U.S. Fish & Wildlife Service

Bloodfluke Planorb (*Biomphalaria glabrata*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, January 2025
Revised, March 2025
Web Version, 6/27/2025

Organism Type: Mollusk
Overall Risk Assessment Category: Uncertain


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1 Native Range and Status in the United States

Native Range

From Mavárez et al. (2002a):

"*Biomphalaria glabrata* is a tropical species, widely distributed from south-eastern Brazil to the northern part of Haiti (Paraense, 2001), […]."

From Pan American Health Organization (1968):

"The species is found in many islands of the West Indies (Hispaniola, Puerto Rico, Vieques, St. Kitts, Antigua, St. Philip, Guadeloupe, Marie-Galante, Martinique, St. Lucia, Curacáo), Venezuela, Surinam, French Guiana, and Brazil (between 20° N and 26° S)."

From Caldeira et al. (2009):

"Geographical distribution in Brazil [of *B. glabrata* (Say, 1818)]: Pará, Maranhão, Piauí, Ceará, Rio Grande do Norte, Alagoas, Paraíba, Pernambuco, Sergipe, Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Goiás, Distrito Federal, Paraná and Rio Grande do Sul [Souza and Lima 1997]"

The occurrence of *B. glabrata* in Rio Grande do Sul may be the result of a recent introduction (see Distribution Outside the Native Range: Introduced).

Status in the United States

From Benson (2025):

"Native Range: […] West Indies (including Puerto Rico), […] ([Pan American Health Organization 1968])."

"Single collections have been reported from Florida (Burch and Tottenham 1980) and Idaho (Bowler and Frest 1991), but it is not known to be established in these states. However, in North Carolina, collections of live specimens have been made at a single location over a three year period."

Additionally, according to Benson (2025), nonindigenous occurrences of *Biomphalaria glabrata* have been reported in Mississippi, from which the species is extirpated, and in Illinois and Texas, where the status of the species is unknown.

Biomphalaria glabrata is available to order for institutional laboratory research purposes in the United States (e.g., BEI Resources 2025).

Regulations

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

Means of Introductions within the United States

From Benson (2025):

"It is not known how *B. glabrata* was introduced in the United States."

Remarks
From Pan American Health Organization (1968):

"Hybridization with the Egyptian *B*[*iomphalaria*] *alexandrina* (Barbosa, Coelho, and Carneiro, 1956), as well as with Brazilian populations of *B. tenagophila* and *B. straminea* (Barbosa, 1960), has been successful."

From Mavárez et al. (2002b):

"[…] *B. glabrata* might constitute a species complex, as already suggested on the basis of allozymic data (Bandoni et al, 1995; Woodruff and Mulvey, 1997), and on the basis of reproductive system (Mavárez et al, 2002[c]). *B. glabrata* indeed displays a wide range of anatomical and morphological (shell) variation, and some variants have even been described as nominal species (see Paraense, 1961)."

There is some uncertainty within the literature regarding *B. glabrata*'s native versus introduced range related to the timing and mode of colonization of different areas.

From Mavárez et al. (2002b):

"Two scenarios might then be considered for explaining the colonisation of these islands [Lesser Antilles]: (i) an ancient introduction, probably involving aquatic birds (see Madsen and Frandsen, 1989) or (ii) a recent introduction of already divergent lineages."

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 ITIS (2025):

Kingdom Animalia
  Subkingdom Bilateria
    Infrakingdom Protostomia
      Superphylum Spiralia
        Phylum Mollusca
          Class Gastropoda
            Subclass Orthogastropoda
              Infraclass Heterobranchia
                Superorder Hygrophila
                  Order Lymnaeida
                    Superfamily Planorboidea
                      Family Planorbidae
                        Genus *Biomphalaria*
                          Species *Biomphalaria glabrata* (Say, 1818)

According to MolluscaBase editors (2025), *Biomphalaria glabrata* (Say, 1818) is the current valid name for this species.

The following synonyms of *Biomphalaria glabrata* from MolluscaBase editors (2025) were used to search for information for this report: *Australorbis glabratus, Planorbis glabratus*.

Size, Weight, and Age Range

From Pan American Health Organization (1968):

"The shell may reach a maximum of about 40 mm in diameter, though usually it ranges between 15 and 30 mm, […]."

From Pimentel (1957):

"The newly emerged snail is light yellow in color and translucent. Its maximum diameter averaged 0.731 mm and ranged from 0.52 to 0.95 mm."

"It is suspected that the maximum longevity of *A. glabratus* is between 2 and 3 years; however, in the natural environment, observations indicate the average longevity to be about 1 year."

Environment

From Mavárez et al. (2002a):

"[…] it is commonly found inhabiting various freshwater habitats (eg, ponds and ditches; Pointier, 1976; Mulvey et al, 1988)."

From Mavárez et al. (2002b):

"[…] *B. glabrata* usually occupies fragmented habitats, such as ponds or small rivers, which can be submitted to temporal variations in water availability and even complete dryness or catastrophic floodings."

From Pimentel (1957):

"The temperature of the [aquarium] environment averaged 26.30° C and ranged from 23 to 36 between April 15 and October 15; it averaged 24.70° C and ranged from 21 to 31 degrees between October 15 and April 15."

From Habib et al. (2021):

"Calcium has been associated with high fecundity of *B. glabrata* [Lodge et al. 1987]. […] field studies by Kloos et al. ([2004]) showed that the widespread distribution of *B. glabrata*, […] together with differences in the seasonal distribution of snails is correlated to high calcium levels that appear to promote large *B. glabrata* populations in wells and springs."

Climate

From Mavárez et al. (2002a):

"*Biomphalaria glabrata* is a tropical species, […] (Paraense, 2001), […]."

Distribution Outside the United States

Native

From Mavárez et al. (2002a):

"*Biomphalaria glabrata* is a tropical species, widely distributed from south-eastern Brazil to the northern part of Haiti (Paraense, 2001), […]."

From Pan American Health Organization (1968):

"The species is found in many islands of the West Indies (Hispaniola, Puerto Rico, Vieques, St. Kitts, Antigua, St. Philip, Guadeloupe, Marie-Galante, Martinique, St. Lucia, Curacáo), Venezuela, Surinam, French Guiana, and Brazil (between 20° N and 26° S)."

From Caldeira et al. (2009):

"Geographical distribution in Brazil [of *B. glabrata* (Say, 1818)]: Pará, Maranhão, Piauí, Ceará, Rio Grande do Norte, Alagoas, Paraíba, Pernambuco, Sergipe, Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Goiás, Distrito Federal, Paraná and Rio Grande do Sul [Souza and Lima 1997]"

The occurrence of *B. glabrata* in Rio Grande do Sul may be the result of a recent introduction (see Distribution Outside the Native Range: Introduced).

Introduced

From Carvalho et al. (1998):

"Previously, southest [sic] record of *B. glabrata* was at the city of Curitiba (latitude 25°25'S) in the State of Paraná [Brazil] ([Paraense 1986]). As a result of its discovery in Esteio [State of Rio Grande do Sul, Brazil], the southern limit of this species is extended to latitude 29°51'S."

From Habib et al. (2021):

"*B. glabrata* […] was recorded from the field in the neighborhood of Cairo in 1981. Later on, in 1996 the snails were collected from water courses in Giza, Qalyoubiya and Kafr El-Sheikh governorates [Egypt]."

From Lotfy et al. (2005):

"Snail collections were undertaken during 2002–2003 from regions between Alexandria and Ismailia in the north of the Nile Delta, to as far south as Abu Simbel at Lake Nasser.

Biomphalaria snails were found in 37 out of 76 sampled localities and were widely distributed in the Nile Delta and along the Nile as far south as Aswan. According to the results of species-specific polymerase chain reaction assays that sampled both nuclear and mitochondrial genomes, and according to DNA sequence data, all *Biomphalaria* collected during this survey were *B. alexandrina*. There was no evidence of the presence of *B. glabrata* or of hybridization of *B. alexandrina* with *B. glabrata* in the examined sites. The results were surprising given that some field-collected snails strongly resembled *B. glabrata* in both size and conchology and that previous survey work suggested *B. glabrata* had established in Egypt. Continued scrutiny to ascertain the possible presence of *B. glabrata* in Egypt is warranted."

From Appleton and Miranda (2015):

"*Biomphalaria glabrata* […] was in fact introduced twice [in South Africa], first to a man-made canal in central Durban, probably during the 1960s, but the population had died out by the mid-1980s (J. Agnew pers. comm. July 1983; Bruton & Merron 1985; Ashton et al. 1986). […] *Biomphalaria glabrata* was reintroduced […] in 1982 […] There is no evidence that either *B. glabrata* or *M*[*arisa*] *cornuarietis* have escaped or occur in natural systems in South Africa today."

From Pointier et al. (2005):

"Between 1977 and 1979, Prentice (1980) carried out an extensive survey in the Lesser Antilles […] and also observed the introduction of the species into Dominica. In the same years, the introduction of *B. glabrata* to Haïti was also reported probably from the neighbouring country Dominican Republic (Raccurt et al., 1985). Established viable populations of *B. glabrata* were subsequently observed in the northern part of the country."

From Raccurt et al. (1985):

"*Biomphalaria glabrata*, an intermediate host for *Schistosoma mansoni*, was first reported in Haiti in 1891 at one location in the Départment du Nord and in 1977 it was reported at several sites in one additional watershed. Our study identifies two additional locations each on a different watershed plus a third possible site. A wide but discontinuous distribution of the snail on the north coast of Haiti is confirmed […] The incursion of *B. glabrata* into Haiti is not recent but at the same time is not expanding."

From Reeves et al. (2008):

"Three species of snails previously reported from Dominica, *Biomphalaria glabrata* (Say, 1818), *Biomphalaria straminea* (Dunker, 1848), and *Thiara granifera* (Lamarck, 1822), were not collected [in surveys conducted in 2005]. Our data suggest that *B. glabrata* has not re-emerged as a prominent component of the freshwater snail fauna since it disappeared or was locally eradicated."

From Alexandrov et al. (2007):

"[…] some of the aquarium species are able to form long-term populations in artificial water bodies (in cooling ponds) [in Ukraine] – [including] *Biomphalaria glabrata* Say, 1818 [Son 2007]."

Means of Introduction Outside the United States

From Habib et al. (2021):

"*B*. *glabrata* was maintained in a laboratory setting in Egypt to conduct Schistosoma research from where it then allegedly escaped and was recorded from the field in the neighborhood of Cairo in 1981. Later on, in 1996 the snails were collected from water courses in Giza, Qalyoubiya and Kafr El-Sheikh governorates."

"Passive dispersal of *Biomphalaria* can also be delivered by water currents both during flooding, where water velocity is high so it sweeps away adhering snails, and also by slower drifting because of the habit of most pulmonates to detach and rise to the surface looking for food or as a deliberately dispersive behavior."

According to Alexandrov et al. (2007), the pathway for *Biomphalaria glabrata* introduction to Ukraine was ornamental trade.

From Appleton and Miranda (2015):

"*Biomphalaria glabrata* was reintroduced [into South Africa], but to laboratories for schistosomiasis research purposes in 1982, the same year that Pflüger warned of the dangers of doing so (Pflüger 1982). This species is an efficient host of *S*[*chistosoma*] *mansoni* in Brazil and *M*[*arisa*] *cornuarietis*, introduced in 1986, is a herbivore which destroys the egg masses of other snails, including species of *Biomphalaria*, as it feeds. It was thus tested as a competitor/ predator of the local schistosomiasis host snails."

From Pointier et al. (2005):

"A large number of planorbid snails are now commonly transported by man mainly through the aquatic plant trade. However, only a restricted number of species establish viable populations in a new habitat and a more restricted number spread. Only five planorbid species can be ranked in this last category and can be considered as pests because of their role in the transmission of parasites to humans or domestic animals: *Biomphalaria glabrata* […]"

Short Description

From Pan American Health Organization (1968):

"The width is between 5 and 8 mm in most specimens at 20 mm diameter. The adult shell has about 5 to 61/2 whorls, increasing slowly or sometimes more rapidly in diameter."

"The whorls are normally rounded on the sides, though sometimes flattened, angular, or even carinate on the left and less frequently on the right. The suture ranges from shallow to deep between flattened and rounded or angular whorls, respectively."

"The pigmentation of the normally exposed [soft] parts ranges from pale gray to deep black."

From Thomas et al. (1985):

"The mouth, which is bounded by three lips, forms a T-shaped slit when closed […]."

Biology

From Thomas et al. (1985):

"[…] freshwater pulmonate snails, such as *B. glabrata*, subsist mainly by selecting decaying macrophyte tissue, colonial diatoms and smaller green algae in preference to living macrophyte tissue, filamentous green algae, or small adpressed forms of epiphytic diatoms and epiphytic bacteria."

From Pimentel (1957):

"*A. glabratus* [*B. glabrata*] has little preference as to placement of its egg masses, for they have been found on the shells of *A. glabratus* and other species, stones, dead leaves, sticks, logs, metal, glass, and on various aquatic plants. A hard surface seems to be the prime requisite."

From Mavárez et al. (2002a):

"Demographic instability, including large fluctuations of population size and frequent local extinction/recolonisation phenomena, has been described in this species (Sturrock, 1973; Pointier and Theron, 1979). This results in marked genetic differentiation (Mulvey and Vrijenhoek, 1982; Mulvey et al, 1988), even at local scale (Mavárez et al, 2002[c]). *B. glabrata* is a simultaneous hermaphrodite which can reproduce by both self and cross-fertilisation (Vianey-Liaud, 1997). The few genetic studies conducted showed that selfing rates are low (see Vianey-Liaud, 1997; Mavárez et al, 2002[c])."

Human Uses

Biomphalaria glabrata is available to order for institutional laboratory research purposes in the United States (e.g., BEI 2025). It may also be present in ornamental trade (e.g., Alexandrov et al. 2007).

Diseases

No information was found associating *Biomphalaria glabrata* with any diseases listed by the World Organisation for Animal Health (2025).

From Pan American Health Organization (1968):

"This species is the most important intermediate host of *S*[*chistosoma*] *mansoni* in the Americas."

Poelen et al. (2014) report *Biomphalaria glabrata* as host to the following parasites and diseases: *Cathaemasia hians*, *Schistosoma mansoni*, *Echinostoma paraensei*, *Ribeiroia marini*, *Aelurostrongylus* sp*, Oslerus* sp., *Angiostrongylus* sp., *Angiostrongylus schmidti*, *Parastrongylus siamensis*, *Angiostrongylus dujardini*, *Crenosoma* sp., *Angiostrongylus vasorum*, *Angiostrongylus malaysiensis*, *Angiostrongylus costaricensis*, *Echinostoma macrorchis,* Schistosomatidae, *Biomphalaria* virus 1, *Biomphalaria* virus 2, and *Biomphalaria* virus 3.

From Habib et al. (2021):

"*B. glabrata* were shown to act as intermediate hosts of *Austrodiplostomum compactum* (Trematoda: Diplostomidae), the causative agent for ocular diplostomiasis in several species of fish in Brazil […]"

Threat to Humans

From CDC (2025):

"Acute schistosomiasis (Katayama fever) is a systemic hypersensitivity reaction that may occur weeks after the initial infection, especially by S[*chistosoma*] *mansoni* [for which *B. glabrata* is an intermediate host, see Diseases] and *S. japonicum*. Manifestations include systemic symptoms/signs including fever, cough, abdominal pain, diarrhea, hepatosplenomegaly, and eosinophilia."

"Occasionally, *Schistosoma* infections may lead to central nervous system lesions. […] granulomatous lesions around ectopic eggs in the spinal cord may occur in *S. mansoni* […] infections. Continuing infection may cause granulomatous reactions and fibrosis in the affected organs (e.g., liver and spleen) with associated signs/symptoms."

"Pathology associated with *S. mansoni* […] schistosomiasis includes various hepatic complications from inflammation and granulomatous reactions, and occasional embolic egg granulomas in brain or spinal cord."

From Habib et al. (2021):

"[…] *Angiostrongylus vasorum* [which can infect *B. glabrata*] can also cause diseases of the central nervous system in humans ([Morley 2010])."

"*B. glabrata* […] act as intermediate hosts for the rat lung worms *Angiostrongylus cantonensis* and *A. costaricensis* the causative agents of eosinophilic meningitis and meningoencephalitis and abdominal angiostrongyliasis, respectively, in humans in many parts of the world ([Slom et al. 2002]). Within the snails, the parasite develops into the infective third-stage larvae and humans are infected after ingestion of infected snails ([Tunholi-Alves et al. 2012])."

"*B. glabrata* were shown to act as intermediate hosts of *Austrodiplostomum compactum* (Trematoda: Diplostomidae), […] a disease which may have potential impacts on […] fish farming."

3 Impacts of Introductions

From Habib et al. (2021):

"Being an intermediate host of *S. mansoni*, its escape was considered a serious threat to public health in Egypt [Pflüger 1982]. In the following years, malacological surveys showed the invasion of the Nile Valley with hybrid snails resulted from mating of *B. alexandrina* and *B. glabrata*, distributed in El-Menia, El-Dakahliya, and Fayoum governorates. The hybrid snails were found naturally infected with *S. mansoni* [Kristensen et al. 1999]. However, molecular investigations of *Biomphalaria* species collected from areas toward the north of Egypt, the Nile Delta and south of Egypt during 2002-2009 using species specific primers for *B. alexandrina* and *B. glabrata* did not identify *B. glabrata* in the collected populations [Lofty et al. 2005, Mohamed et al. 2012]. Recent mapping of *S. mansoni* prevalence in the Nile Delta region showed high infection rates in schoolchildren [Haggag et al. 2017] suggesting a recent contact with areas manifested with infected *Biomphalaria*."

"Some of the hybrid snails collected from El-Gharbia, El-Behierah, El-Menia, Kafr El-Sheikh, Dakahlia, and Alexandria governorates were found naturally infected with *S. mansoni* [Yousif et al. 1998a]. Field and laboratory studies suggested that *B. glabrata* and hybrid snails have a higher potential in transmitting *S. mansoni*, which could lead to an increase in schistosomiasis in associated communities [Yousif et al. 1998b]."

4 History of Invasiveness

The History of Invasiveness for *Biomphalaria glabrata* is classified as Data Deficient. Multiple introductions of this species have been documented in the scientific literature; introductions have resulted in establishment in the United States (North Carolina), Ukraine, Dominica, and Egypt, although the Dominican and Egyptian populations may have since failed and the Ukrainian population is only known from artificially warmed water bodies. There is limited information on negative impacts of this species outside of its range. There is only circumstantial evidence connecting the introduction of *B. glabrata* with a rise in schistosomiasis infections in Egypt. Similarly, more information is needed on the hybridization of *B. glabrata* and *B. alexandrina* to understand what impact hybridization has had on native *B. alexandrina* populations, or if there are impacts of introduced *B. glabrata* on other native species in Egypt or Dominica.

5 Global Distribution

Figure 1. Reported global distribution of *Biomphalaria glabrata*. Map from GBIF Secretariat (2023). Observations are reported from the United States (including Puerto Rico), Brazil, Venezuela, Suriname, French Guiana, Ecuador, Italy, Germany, the Netherlands, Taiwan, the Philippines, Bermuda, and the Caribbean. Points in Germany and the Netherlands represent museum specimens. It cannot be determined whether occurrences in central-western Brazil (States of Amazonas, Mato Grosso, and Mato Grosso do Sul), Italy, Mexico, Bermuda, Jamaica, Ecuador, Taiwan, and the Philippines represent established populations because occurrences there have not been reported elsewhere in the literature. A Mozambique record appears to have incorrect coordinate information. Observations located outside North Carolina in the United States do not represent established populations. All locations that do not represent established populations of *B. glabrata* were excluded from climate matching analysis.

No georeferenced occurrences were available for *Biomphalaria glabrata* in Egypt. However, it is unclear whether the species remains established there (Lotfy et al. 2005; see Distribution Outside the United States).

No georeferenced occurrences were available for *Biomphalaria glabrata* in Ukraine. However, these occurrences would not be included in the climate matching analysis, regardless. The occurrences are known only from thermally regulated water bodies, which do not reflect the ambient climate conditions of the region.

Additional georeferenced occurrences in northern Haiti were estimated from the distribution described verbally by Raccurt et al. (1985).

6 Distribution Within the United States

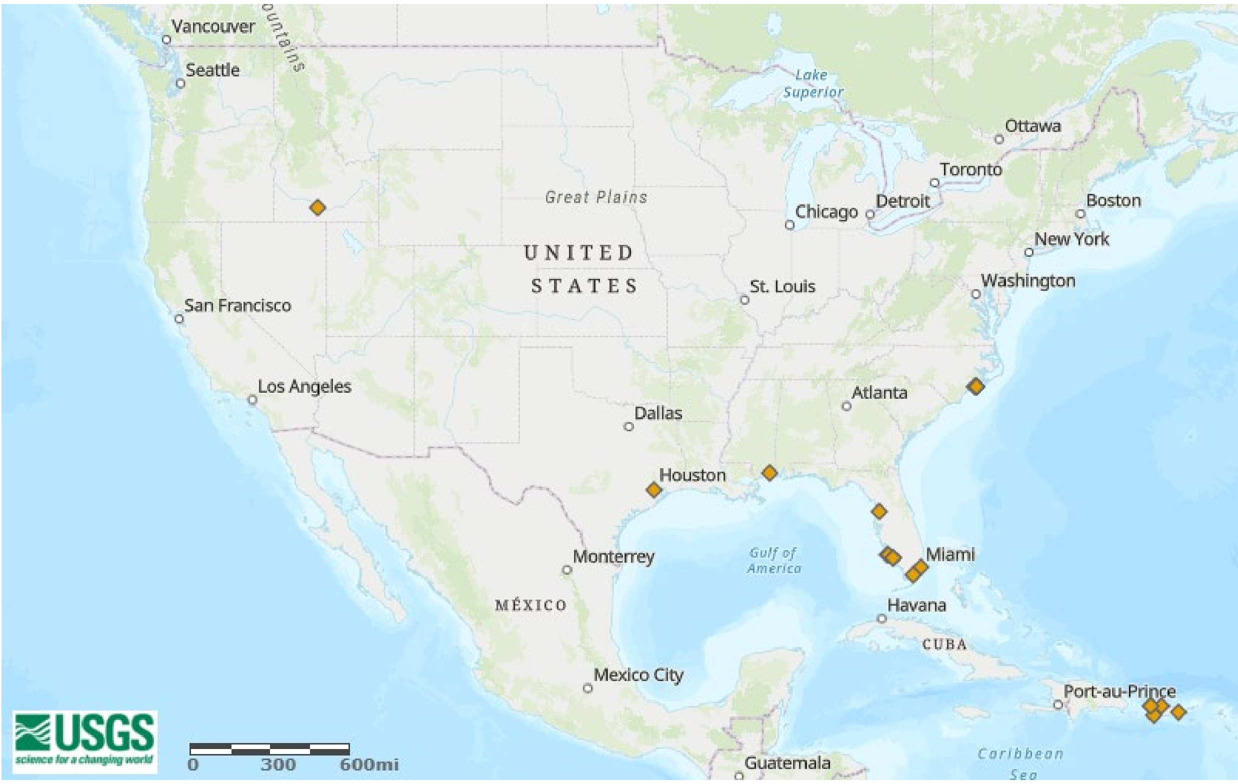

Figure 2. Reported distribution of *Biomphalaria glabrata* in the United States. Map from USGS (2025). Observations are reported from Florida, Idaho, Illinois, Mississippi, North Carolina, Puerto Rico, and Texas. Benson (2025) reports only North Carolina as the established nonindigenous range of *Biomphalaria glabrata* in the contiguous United States. This species is native to Puerto Rico, a United States territory.

7 Climate Matching

Summary of Climate Matching Analysis

The climate matching analysis for *Biomphalaria glabrata* to the contiguous United States found areas of high climate match along the Gulf and Atlantic Coasts, especially around the location in North Carolina where the species is already established. Medium climate match was found in the Mid-Atlantic, Appalachian, and interior Southeast regions, and along the U.S.-Mexico border from western Texas to California. Much of the northern and western contiguous United States had a low climate match. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.168, 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 *Biomphalaria glabrata* (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.

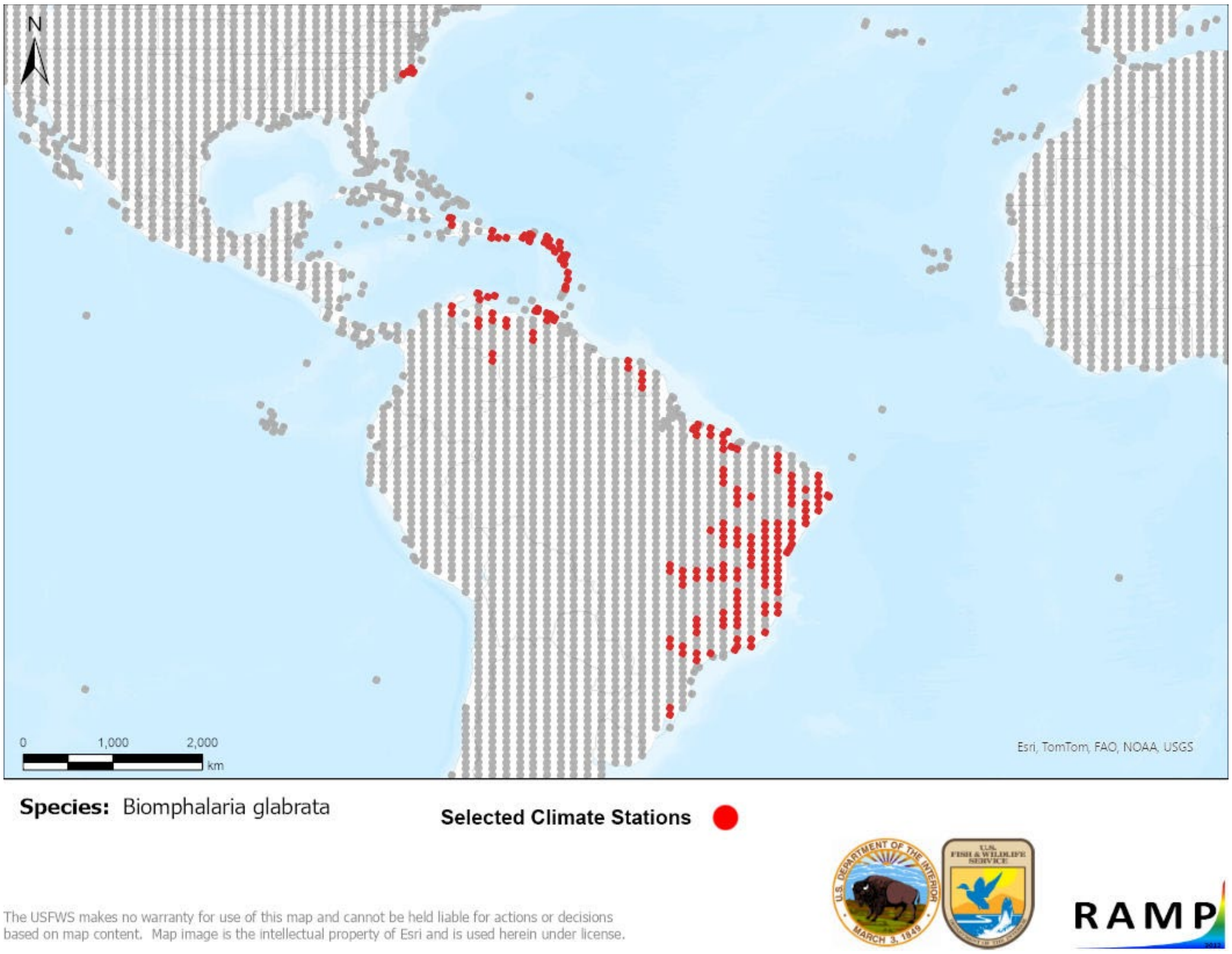

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in North and South America selected as source locations (red; United States including Puerto Rico, Brazil, Venezuela, Suriname, French Guiana, the Caribbean) and non-source locations (gray) for *Biomphalaria glabrata* climate matching. Source locations from GBIF Secretariat (2025) and Raccurt et al. (1985). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

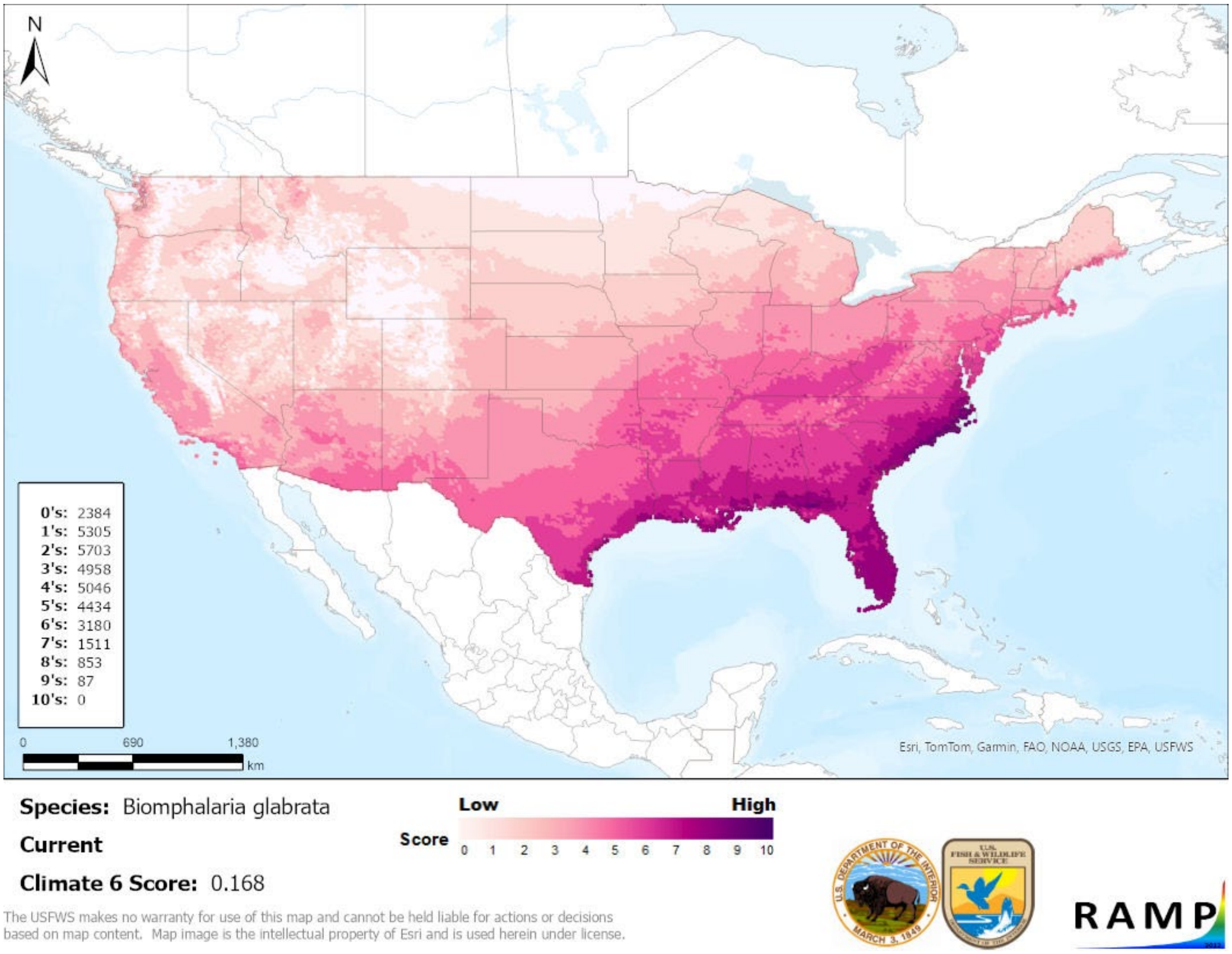

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Biomphalaria glabrata* in the contiguous United States based on source locations reported by GBIF Secretariat (2023) and Raccurt et al. (1985). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Biomphalaria glabrata* is classified as Low. Biological information on this species is available in scientific literature, although most of the literature focuses on *B. glabrata*'s role as a host of a human pathogen. There is not enough evidence on impacts of introductions of *B. glabrata*. Further information is needed to adequately assess the risk this species poses to the contiguous United States.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Biomphalaria glabrata, Bloodfluke Planorb, is a freshwater aquatic snail that is native to South America and the Caribbean. *B. glabrata* has received much research attention for its role as an intermediate host of the parasite *Schistosoma mansoni*, which causes the human disease schistosomiasis. This species has been introduced outside its native range through escape from schistosomiasis research laboratories or by hitchhiking on plants in the ornamental trade. *B. glabrata* became established in North Carolina, Egypt, Dominica, and Ukraine, although recent surveys have failed to find persistent populations in either Egypt or Dominica. In Egypt, it hybridized with the native snail *B. alexandrina*; both *B. glabrata* and the hybrid snails may have greater potential to transmit *Schistosoma mansoni*, although no information is available establishing a causal relationship between *B. glabrata* introduction and new or increased *S. mansoni* outbreaks. The History of Invasiveness for *B. glabrata* is classified as Data Deficient. The climate matching analysis for the contiguous United States indicates establishment concern for this species. The climate match was highest in the Southeast, around its current established location in North Carolina. The Certainty of Assessment for this ERSS is classified as Low because not enough information is available to demonstrate or refute negative impacts of introductions of this species. The Overall Risk Assessment Category for *Biomphalaria glabrata* 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: Host of *Schistosoma mansoni,* causative agent of human schistosomiasis, and several other zoonotic parasites.**
- **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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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 Benson (2019) and GBIF Secretariat (2023).

Under the future climate scenarios (figure A1), on average, high climate match for *Biomphalaria glabrata* was projected to occur in the Southern Atlantic Coast and Southern Florida regions of the contiguous United States. The greatest extent of high match, particularly in the Southeast into the southern Midwest, appeared under SSP3 and time step 2085. Areas of low climate match were projected to occur in the Colorado Plateau, Great Basin, Northern Plains, and Western Mountains regions. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.062 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.255 (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 (0.168, 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 the 2085 time step in particular, areas within the Great Lakes and Northeast saw a large increase in the climate match relative to current conditions. Additionally, under one or more time step and climate scenarios, areas within the Appalachian Range, California, Colorado Plateau, Great Basin, Northern Pacific Coast, Northern Plains, 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, Southeast, Southern Atlantic Coast, and Southern Florida saw a moderate decrease in the climate match relative to current conditions. The moderate decrease in climate match was present in all scenarios for the Gulf Coast and confined to time step 2085 for the other regions listed. 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).

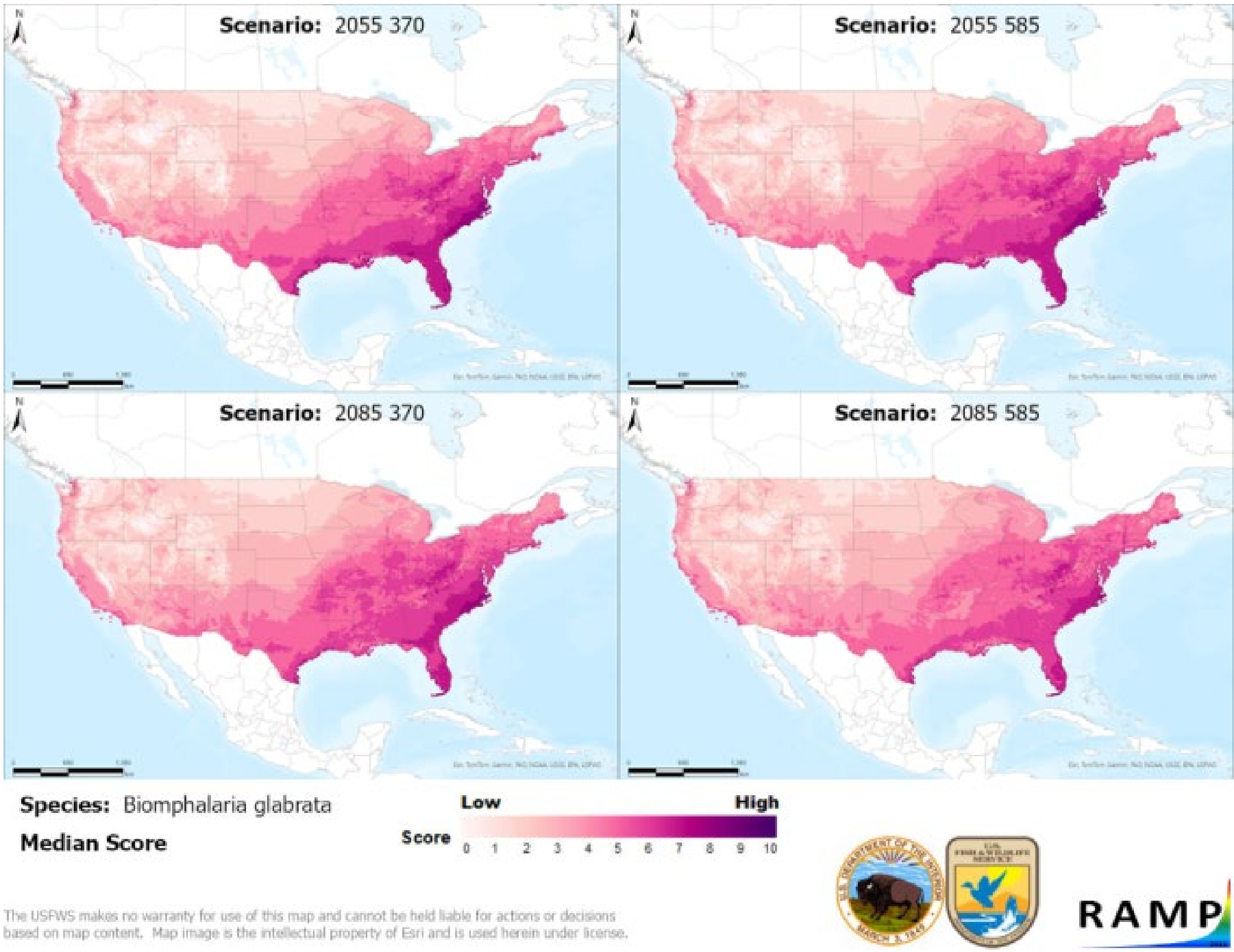

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Biomphalaria glabrata* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023) and Raccurt et al. (1985). 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.

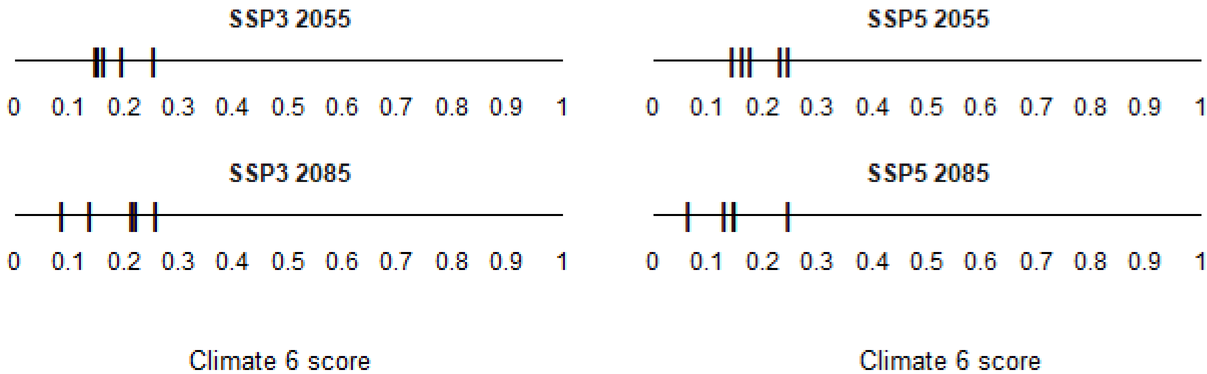

Figure A2. Comparison of projected future Climate 6 scores for *Biomphalaria glabrata* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018;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

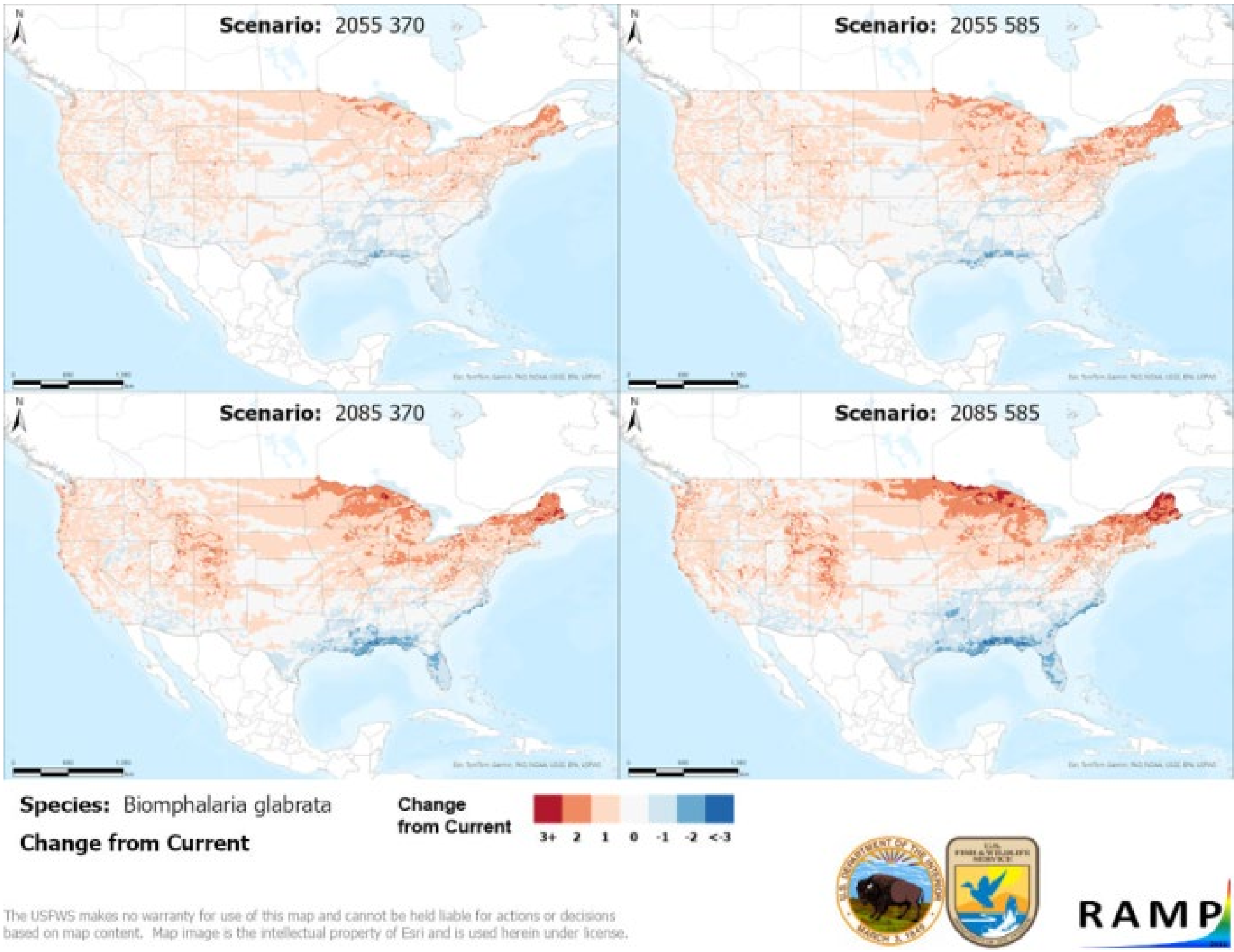

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Biomphalaria glabrata* based on source locations reported by GBIF Secretariat (2023) and Raccurt et al. (1985). 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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