U.S. Fish & Wildlife Service

Giant Cabomba (*Cabomba aquatica*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, May 2021
Revised, May 2021
Web Version, 7/23/2021

Organism Type: Plant
Overall Risk Assessment Category: Uncertain

Photo: Alex Popovkin. Licensed under CC BY-NC-SA 2.0. Available: https://www.flickr.com/photos/plants_of_russian_in_brazil/6780045440 (May 2021).

1 Native Range and Status in the United States

Native Range

From Ørgaard (1991):

"Brazil (state Amazonas, Pará, Amapa, Paraná, Roraima, Pernambuco, Alagoas), French Guiana, Suriname, and Guyana, with a few collections from Venezuela and Colombia […]"

According to World Flora Online (2021), *C. aquatica* is found in the following Brazilian states: Acre, Amapí, Amazonas, Parí, Rondônia, Roraima, Alagoas, Bahia, Ceará, Maranh, Paraába, Pernambuco, Piauá, Rio Grande do Norte, Sergipe, Paraní, Espirito Santo, Rio de Janeiro, São Paulo.

Status in the United States

Edgerton (2014) lists *C. aquatica* as a minor invader in Texas, with an introduction date of 1967. "Minor invaders" are defined in this source as "species which are adventive in Texas." No further information was found about the location or current status of this introduction.

Cabomba aquatica has been found for sale in the United States. The following refers to a store in southern California that sells the plant but is currently sold out.

From Buce Plant (2021):

"*Cabomba aquatica* […]
$ 5.99"

According to IWGS (2021), all *Cabomba* spp. are regulated in Puerto Rico. No further English-language information was found on this regulation.

Means of Introductions in the United States

No records of *Cabomba aquatica* in the wild in the United States were found.

Remarks

World Flora Online (2021) lists *Cabomba aubletii*, *Cabomba schwartzii*, *Nectris aquatica*, and *Nectris peltata* as synonyms of *Cabomba aquatica*. Information for this assessment was searched for using the valid name *Cabomba aquatica* and the above listed synonyms.

C. aquatica is often confused with the related *C. caroliniana*. For example:

From Wilson et al. (2007):

"[*C. caroliniana*] has been reported as introduced to India under the name *Cabomba aquatica* (Aleykutty and Inamdar 1978; Inamdar and Aleykutty 1979), although the plants are clearly referable to *C. caroliniana* (M. Ørgaard, personal communication)."

From Brunel (2009):

"Many consignments labelled as *Cabomba aquatica* actually consisted of *C. caroliniana* (pers. comm. J van Valkenburg)."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to World Flora Online (2021), *Cabomba aquatica* is the current accepted name for this species.

From MyBIS (2021):

Kingdom Plantae
Division Magnoliophyta
Class Magnoliopsida
Order Nymphaeales
Family Cabombaceae
Genus *Cabomba*
Species *aquatica* Aubl.

Size, Weight, and Age Range

From Tropica Aquarium Plants (2021):

"It reaches 30-80 cm and each stem can become 5-8 cm wide."

From Lima et al. (2014):

"Species of *Cabomba* are perennial aquatic herbs […]"

Environment

From Ørgaard (1991):

"*C. aquatica* requires […] water temperatures 22–30°C throughout the year […]"

"Found in both stagnant water and slow to fast running streams, free floating as well as rooted; according to Kasselmann (1987) the water is acidic, pH 4–5, poor in mineral nutrition and very soft, GH [general hardness] and KH [carbonate hardness] below 1°."

From Siti-Munirah and Chew (2010):

"Found in both stagnant and slow-moving water, in fully exposed conditions."

Climate

From Ørgaard (1991):

"Equatorial with diurnal climate characterized by a brief period of dryness in winter and a monthly precipitation above 100mm."

Distribution Outside the United States

Native

From Ørgaard (1991):

"Brazil (state Amazonas, Pará, Amapa, Paraná, Roraima, Pernambuco, Alagoas), French Guiana, Suriname, and Guyana, with a few collections from Venezuela and Colombia […]"

According to World Flora Online (2021), *C. aquatica* is found in the following Brazilian states: Acre, Amapí, Amazonas, Parí, Rondônia, Roraima, Alagoas, Bahia, Ceará, Maranh, Paraába, Pernambuco, Piauá, Rio Grande do Norte, Sergipe, Paraní, Espirito Santo, Rio de Janeiro, São Paulo.

Introduced

From Siti-Munirah and Chew (2010):

"In Peninsular Malaysia, naturalized in Sungai Mati, Muar, Johor."

Means of Introduction Outside the United States

From Siti-Munirah and Chew (2010):

"It is not known when *Cabomba* species were first introduced into Peninsular Malaysia nor whether they were accidentally or purposely introduced. However, we strongly suspect that the introduction is related to the high demand for export either from Malaysia or Singapore [for the aquatic plant trade]."

Short Description

From Ørgaard (1991):

"*C. aquatica* is characterized by the broadly elliptic to ovate lamina of the floating leaves in combination with the bright yellow flowers. The seeds are large and elliptic."

"The colour of the shoots [of *Cabomba* spp.] is strongly influenced by light conditions. If the plant grows in shade it will become green to olive green. In open sun it may appear reddish brown due to accumulation of red pigments in the epidermal cells of stems, leaves, petioles, and pedicels. If the plant is removed to a habitat with poorer light conditions, it will lose some of its red coloration in the old shoots and new shoots may be all green. The pigmentation may also depend on some other environmental factors, e.g. water composition and nutrient supply."

"Flowers are solitary, raised above the water surface on a long pedicel."

From Siti-Munirah and Chew (2010):

"Stems grass- to olive-green. *Submerged filiform leaves* green, opposite; petiole 3–8 mm long; lamina divisions three dimensional, terminal divisions narrow and linear, 15–30 mm long. *Floating peltate leaves* green above, often deep magenta beneath, raised to the surface of water

by a thick petiole, c. 7–35 mm long; lamina broadly elliptic to oval, 5–20 × 4–15 mm, margin entire. *Pedicels* hairy, 2–4 cm long. *Flowers* bright yellow, 8–10 mm in diameter, c. 7 mm long; sepals obovate, c. 7 × 3 mm, reddish-tinged at base; petals ovate-oblong, c. 7 × 2–3 mm, base extended into two equal, straight semi-ovate lobes with two elliptic, yellow-orange patches, apex truncate-obtuse or rarely emarginate; stamens bright yellow; carpels 2, divergent at maturity, with 1–4 ovules each. *Seeds* black, ovoid-ellipsoid, 2–3.5 × 1.5–2.5 mm broad, surface verrucate."

Biology

From Lima et al. (2014):

"[*Cabomba* spp.] propagate mainly by detachment of portions of the stem from the mother plant, with adventitious roots produced in the nodes."

"In *C. aquatica*, each fruit typically develops only one seed […]"

From Silva and Leite (2011):

"Flower anthesis [the period when the flower is fully open] in this species is diurnal and lasts two days."

"The floral buds develop under water and only emerge on flower-opening day. In each individual, one flower opens per day. Flowering in this species usually extends over the entire year."

"This species is self-compatible, but requires biotic vectors to transfer pollen. We observed visits of bees (Apidae and Halictidae), wasps (Vespidae) and flies (Diptera) to the flowers. Bees and wasps were considered to be effective pollinators, both due to their behavior and their high frequency of visits to flowers, whereas flies were considered to be occasional pollinators."

Human Uses

Cabomba aquatica is a very popular aquarium plant and is found for sale from several locations in the United States and in other countries (Buce Plant 2021, Tropica Aquarium Plants 2021).

From Siti-Munirah and Chew (2010):

"Sold as oxygenating aquarium plants (Williamson & Schneider 1993)."

From Tropica Aquarium Plants (2021):

"Eaten locally as a vegetable."

Diseases

No information on diseases for *Cabomba aquatica* was found.

Threat to Humans

No information on threats to humans for *Cabomba aquatica* was found.

3 Impacts of Introductions

Cabomba aquatica has been introduced and has become naturalized outside of its native range in Malaysia, but no information was found on impacts of that introduction.

According to IWGS (2021), all *Cabomba* spp. are regulated in Puerto Rico. No further English-language information was found on this regulation.

4 History of Invasiveness

The history of invasiveness for *Cabomba aquatica* is Data Deficient. This species has been introduced into Malaysia where it has become naturalized. Additionally, there is one report of potential establishment in the United States. Even though *C. aquatica* has become established outside its native range, there was no information found on the impacts that occurred as a result of its establishment. *C. aquatica* is also a very popular aquarium plant but information on its exact trade history and volume could not be found and may be unknown due to the potential for confusion with *C. caroliniana*.

5 Global Distribution

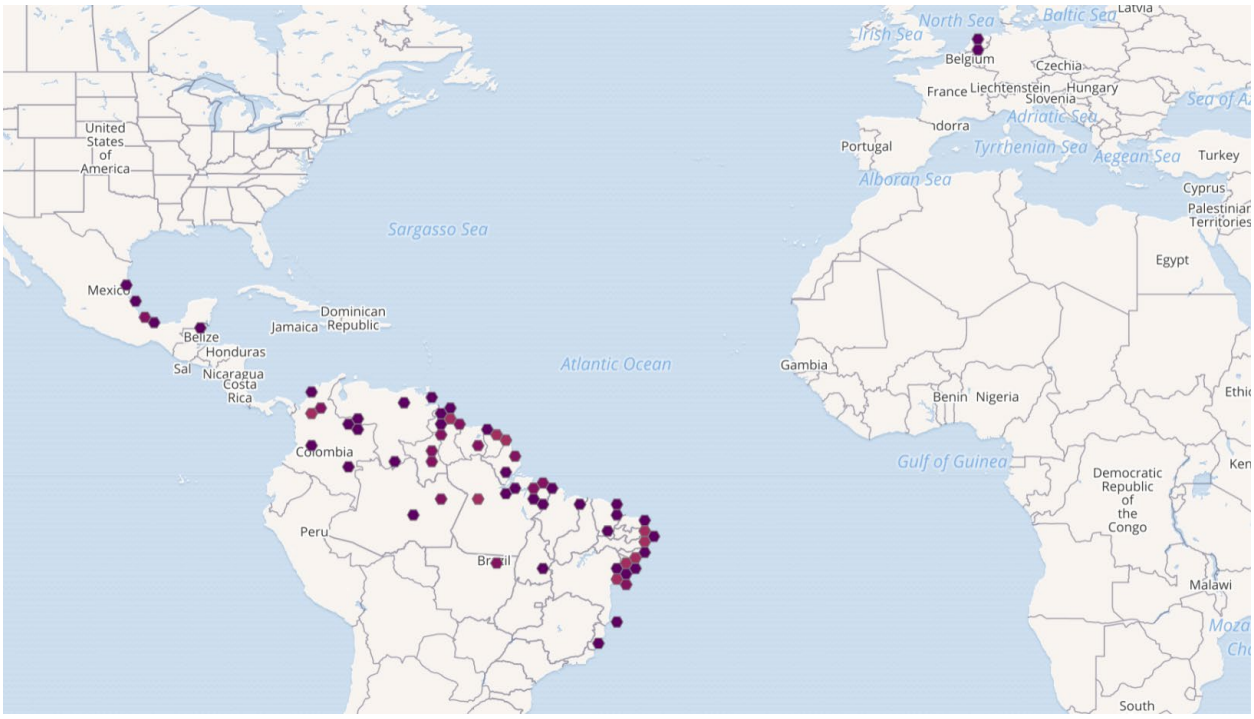

Figure 1. Known global distribution of *Cabomba aquatica*. Observations are reported from Mexico, South America, and the Netherlands. Map from GBIF Secretariat (2021). The points in Mexico and the Netherlands were not included in the climate matching analysis because no scientific literature corroborated that this species is found there or has been introduced there. Additional locations where *C. aquatica* is established in Malaysia are reported in Siti-Munirah and Chew (2010) but are not represented in this figure.

6 Distribution Within the United States

Edgerton (2014) lists *C. aquatica* as a minor invader in Texas, with an introduction date of 1967. "Minor invaders" are defined in this source as "species which are adventive in Texas." No further information was found about the location or current status of this introduction, so it was not used in the climate matching analysis.

7 Climate Matching

Summary of Climate Matching Analysis

A majority of the contiguous United States was a low climate match for *Cabomba aquatica*. Locally medium matches were found in southern peninsular Florida, coastal Texas, extreme southern Louisiana, and coastal southern California. The overall Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.000, low (scores between 0.000 and 0.005, inclusive, are classified as low). All States had low individual Climate 6 scores except for Florida, which had a medium individual Climate 6 score.

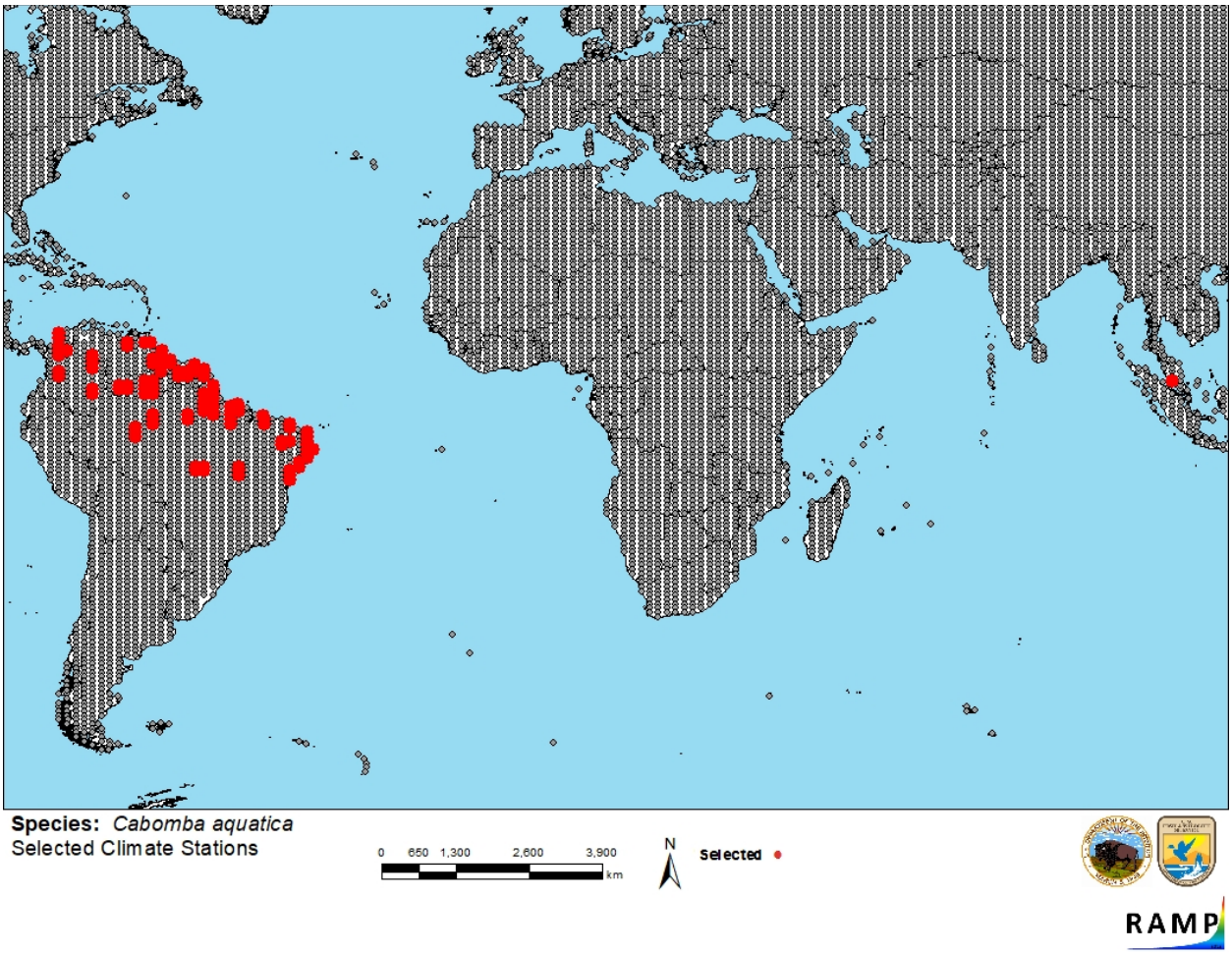

Figure 2. RAMP (Sanders et al. 2018) source map showing global weather stations selected as source locations (red; Colombia, Venezuela, Guyana, Suriname, French Guiana, Brazil, and Malaysia) and non-source locations (gray) for *Cabomba aquatica* climate matching. Source locations from GBIF Secretariat (2021) and Siti-Munirah and Chew (2010). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

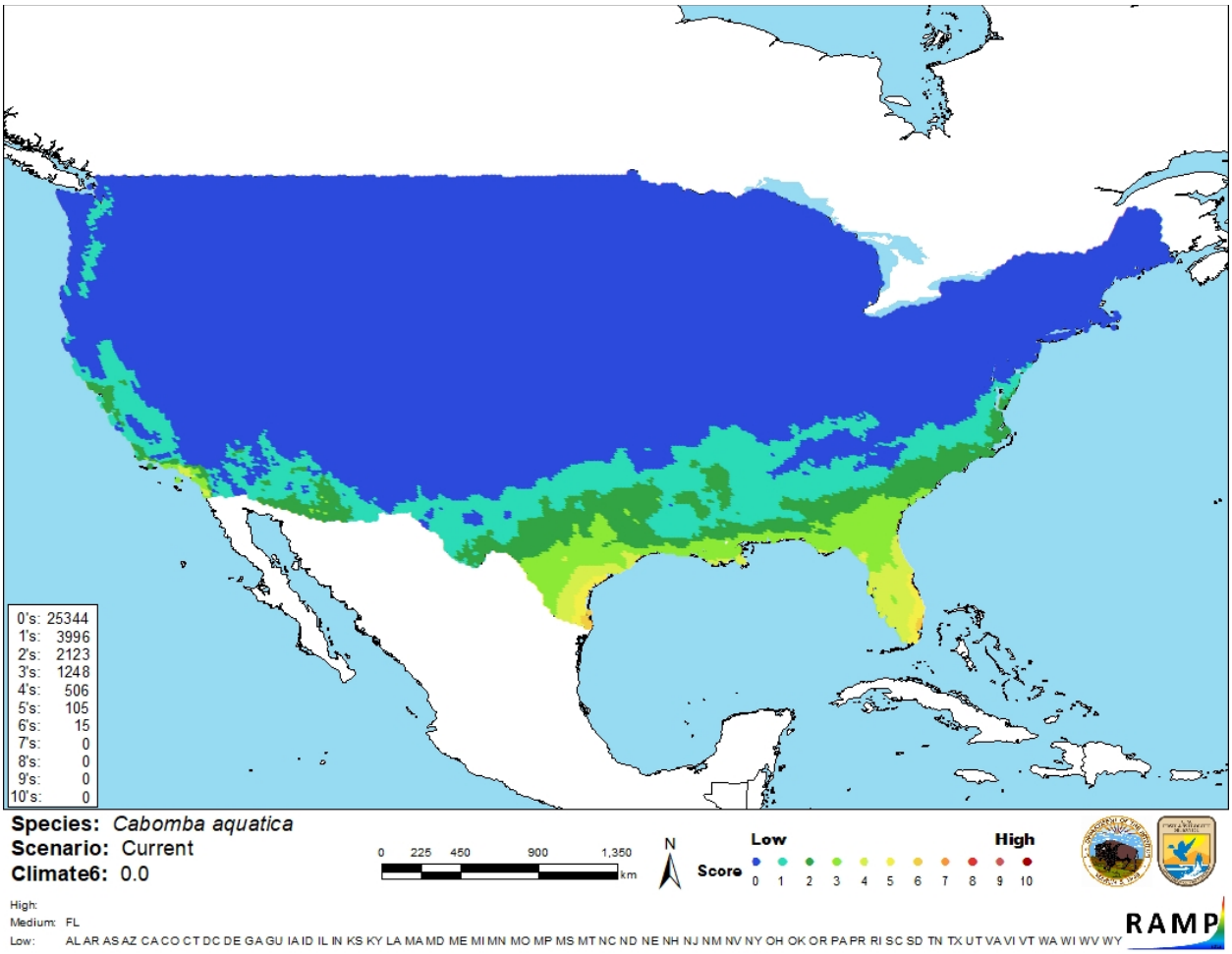

Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *Cabomba aquatica* in the contiguous United States based on source locations reported by GBIF Secretariat (2021) and Siti-Munirah and Chew (2010). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

8 Certainty of Assessment

The certainty of assessment for *Cabomba aquatica* is low. There was information available on the biology and ecology of this species but there was some confusion surrounding both its native and introduced range. No information was available on impacts of *Cabomba aquatica* where it

has become established outside its native range. Additionally, *C. aquatica* is frequently confused with its congener *C. caroliniana*, making it difficult to track the trade history of this species.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Cabomba aquatica (Giant Cabomba) is an aquatic flowering plant native to the South American countries of Brazil, French Guiana, Surinam, Guyana, Venezuela, and Colombia. It is a very popular aquarium plant that has been found for sale in the United States and in other countries. *C. aquatica* can be distinguished from other species in the genus *Cabomba* by the combination of bright yellow flowers and the shape of its leaves, but in trade, it is often confused with *C. caroliniana*, making it difficult to track the exact trade history of *C. aquatica*. One source reported *C. aquatica* as having been introduced to Texas in the 1960s, but no further information was available on location of introduction or current status, and this report could not be corroborated with other sources. *C. aquatica* has established outside of its native range in Malaysia but the means of introduction and any impacts of introduction are unknown. The history of invasiveness is Data Deficient. The overall climate match to the contiguous United States was low, with areas of medium match found only in the southern portions of Florida, Texas, and California. The certainty of assessment is low because of the lack of information available on impacts of introductions, confusion over the established range, and potential confusion with similar species. The overall risk assessment category is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): Data Deficient**
- **Overall Climate Match Category (Sec. 7): Low**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information: No additional remarks**
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

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Siti-Munirah MY, Chew MY. 2010. Cabombaceae, a new family record for Peninsular Malaysia. Malayan Nature Journal 62(3):241–248.

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Wilson CE, Darbyshire SJ, Jones R. 2007. The biology of invasive alien plants in Canada. 7. *Cabomba caroliniana* A. Gray. Canadian Journal of Plant Science 87(3):615–638.

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

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.

Aleykutty KM, Inamdar JA. 1978. *Cabomba aquatica* Aubl. – a new record for India from Kerala. Current Science 47:136–137.

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Kasselmann C. 1987. Neue Erkentnisse über drei seltene *Cabomba*-Arten. 2. Zwei neue Sorten: *Cabomba palaeformis* 'Grün' und *Cabomba palaeformis* 'Rotbraun.' Deutsche Aquarien- und Terrarien-Zeitschrift 1:38–40.

Williamson PS, Schneider EL. 1993. Cabombaceae. Pages 157-161 in Kubitzki K, editor. The families and genera of vascular plants. Berlin: Springer-Verlag.