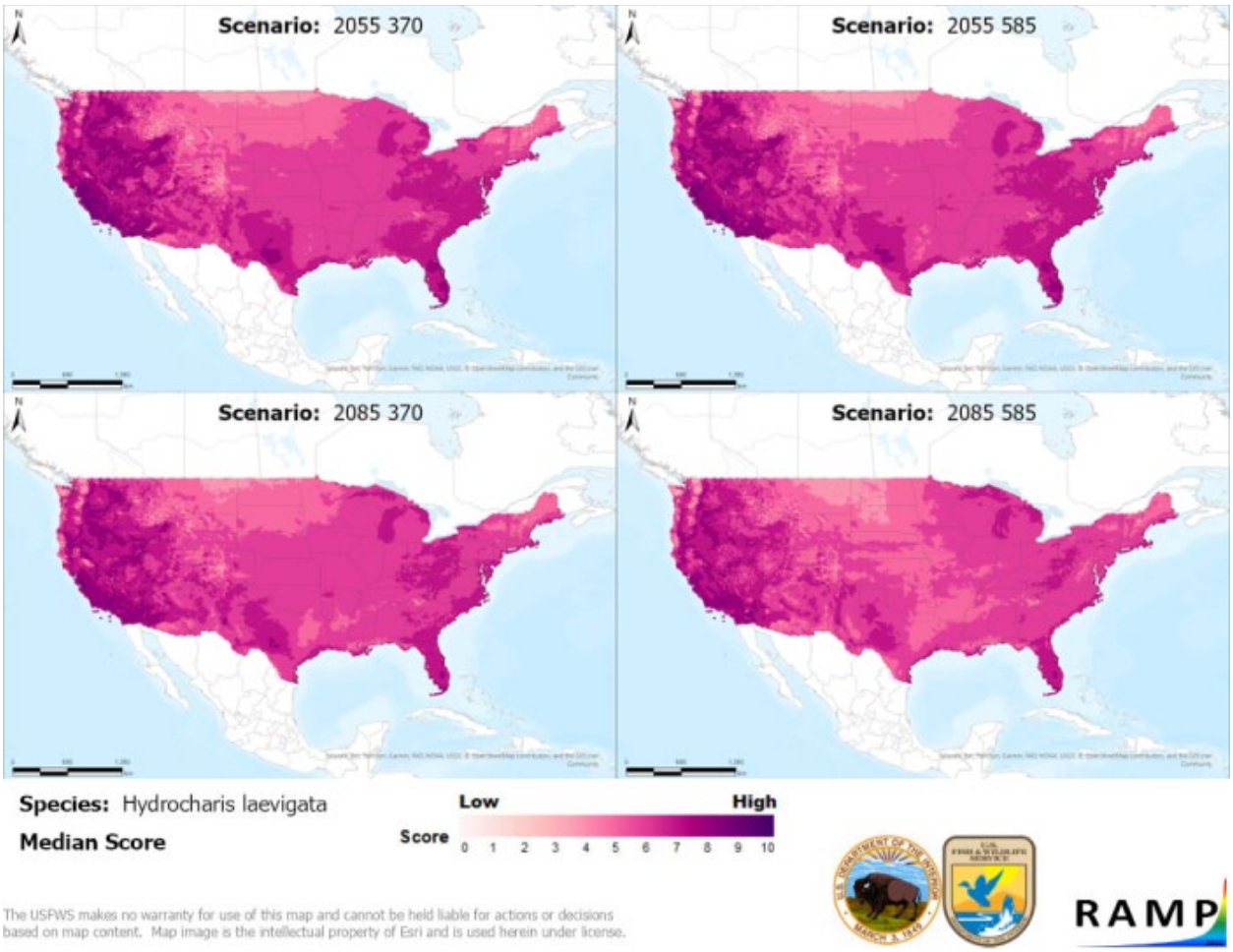

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Hydrocharis laevigata* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023) and Islamy et al. (2024). 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.

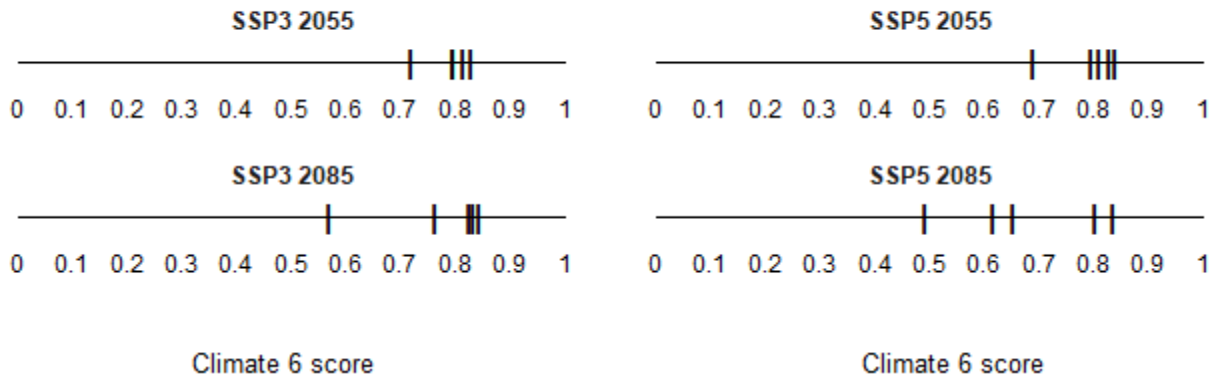

Figure A2. Comparison of projected future Climate 6 scores for *Hydrocharis laevigata* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; 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.

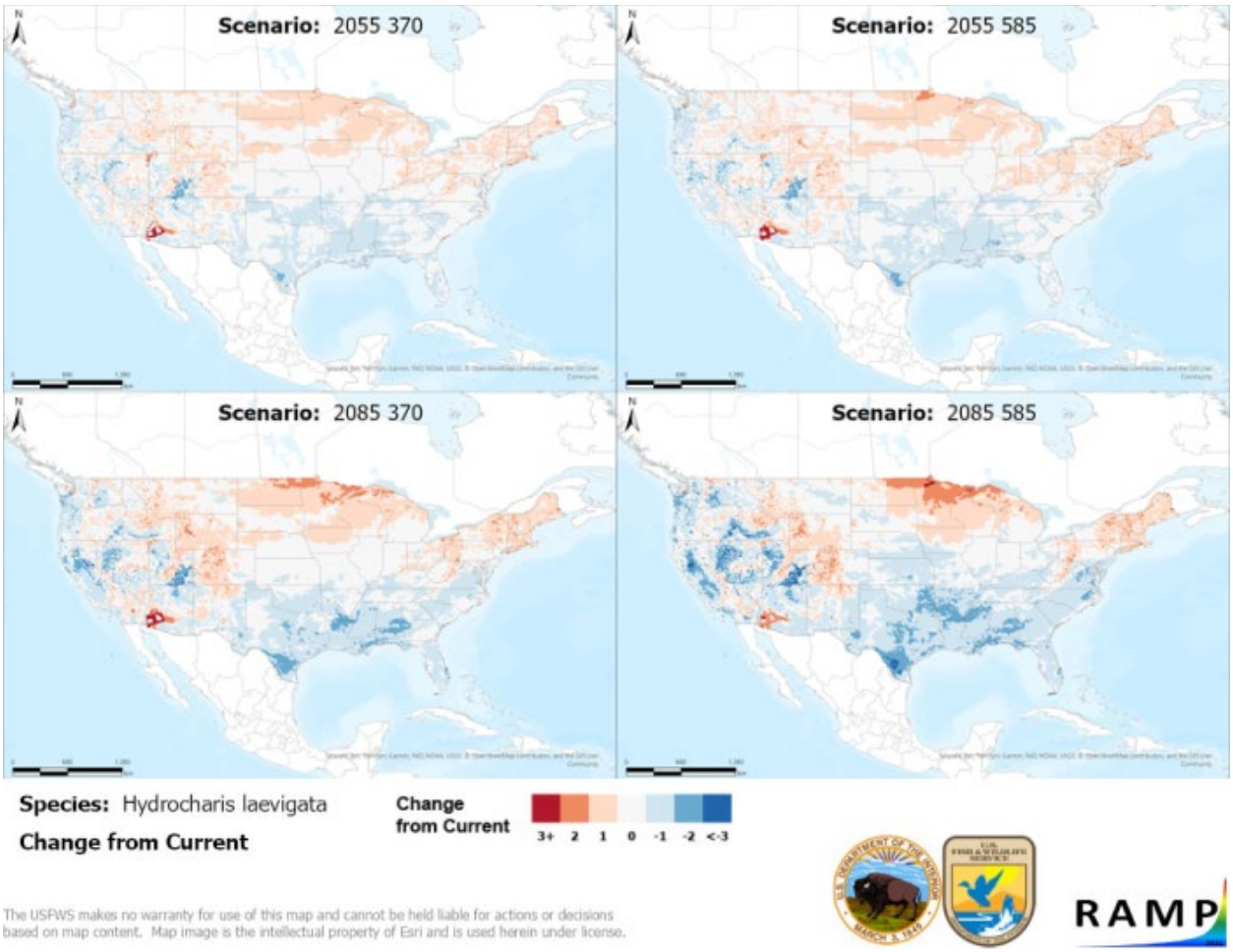

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Hydrocharis laevigata* based on source locations reported by GBIF Secretariat (2023) and Islamy et al. (2024). 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.

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