

Floating Watermoss (*Salvinia natans*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, April 2025

Revised, July 2025

Web Version, 4/17/2026

Organism Type: Fern

Overall Risk Assessment Category: Uncertain



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[https://commons.wikimedia.org/wiki/File:Salvinia_natans_\(habitus\)_1.jpg](https://commons.wikimedia.org/wiki/File:Salvinia_natans_(habitus)_1.jpg) (April 2025).

1 Native Range and Status in the United States

Native Range

From Allen (2011):

“This is an Eurasiatic (palaeotemperate) species, essentially occurring in central and eastern Europe and in Asia, from the Caucasus to China, northern parts of India and into southeast Asia,

and Japan. In Europe, it is scattered from the Rhine valley (Germany) to Russia, and southwards, from northern Italy, to the Danube basin towards the Black Sea, and to northern Greece.”

“Algeria; Armenia; Azerbaijan; Bangladesh; Belarus; Bosnia and Herzegovina; Bulgaria; China (Tibet [or Xizang], Henan, Guangxi, Liaoning, Jiangxi, Jiangsu, Shanghai, Ningxia, Nei Mongol, Gansu, Guizhou, Guangdong, Fujian, Hubei, Heilongjiang, Sichuan, Hebei, Hunan, Shandong, Shaanxi, Hainan, Jilin, Qinghai, Shanxi, Beijing); Croatia; Czechia; Georgia; Germany; Greece (Greece (mainland)); Hong Kong; Hungary; India (Jammu-Kashmir, Assam, Manipur); Iran, Islamic Republic of; Iraq; Israel; Italy (Italy (mainland)); Japan; Kazakhstan; Lithuania; Macao; Moldova; Mongolia; North Macedonia; Pakistan; Poland; Romania; Russian Federation (Dagestan, Ingushetiya, East European Russia, Chechnya, South European Russia, Krasnodar, Central European Russia, Karachaevo-Cherkessiya, Kabardino-Balkariya, Stavropol, Amur, Kamchatka, Sakhalin); Serbia; Slovakia; Slovenia; Spain (Spain (mainland)); Syrian Arab Republic; Taiwan, Province of China (Taiwan, Province of China (main island)); Thailand; Türkiye (Türkiye-in-Asia, Türkiye-in-Europe); Ukraine; Viet Nam”

In addition to the countries and regions listed above, POWO (2025) reports *S. natans* as native to Afghanistan, Indonesia, Korea, Ryuku Islands (Japan), Nepal, Netherlands, Palestine, Russia (Altay, Khabarovsk, Northwest European Russia, Primorye, West Siberia), Tunisia, and Uzbekistan.

Status in the United States

USGS (2025) reports a single occurrence record of *Salvinia natans* from Lake Itasca in northwestern Minnesota in 1948; the status is recorded as “extirpated.”

From Butters (1921):

“For some years the various floras of the eastern United States have reported *Salvinia natans* (L.) All. as occurring in the vicinity of Minneapolis. [...] An examination of both living plants and herbarium material has convinced me that it is all *S. auriculata* var. *Olfersiana* Klotzsch ex.”

From Weatherby (1921):

“The earliest report of the species is in Pursh's Flora of North America, where it is said to have been found ‘floating like *Lemna* on the surface of stagnant waters in several of the small lakes in the western part of New York.’ No subsequent botanist has been able to find the plant in this region: we must conclude either that it did not become permanently established, or that it is one of several very dubious records [...] which are now generally believed to be without foundation of fact.”

“A second New York locality is on Staten Island. [...] specimens of it, which I have had the privilege of examining at the New York Botanical Garden and at the Gray Herbarium, prove to be, like the Minnesota material, *S. auriculata*, var. *Olfersiana*.”

“[One specimen from Missouri] is preserved at Cambridge and is true *Salvinia natans*. Mr. B. F. Bush and Mr. E. J. Palmer, who have collected very extensively in Missouri in recent years, state that they have never met with the plant.”

“The claim of *Salvinia natans* to a place in our [U.S.] flora rests, then, on one ancient and very doubtful report, two mis-identifications, and a single authentic collection, never repeated, at a station which has not been re-discovered in 35 years.”

According to POWO (2025), *Salvinia natans* has also been reported as introduced in Massachusetts.

Salvinia natans is reported in live trade in the United States (e.g., Flip Aquatics 2025).

Regulations

Salvinia natans is regulated at the genus level (*Salvinia*) in Florida (FDACS 2010), Louisiana (LDWF 2022), North Carolina (North Carolina DEQ 2023), Oklahoma (ODWC 2023), and Texas (TPWD 2022). 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 Weatherby (1921):

“[...] I [William T. Davis, quoted from a letter to Weatherby] made the following notes in my journal: ‘Sunday, April 3, 1899. I planted *Salvinia natans* in Ketchum's Mill Pond [New York], as I did last spring. I have not been able to find that any planted last year lived over winter.’ ‘September 23, 1899 (Saturday). In the spring I planted some *Salvinia natans* in Ketchum's Mill Pond and now there are countless numbers of fine plants.’”

From USGS (2025):

“Potential Pathway: released aquarium”

Remarks

This ERSS was previously published in July 2021. Revisions were completed to incorporate new information and conform to updated standards.

Zutshi and Vass (1971) propose that *Salvinia natans* was introduced and became established in the Kashmir region, South Asia. However, both Allen (2011) and POWO (2025) include Kashmir or northern India in the native range of the species. No definitive information was found to confirm the species' status as native or introduced in Kashmir.

From Allen (2011):

“The species appears to be declining throughout much of its European range with some local extinction, however the cause of the decline is not known.”

“The species is classed as Extinct in the Netherlands and Switzerland, Critically Endangered in Germany, Endangered in Czech Republic, and Near Threatened in Croatia and Belarus; it is protected but not classed as threatened in Hungary and protected throughout France and in Greece. It is included in the Red Data Book of Ukraine and included in some protected areas. In Russia it is categorized as Near Threatened (I. Illarionova pers. comm. 2010).”

From POWO (2025):

“Extinct in:
Belgium, France, Switzerland”

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2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2025):

Kingdom Plantae
Subkingdom Viridiplantae
Infrakingdom Streptophyta
Superdivision Embryophyta
Division Tracheophyta
Subdivision Polypodiophytina
Class Polypodiopsida
Subclass Polypodiidae
Order Salviniiales
Family Salviniaceae
Genus *Salvinia*
Species *Salvinia natans* (L.) All.

According to WFO (2025), *Salvinia natans* (L.) All. is the current valid name for this species.

The following synonyms of *Salvinia natans* from WFO (2025) were used to search for information for this report: *Marsilea natans* L., *Marsilea patens* J.F.Gmel., *Marsilea salvinoides* Neck., *Salvinia europaea* Desv., *Salvinia sprengelii* Corda, *Salvinia verticillata* Roxb., *Salvinia vulgaris* Rupr., *Trichomanes villosulum* Wall.

Size, Weight, and Age Range

From Missouri Botanical Garden (2025):

“Height: 0.25 to 0.25 feet”

“Spread: 0.25 to 1.00 feet”

From Szmeja and Gałka (2013):

“*S. natans* is an annual plant [...]”

Environment

From Allen (2011):

“The species is a free-floating fern, growing in large populations at the surface of still waters or in weak currents: ditches, canals, ponds, oxbows.”

From Missouri Botanical Garden (2025):

“Grow on still water in full sun to part shade.”

From Zutshi and Vass (1971):

“Under laboratory conditions, water of a pH between 4.6–6.0, sodium chloride concentrations higher than 1% and continuous submergence under water are harmful to the growth of the weed. Partial shady situations seem to be quite beneficial for the growth.”

From Szmeja et al. (2016):

“Macrospores germinate at water temperature of $12.4 \pm 0.2^{\circ}\text{C}$ or higher; at 20°C they develop more effectively than at 15°C .”

Climate

From Szmeja and Gałka (2013):

“[...] temperate, subtropical and tropical climate (Rothmaler et al. 1986) [...]”

“Observations under the microscope show that freezing air temperatures kills young gametophytes.”

From Szmeja et al. (2016):

“The expansion of *Salvinia natans* in the Vistula Delta [northern Poland] is most likely due to climate warming, and primarily to the rise of March and April mean temperature combined with the narrowing of its variation in these months.”

Distribution Outside the United States

Native

From Allen (2011):

“This is an Eurasiatic (palaeotemperate) species, essentially occurring in central and eastern Europe and in Asia, from the Caucasus to China, northern parts of India and into southeast Asia, and Japan. In Europe, it is scattered from the Rhine valley (Germany) to Russia, and southwards, from northern Italy, to the Danube basin towards the Black Sea, and to northern Greece.”

“Algeria; Armenia; Azerbaijan; Bangladesh; Belarus; Bosnia and Herzegovina; Bulgaria; China (Tibet [or Xizang], Henan, Guangxi, Liaoning, Jiangxi, Jiangsu, Shanghai, Ningxia, Nei Mongol, Gansu, Guizhou, Guangdong, Fujian, Hubei, Heilongjiang, Sichuan, Hebei, Hunan, Shandong, Shaanxi, Hainan, Jilin, Qinghai, Shanxi, Beijing); Croatia; Czechia; Georgia; Germany; Greece (Greece (mainland)); Hong Kong; Hungary; India (Jammu-Kashmir, Assam, Manipur); Iran, Islamic Republic of; Iraq; Israel; Italy (Italy (mainland)); Japan; Kazakhstan; Lithuania; Macao; Moldova; Mongolia; North Macedonia; Pakistan; Poland; Romania; Russian Federation (Dagestan, Ingushetiya, East European Russia, Chechnya, South European Russia, Krasnodar, Central European Russia, Karachaevo-Cherkessiya, Kabardino-Balkariya, Stavropol, Amur, Kamchatka, Sakhalin); Serbia; Slovakia; Slovenia; Spain (Spain (mainland)); Syrian Arab Republic; Taiwan, Province of China (Taiwan, Province of China (main island)); Thailand; Turkey (Turkey-in-Asia, Turkey-in-Europe); Ukraine; Viet Nam”

In addition to the countries and regions listed above, POWO (2025) reports *S. natans* as native to Afghanistan, Indonesia, Korea, Ryuku Islands (Japan), Nepal, Netherlands, Palestine, Russia (Altay, Khabarovsk, Northwest European Russia, Primorye, West Siberia), Tunisia, and Uzbekistan.

Introduced

Allen (2011) states that *Salvinia natans* has been introduced and is established in Cuba and Jamaica.

POWO (2025) states that *Salvinia natans* has also been introduced in Austria.

Means of Introduction Outside the United States

No information is available on means of introduction of *Salvinia natans* in the wild outside the United States.

Short Description

From Zutshi and Vass (1971):

“*S. natans* is an annual aquatic free-floating fern belonging to the family Salviniaceae. The sporophyte has a delicate horizontal rhizome growing up to 20 cm long. The leaves are opposite, oblong and ovate with a number of minute bristles on the upper surface. They are 1.5-1.8 cm long and 1.0-1.2 cm broad, and are usually between 25-30 cm on a single mature rhizome. A tuft

of shinning leafy roots, 11-13 per node and each 10-12 cm long, are produced on the under surface of leaves and rhizome.”

From eFloras (2008):

“Floating fronds sessile or with stipe to ca. 1 mm; lamina *Robinia*-shaped, 0.8-1.4 × 0.5-0.8 cm, base rounded or subcordate, margin entire, apex obtuse; lateral veins 15-20 on each side of costa, each one with 5-8 low dome-shaped papillae, each with a terminal bunch of ca. 4 white setae; lamina deep green on upper surface, densely brown villous on lower surface; submersed fronds finely dissected into linear segments, covered with hairs, and acting as roots. Sporocarps 4-8, clustered at bases of submersed fronds, with sparse bunches of hairs; microsporocarps yellowish, megasporocarps brownish.”

Biology

From Allen (2011):

“The species is a free-floating fern, growing in large populations at the surface of still waters or in weak currents: ditches, canals, ponds, oxbows. It is often associated with *Lemnaceae* and other floating plants.”

From Szmeja and Gałka (2013):

“*Salvinia natans* is an annual clonal plant; however, its architecture makes it more similar to perennials than to other annual plants. *S. natans* reproduces by sexual and asexual means, which is an intrinsic feature of the perennial life strategy (Grime and Mackey 2002; de Kroon et al. 2005), not the annual one. Low mortality of mature individuals (2.4–4.4%) and vegetative offspring (ramets) is another *S. natans* characteristic typical of clonal perennials. [...] On the other hand, high seasonal variation of population size is a feature that makes *S. natans* different from clonal perennials and similar to annuals.”

From Zutshi and Vass (1971):

“The sporophyte of *S. natans* is extremely delicate and breaks readily. The fragments thus formed develop into new plants within two to three weeks and thereby add to the population. Ten to twelve axillary branches also develop on the rhizome imparting it a stellate appearance. [...] Sporocarps are produced by all plants at maturity, including those stranded on mud by the receding water level.”

“Higher temperature and better light during August-September support maximum biomass production of *S. natans*. Plants growing under partial shade are better producers of dry matter than those growing under deep shady situations.”

“The most common associates of *Salvinia* are *Hydrocharis dubia* and *Ceratophyllum demersum*.”

Human Uses

From Allen (2011):

“The species is used as ornamental plant in basins but is found in trade less frequently than other *Salvinia* species.”

From eFloras (2008):

“The whole plant is used medicinally; it is boiled and eaten for ‘consumptive disease’ and eczema and externally used for inflammatory diseases affecting the skin.”

From Van Valkenburg et al. (2023):

“Despite all mislabelling of *Salvinia* plants, there are at present three species in trade [in Europe]: *S. cucullata*, *S. minima* and *S. molesta*. This is based on targeted surveys at garden centres and producers of aquatic plants in the Netherlands that also export to Belgium and the United Kingdom, as well as online ordering of plants in trade in the three countries. [...] Despite plants in trade being labelled as *Salvinia natans*, the actual species was never found.”

Salvinia natans is reported in live trade in the United States (e.g., Flip Aquatics 2025).

Diseases

From Missouri Botanical Garden (2025):

“No serious insect or disease problems.”

Threat to Humans

From Szymeja and Gałka (2013):

“Studies by Markowski et al. (2004) and Szymeja et al. (2012) indicate that from the mid-19th century to the end of the 20th the plant was rare in the [Vistula River] delta [in northern Poland] but that after 2005 it grew in every watercourse and formed very numerous populations. The population increase was so rapid that it completely clogged the delta’s vast hydrological regulation system, construction of which began in the Middle Ages and was gradually expanded over the next centuries.”

3 Impacts of Introductions

Zutshi and Vass (1971) propose that *Salvinia natans* has been introduced and become established in the Kashmir region of South Asia. However, both Allen (2011) and POWO (2025) include this region in the native range of the species. No definitive information was found to confirm the species status as native or introduced, so it is unknown whether the impacts described below are truly impacts resulting from introduction, or whether they are impacts of a native species that has increased substantially in abundance.

From Zutshi and Vass (1971):

“Abnormal growth of *S. natans* in the side channels of Dal and Anchar lakes result [sic] in a thick vegetation mat. Once this floating mat is established it controls the sequence of submerged vegetation underneath by changing the environmental conditions, particularly light penetration. [...] The establishment of *Salvinia* during May-June when the light conditions become slightly unfavourable, brings a shift for the under water vegetation and results in the replacement of the *P[otametum] crisp*i association by the *Ceratophylletum demersi* association which seems to prefer low light intensity. [...] During summer the floating association of *Spirodelo-Lemnetum gibbae* is also offered great competition by the expanding *Salvinio natantis* [sic] association. Besides the lake channels, *Salvinia* [...] may also invade an open association of *Typhetum angustatae*.”

“A well established mat of *S. natans* has a characteristic effect on the water, vegetation and substrate beneath it. The thermal stratification of channel water covered with the plant is quite different from open water. A thick carpet of this species acts as a screen against the solar radiation, with the result that the water beneath is much cooler. [...] Reduction of oxygen tension under *Salvinia* cover has important ecological implications. At sites covered densely with the weed, the oxygen content of the water is reduced from 4.5 mg/l to 0.7 mg/l. These oxygen poor layers are detrimental to the development of juvenile fish and insect life.”

“In conclusion, it may be said that the increased growth of *S. natans* in the lakes of Kashmir has already started posing many problems, the most serious being its effect on fish life and on the growth of paddy.”

Salvinia natans is regulated in Florida (FDACS 2010), Louisiana (LDWF 2022), North Carolina (North Carolina DEQ 2023), Oklahoma (ODWC 2023), and Texas (TPWD 2022); see section 1.

4 History of Invasiveness

The History of Invasiveness for *Salvinia natans* is classified as Data Deficient. *Salvinia natans* has been documented as introduced and established in the Caribbean and Austria outside of its native range; no information was found on any impacts of these introductions. Negative impacts on water quality and native species have been documented in the central Asian region of Kashmir, but it is unclear whether *Salvinia natans* is native or introduced in this region.

5 Global Distribution

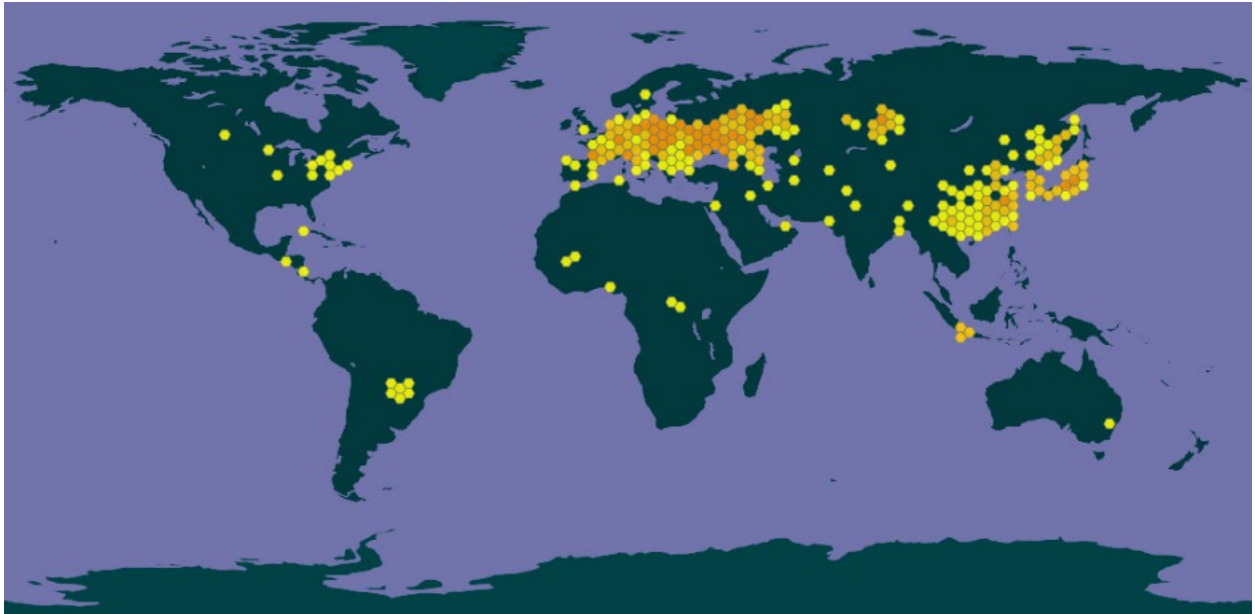


Figure 1. Reported global distribution of *Salvinia natans*. Map from GBIF Secretariat (2025). Observations are reported throughout Europe and Asia, with scattered locations in North America, South America, Africa, Indonesia, and Australia. Locations in Canada, the United States, Honduras, Costa Rica, Brazil, Paraguay, Mali, Nigeria, Democratic Republic of the Congo, France, Belgium, the Netherlands, Switzerland, Sweden, Finland, United Kingdom, United Arab Emirates, and Australia were excluded from use as source points in the climate matching analysis. No source provided information to indicate these locations represent populations that are currently established in the wild.

No georeferenced occurrences were available for parts of the species established range in Afghanistan, Bangladesh, Jamaica, Lithuania, Mongolia, Nepal, North Macedonia, Pakistan, Syria, Thailand, or Tunisia.

6 Distribution Within the United States



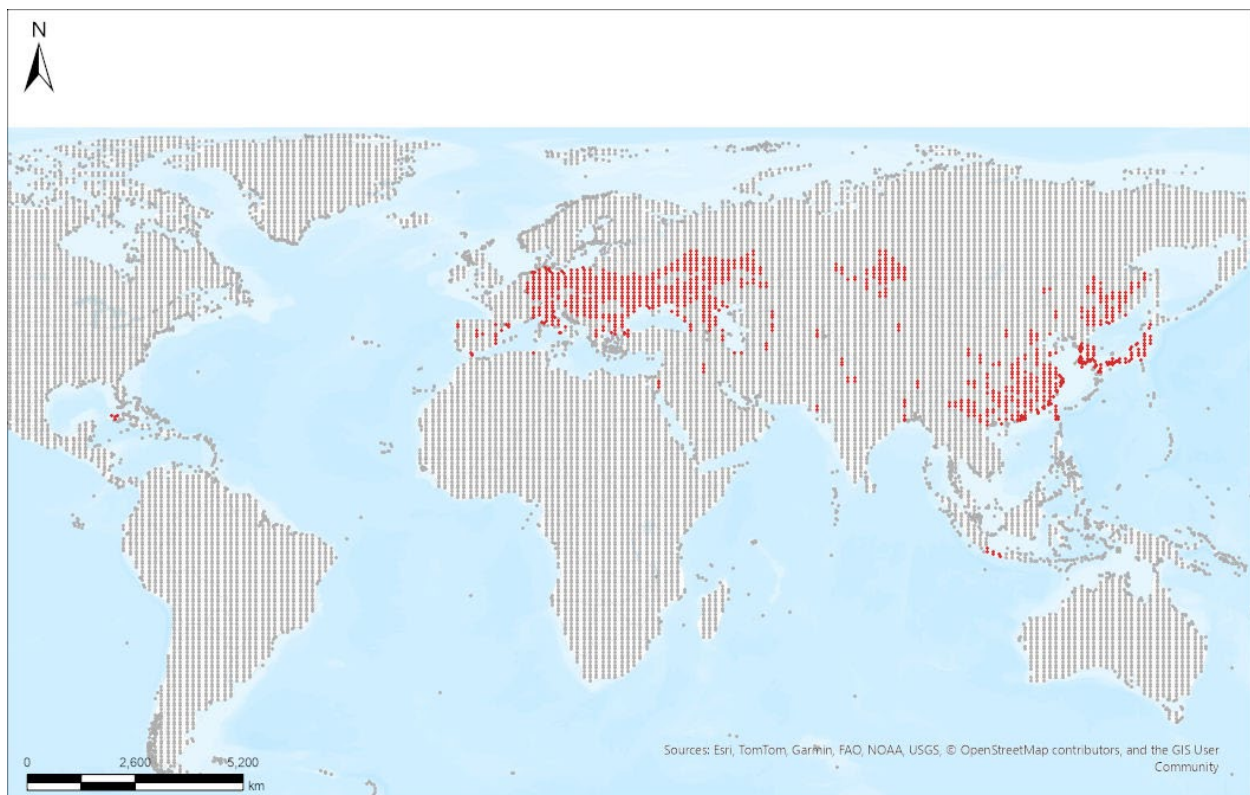
Figure 2. Reported distribution of *Salvinia natans* in the United States. Map from USGS (2025). One observation is reported from Minnesota. This occurrence was excluded from climate matching analysis because established populations have not been documented in the United States.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for the contiguous United States was generally high. The areas of highest match were found in the Great Lakes, Appalachian Range, and parts of the Southern Plains and Northern Plains regions. Small patches of low to medium-low match were found in the Northern Pacific Coast region and parts of the Western Mountains and Southwest regions. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.969, indicating that Yes, there is establishment concern. 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 *Salvinia natans* (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: *Salvinia natans*

Selected Climate Stations ●



RAMP

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Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in Europe, Asia, Cuba, and Indonesia selected as source locations (red; Algeria, Austria, Azerbaijan, Bangladesh, Belarus, Bulgaria, China, Croatia, Cuba, Czechia, Georgia, Germany, Greece, Hungary, India, Indonesia, Iran, Iraq, Israel, Italy, Japan, Jordan, Kazakhstan, Moldova, Myanmar, North Korea, North Macedonia, Pakistan, Poland, Romania, Russia, Saudi Arabia, Serbia, Slovakia, Slovenia, South Korea, Spain, Taiwan, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan) and non-source locations (gray) for *Salvinia natans* climate matching. Source locations from GBIF Secretariat (2023). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

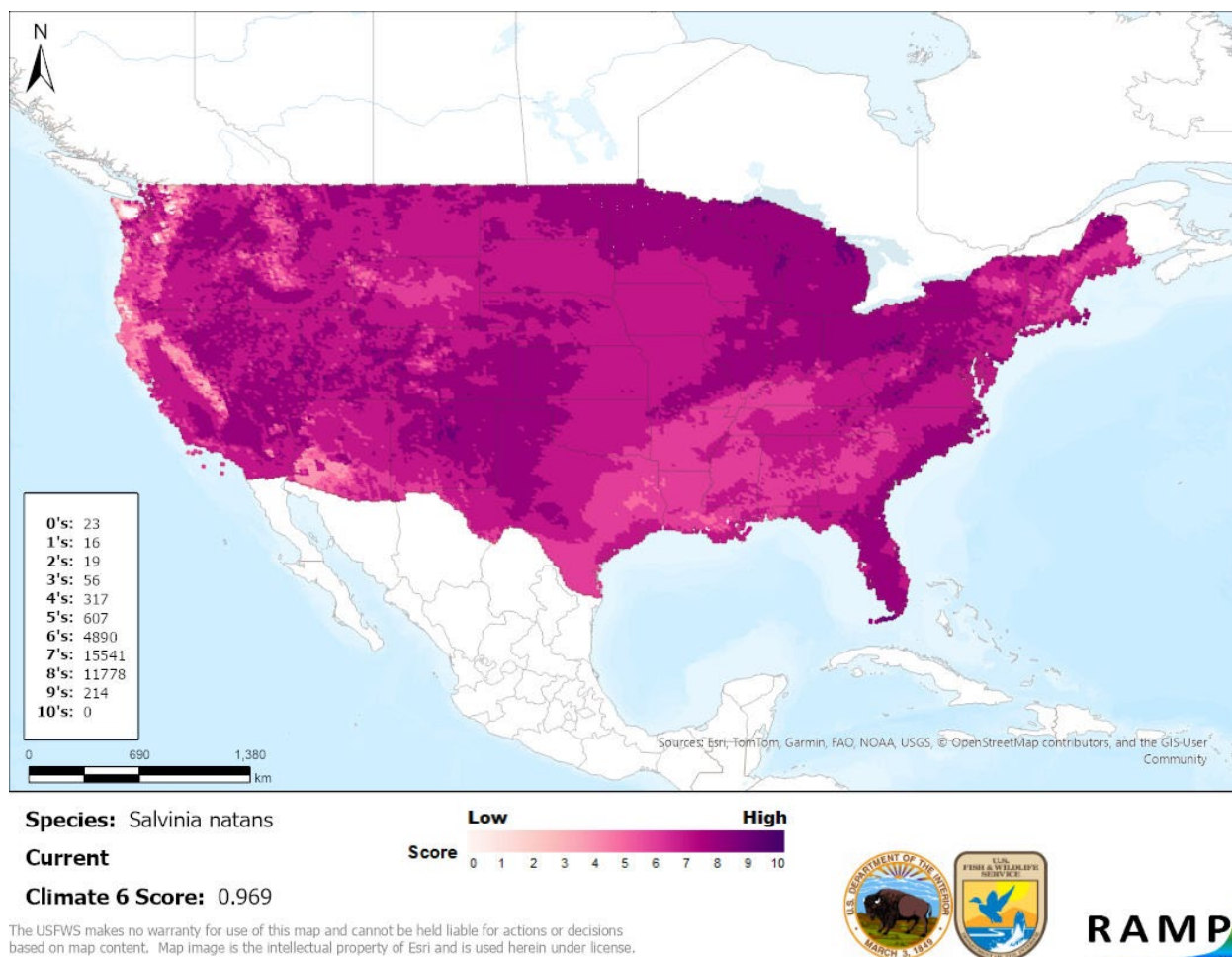


Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Salvinia natans* in the contiguous United States based on source locations reported by GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Salvinia natans* is classified as Low. Information is available on the biology and ecology of *Salvinia natans*. There is some uncertainty about native status and introduced status at the margins of its native range in Europe and Asia, and the species is frequently misidentified in trade. Limited information was found on impacts of introduction.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Salvinia natans, Floating Watermoss, is a plant that is native to Europe, Asia, and northern Africa. This species is reported in the aquarium trade in the United States, although at least some reports may be misidentifications of *Salvinia molesta*. *S. natans* is regulated in five U.S. States, and although it has been reported as introduced in the past, no populations are currently reported as established and may have been misidentifications. *S. natans* has also been reported as

introduced and established in Jamaica and Cuba. In the Kashmir region of central Asia, *S. natans* grows in thick mats that cause changes in water temperature and reduce dissolved oxygen concentrations, potentially affecting native plant and fish health. However, there is disagreement in the literature over whether the species is native or nonnative in the Kashmir region, so the History of Invasiveness for *Salvinia natans* is classified as Data Deficient. The climate matching analysis for the contiguous United States indicates establishment concern. For most of the contiguous United States, climate match was generally high. The areas of highest climate match were found in the Great Lakes, Appalachian Range, and parts of the Southern Plains and Northern Plains regions. The Certainty of Assessment for this ERSS is classified as Low due to limited information on establishment and impacts of introduction and a history of misidentification. The Overall Risk Assessment Category for *Salvinia natans* 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: Plants in trade labeled as *S. natans* may be misidentifications of *S. molesta*.**
- **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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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).

Under the future climate scenarios (figure A1), on average, high climate match for *Salvinia natans* was projected to occur in the Colorado Plateau, Great Basin, Great Lakes, and Southern Florida regions of the contiguous United States. All future climate scenarios showed a similar pattern of high match near the Great Lakes and in some areas of the western half of the contiguous United States, and areas of low match in the South and West. Both 2085 scenarios show larger areas of low match and more isolated sections of high match in the aforementioned areas. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.637 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.944 (model: MPI-ESM1-2-HR, SSP5, 2055). 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 (0.969, figure 4) falls above 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 Southwest saw a moderate to large increase in the climate match relative to current conditions. No other large increases were observed regardless of time step and climate scenarios. Under multiple time step and climate scenarios, areas within the Appalachian Range, California, Colorado Plateau, Great Basin, Great Lakes, Gulf Coast, Mid-Atlantic, Northeast, Northern Pacific Coast, Northern Plains, Southeast, Southern Atlantic Coast, Southern Florida, Southern Plains, 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). Projected change from current conditions was minimal in both 2055 scenarios except in southwestern Arizona. A majority of the areas showing change in the 2085 scenarios showed a decrease in the climate match.

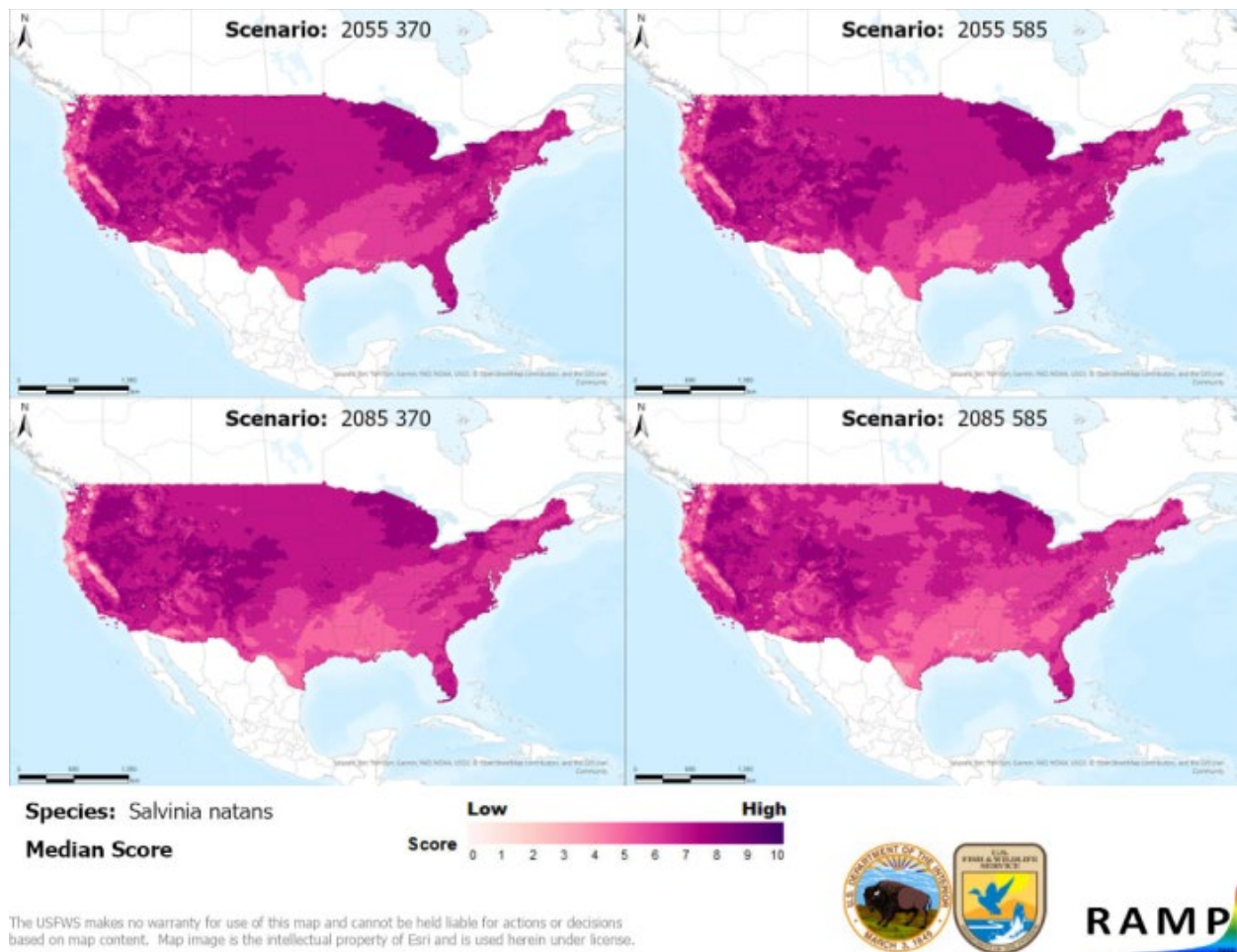


Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Salvinia natans* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2025). Shared Socioeconomic 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.

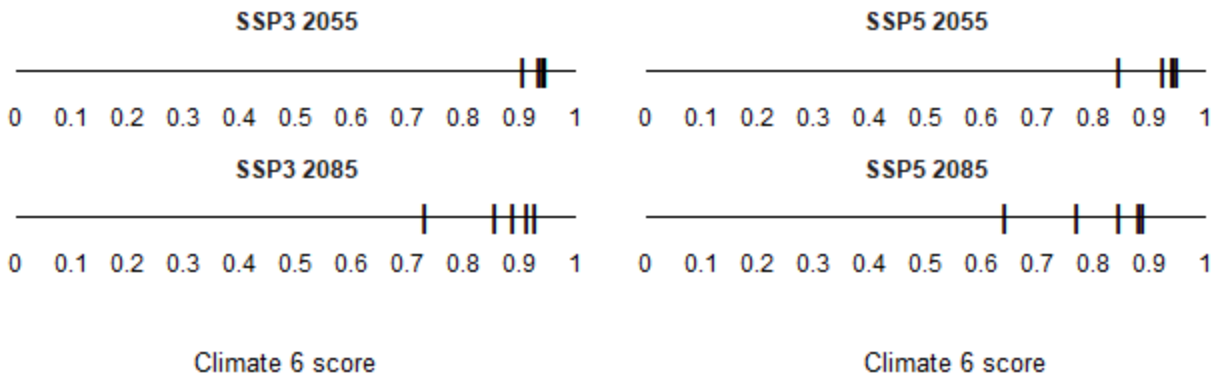


Figure A2. Comparison of projected future Climate 6 scores for *Salvinia natans* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC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

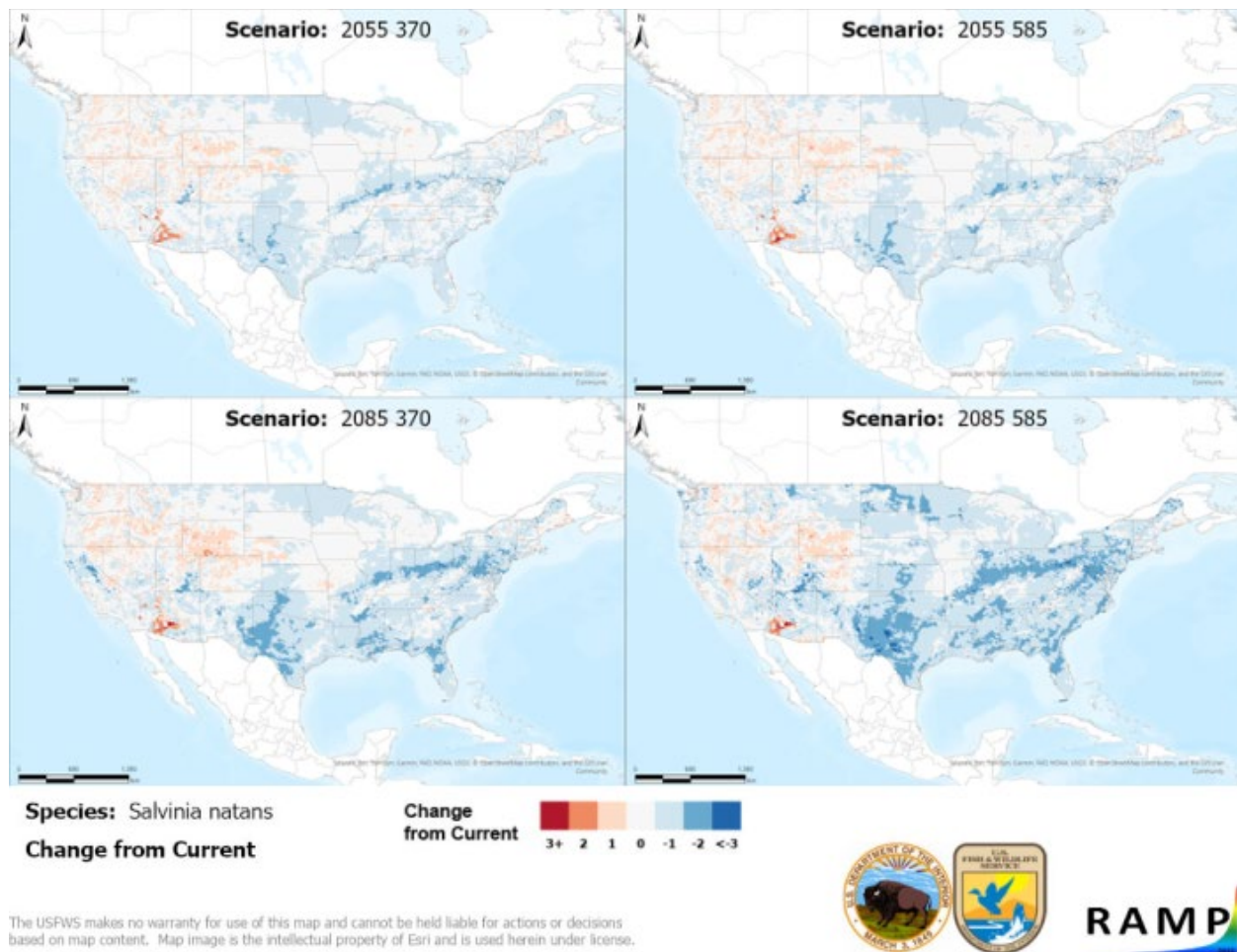


Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Salvinia natans* based on source locations reported by GBIF Secretariat (2025). 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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