Senegal Tea Plant (*Gymnocoronis spilanthoides*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, June 2018
Revised, March 2018
Web Version, 8/16/2019

Photo: John Tann. Licensed under Creative Commons BY 2.0. Available: https://www.flickr.com/photos/31031835@N08/6775697437/. *Gymnocoronis spilanthoides* is the plant with white flowers along the water's edge.

1 Native Range and Status in the United States

Native Range

From Vivian-Smith et al. (2005):

"Senegal tea is native to the tropical and sub-tropical regions of South America between Mexico and Argentina (Parsons and Cuthbertson 2001)."

GISD (2018) lists *Gymnocoronis spilanthoides* as native in Argentina, Bolivia, Brazil, Mexico, Paraguay, Peru, and Uruguay.

Status in the United States

From CABI (2018):

"*G. spilanthoides* was also recently put on NAPPOs Phytosanitary Alert List, with the Weed Science Society of America noting that it was one of 16 weeds not yet present in the USA but posing the greatest potential threat to its ecosystems (WSSA, 2010). It continues to be available from websites and plant catalogues as a tropical aquarium plant and thus further introduction to other areas not only remains possible, but probable, especially when it is disposed of unwisely."

Means of Introductions in the United States

No records of *Gymnocoronis spilanthoides* in the United States were found.

Remarks

From CABI (2018):

"A common name in the aquarium plant trade is 'water snowball' which refers to the showy large round clusters of white flowers. Three varieties are described, var. *spilanthoides*, var. *attenuata* (DC.) Baker and var. *subcordata* (DC.) Baker."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From Flann (2018):

"Biota > Plantae (Kingdom) > Viridiaeplantae (Subkingdom) > Streptophyta (Infrakingdom) > Tracheophyta (Phylum) > Spermatophytina (Subdivision) > Magnoliopsida (Class) > Asteranae (Superorder) > Asterales (Order) > Compositae (Family) > Eupatorieae (Tribe) > *Gymnocoronis* (Genus) > *Gymnocoronis spilanthoides* (Species)

Status accepted"

Size, Weight, and Age Range

From Vivian-Smith et al. (2005):

"[…] form scrambling mats of floating stems 1-1.5 m in height."

From CABI (2018):

"*G. spilanthoides* is a perennial that lives for at least several years (DEH, 2003)."

Environment

From CABI (2018):

"It also grows in slightly acid or alkaline water within the pH range of 5.5-8, but cannot tolerate saline or brackish water."

Climate/Range

From CABI (2018):

"*G. spilanthoides* requires tropical, sub-tropical or warm temperate climates to thrive, and grows best at [air] temperatures of 15-30°C. However, it also appears to be frost tolerant, at least in New Zealand."

From Ardenghi et al. (2016):

"The growing sites are characterized by hot summers, in which the monthly mean maximum [air] temperatures approaches 30 °C, and relatively cold winters with the mean minimum temperature of January slightly below −1 °C (Fig. 3A [in source material]). The plant was first detected in July, and its presence was confirmed the following year at the end of and after the winter season in early March and mid-July, respectively."

Distribution Outside the United States

Native

From Vivian-Smith et al. (2005):

"Senegal tea is native to the tropical and sub-tropical regions of South America between Mexico and Argentina (Parsons and Cuthbertson 2001)."

GISD (2018) lists *Gymnocoronis spilanthoides* as native in Argentina, Bolivia, Brazil, Mexico, Paraguay, Peru, and Uruguay.

Introduced

GISD (2018) lists *Gymnocoronis spilanthoides* as alien, invasive, and established in Australia, Hungary, India, and New Zealand.

From CABI (2018):

"*G. spilanthoides* was introduced into Australia from India by the aquarium industry in the mid 1970s, and was first recorded as naturalized on Oxley Island in the Manning River near Taree, New South Wales in 1980 (Weeds CRC, 2008). Subsequently, in 1985, it was reported growing in a farm dam near Dapto, where it had been deliberately planted to enable commercial harvesting for the aquarium trade (Parsons and Cuthbertson, 1992). A third large infestation was found in Gloucester, near Barrington in New South Wales, Australia. In the early 1990s Senegal tea was found on sale in South Australia at a hardware shop. First discovery of Senegal tea in Victoria was located at Lake Nagambie about 150 km away from Melbourne and a further two

small infestations were found in a garden and a farm dam (Gunasekera et al., 2002). It has also recently been found around Perth, Western Australia (Weeds CRC, 2008). It is likely to be more widely distributed than recorded in the distribution table, especially as an escaped aquarium plant, such as its spread in Hungary (Torok et al., 2003)."

From NIES (2018):

"The first record of establishment was in 1995 at Aichi Pref [Japan]."

"Introduced range in other countries: Taiwan, Australia, New Zealand, etc."

According to Pagad et al. (2018), *Gymnocoronis spilanthoides* is introduced in Australia, China, Hungary, India, Japan, New Zealand, Senegal, Taiwan, and Thailand.

From Ardenghi et al. (2016):

"In July 2015, an extended population of *Gymnocoronis spilanthoides* was discovered in an irrigation canal in Zerbolò (province of Pavia, Lombardia, Italy); further field surveys conducted in the following months revealed a wider distribution of the species across the local irrigation network."

"In Europe, it has been known since 1988 from the thermal lake of Hévíz, Hungary (Szabó 1998, 2002; Hussner 2012; Lukács & al. 2014), the northernmost growing site within its range."

Means of Introduction Outside the United States

From Vivian-Smith et al. (2005):

"The species was initially introduced to Australia as an aquarium plant in the 1970s (Parsons and Cuthbertson 2001)."

From GISD (2018):

"Most are thought to have been the result of the careless disposal of aquarium plants into Brisbane s waterways. However, a few infestations were probably illegally planted for harvest and subsequent sale to the aquarium plant industry (The Department of the Environment and Heritage, 2003)."

Short Description

From CABI (2018):

"*G. spilanthoides* is an aquatic perennial that can form rounded bushes up to 1-1.5 m tall or scrambling mats of tangled stems. The plant can grow in various forms, producing runners and floating stems up to 2.5 m in length or growing as rounded bushes or extending from the banks, in mats of tangled stems reproducing vegetatively and by seed (Csurhes and Edwards, 1998). The following description is from Parsons and Cuthbertson (1992).

Stems are pale green, erect at first but becoming prostrate, scrambling and branching at the nodes, 1-1.5 m long, 5-10 mm in diameter at first increasing to 10-20 mm with age. Young stems are often angled, with several ridges running down the length of the stem, but they become more or less rounded (six sided) as they mature. Larger stems are hollow between the nodes and mats are buoyant in water. Erect stems are produced prior to flowering. Leaves are opposite, shiny dark green, ovate to lanceolate, large, 5-20 cm long, 2.5-5 cm wide, on shortish stalks, margins serrate and slightly wavy. Flowers have florets, whitish, numerous, grouped into terminal heads 1.5 to 2 cm diameter, subtended by a single row of green involucral bracts. Seeds are small, light brown achenes, 0.8-1.2 mm in length and 0.5 mm in diameter, each weighing approximately 0.20 mg when dry (Vivian-Smith et al., 2005) ribbed, without a crown or pappus. Roots are numerous; finely fibrous adventitious roots can develop at any node that is in contact with moist soil or immersed in water."

"*G. spilanthoides* is easily recognized when in flower but otherwisecould [sic] be confused with a number of species which grow in or near water. It may be confused with *Hygrophila corymbosa*, although leaves of *G. spilanthoides* are fleshier and less rigid than those of *H. corymbosa*; and with the invasive *Alternanthera philoxeroides* (alligator weed) although *G. spilanthoides* has serrated leaf margins whereas alligator weed has rounded margins. It is also similar to *Veronica anagallis-aquatica* (blue water speedwell) which has hollow stems, an erect habit and rhizomes, opposite finely toothed stalkless leaves whereas *G. spilanthoides* has leaves on short stalks, and the flowers are very different, being pale blue or mauve and arranged in long terminal spikes with large gaps between flowers. Another similar species is *Hygrophila costata*, which is also emergent with serrated leaf margins, is reddish four angled and white flower produced at each leaf joins without any stalk."

Biology

From CABI (2015):

"Reproductive Biology

G. spilanthoides can reproduce by seeds and vegetatively from stem fragments. The seeds are quite heavy and most drop near the parent plant or can be spread in mud attached to animals or machinery. Recent research has shown that seed production in infestation in Queensland, Australia is extremely low, less than 1% of its potential, which indicates that spread by seed is not very important there (Weeds CRC, 2008). Research reported that Senegal tea seeds germination could be stimulated by light (Vivian Smith et al., 2005). Vegetative spread occurs when any part of the stem that includes a node breaks away from the main plant, sending out fine roots from the node wherever stem fragments settle on stream banks or beds, and the new plant can spread quickly and create a new colony by producing roots where nodes come in contact with moist soil. Leaves can also root from the veins.

Physiology and Phenology

In Australia, *G. spilanthoides* has active vegetative growth from September to November, and flowers from October to February, extending to May in optimal conditions, and seeds form from November to March, about one month after flowering. Plants become dormant during winter

(June to August), and most seeds germinate in spring from September to November at the same time as the plant is actively growing (Weeds CRC, 2008). Seedling growth is rapid, and plants quickly reach the surface if submerged in shallow water."

"It grows over the surface of slow moving or stationary water bodies, in wet marshy soils, wetlands and especially in degraded waterways. Rooting in the bank, it grows out into the waterway, though it can also survive and continues growing even when completely inundated; also growing on wet marshy soils near water."

From GISD (2018):

"The Department of the Environment and Heritage (2003) states that, "*G. spilanthoides* can reproduce by seeds and vegetation. The seeds can be spread by flowing water. Seeds are approximately 0.20 mg (air dried) (Vivian-Smith et al. 2005). They are small and quite light and germinate readily under light conditions. Vivian-Smith et al. (2005) reported 83% germination. Seeds can also be spread in mud attached to animals or machinery. […] Stem fragments can also be accidentally spread by transport of machinery (e.g. boats, trailers, lawnmowers) or in animals' hooves." *G. spilanthoides* stem fragments can enabling the plant to regrow when broken up and dislodged by floodwater or other disturbance (PIER, 2005)."

Human Uses

From CABI (2015):

"*G. spilanthoides* is a valued ornamental plant, either in aquariums or garden ponds. It grows very quickly, and has large showy flowers that are also especially attractive to butterflies."

From GISD (2018):

"The importation of *G. spilanthoides* into Australia is not permitted because of the risk of further spread, and the potential introduction of new genetic diversity that could make future control more difficult (The Department of the Environment and Heritage, 2003)."

"*G. spilanthoides* is a declared Class 1 plant under Queensland legislation. Declaration requires landholders to control declared pests on the land and waters under their control. A Local Government may serve a notice upon a landholder requiring control of declared pests (Land Protection, 2004)."

"*G. spilanthoides* is included in the First Schedule of the National Pest Plant Accord. All plants on the list are designated as Unwanted Organisms, and are banned from sale, propagation and distribution throughout New Zealand."

From NIES (2018):

"Import, transport and keeping are prohibited in Japan."

Diseases

No information on parasites or pathogens of *Gymnocoronis spilthanoides* was found.

Threat to Humans

No information on threats to humans from *Gymnocoronis spilthanoides* was found.

3 Impacts of Introductions

From Pfeiffer and Voeks (2008):

"In New Zealand, freshwater invasive aquatic species such as giant gunnera (*Gunnera manicata*, *G. tinctoria*), Senegal tea (*Gymnocoronis spilanthoides*), *Egeria densa* and *Lagarosiphon major* displace culturally important species for the Maori including flax (*Phormium tenax*) and edible watercress (*Lepidium sativum*); […]"

From CABI (2018):

"*G. spilanthoides* poses a significant risk for wetland ecosystems (Weeds CRC, 2008). It can invade and degrade natural wetlands, competing strongly with slower growing native plants and affecting wetland birds and other animals depend upon them. Native species can also be submerged causing death. Water quality may also be negatively affected if lots of plant material dies off and rots under water (Weeds CRC, 2008)."

From GISD (2018):

"*G. spilanthoides* grows very quickly, and is known to rapidly cover water bodies with a floating mat, excluding other plants and the animals that rely on them. The effects of flooding are made much worse because infestations block drainage channels. Recreational activities, irrigation and navigation may also be affected. Water quality may decline if large amounts of *G. spilanthoides* die off and rot under water." The authors also report that, "*G. spilanthoides* poses a significant risk to the health of wetland ecosystems. It can quickly take over wetlands and detract from their environmental value, natural beauty and recreational potential. It is also very difficult to control because it can spread by both seed and vegetative reproduction. Even tiny pieces of vegetation can give rise to new colonies. Because it is found mainly in water, the potential impacts of herbicides on nontarget plants and animals must also be carefully managed (The Department of the Environment and Heritage, 2003). Land Protection (2004) reports that, "*G. spilanthoides* will invade and degrade natural wetlands, competing strongly with slower growing native plants and affecting wetland birds and other animals dependent upon them."

"In New Zealand it has caused flooding by blocking streams and drainage channels (Department of the Environment and Heritage, 2003)."

"It may also impede the flow of water and interfere with water utilisation including navigation and recreational activities" (Waikato Regional Council, 2005)."

From NIES (2018):

"Competition with native species. Disturbance of channel. Destruction of fish habitat.
Eradication is conducted in channels of Tokyo, Osaka, and Fukuoka.
Affected organism: Native aquatic plants and animals."

4 Global Distribution

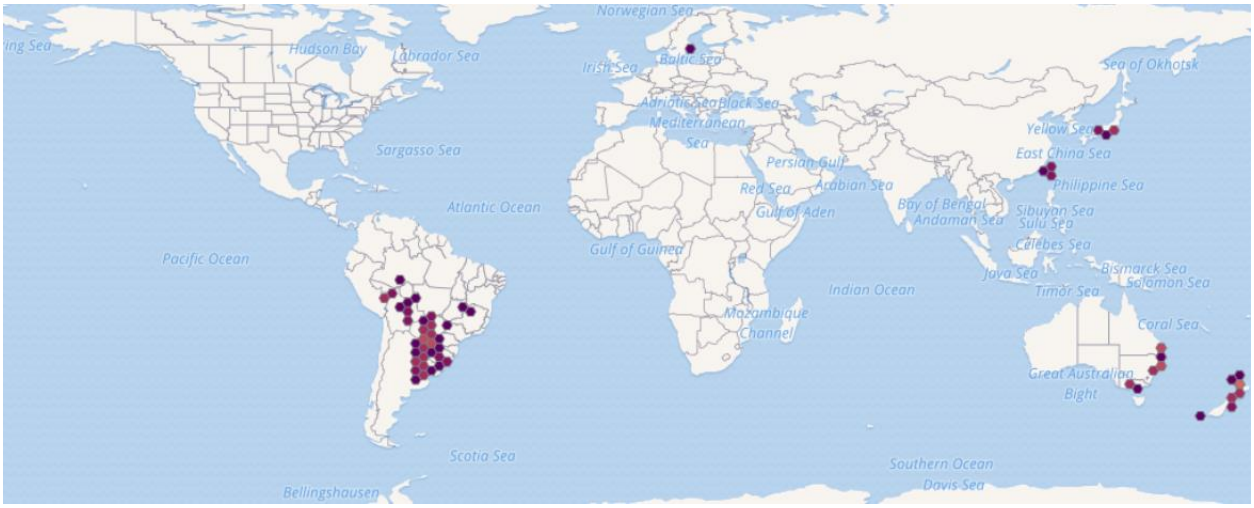

Figure 1. Known global distribution of *Gymnocoronis spilanthoides*. Map from GBIF Secretariat (2018).

The location in Sweden was not used as a source point for the climate match. The record is the result of a specimen living in a botanical garden (GBIF Secretariat 2018).

Figure 2. Location of a known population of *Gymnocoronis spilanthoides* in Italy. Map from Ardenghi et al. (2016).

5 Distribution Within the United States

No records of *Gymnocoronis spilanthoides* in the United States were found.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Gymnocoronis spilanthoides* was high in the southeastern United States, particularly along the southern Atlantic and Gulf coasts. There were areas of low match in New England and much of the western contiguous United States. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous United States was 0.210, high (scores 0.103 and greater are classified as high). Just under half the States had high individual Climate 6 scores. Arizona, Idaho, Kansas, Massachusetts, Michigan, Tennesee, and Washington had medium individual Climate 6 score, and California, Colorado, Connecticut, Iowa, Maine, Minnesota, Montana, Nebraska, New Hampshire, New Mexico, Nevada, North Dakota, Oregon, Rhode Island, South Dakota, Utah, Vermont, Wisconsin, and Wyoming had low individual scores.

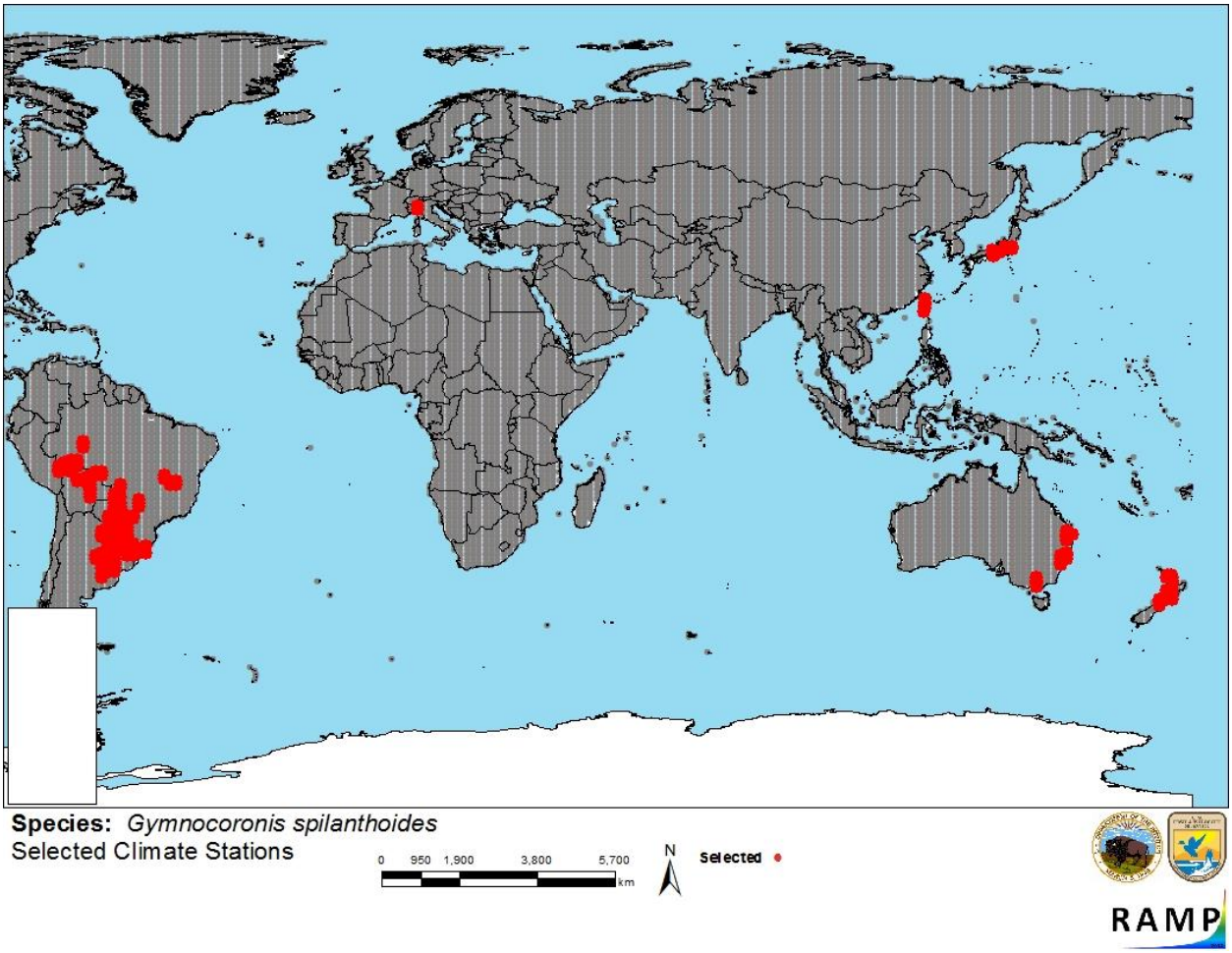

Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red; South America, Italy, Australia, New Zealand, Taiwan, and Japan) and non-source locations (gray) for *Gymnocoronis spilanthoides* climate matching. Source locations from Ardenghi et al. (2016) and GBIF Secretariat (2018). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

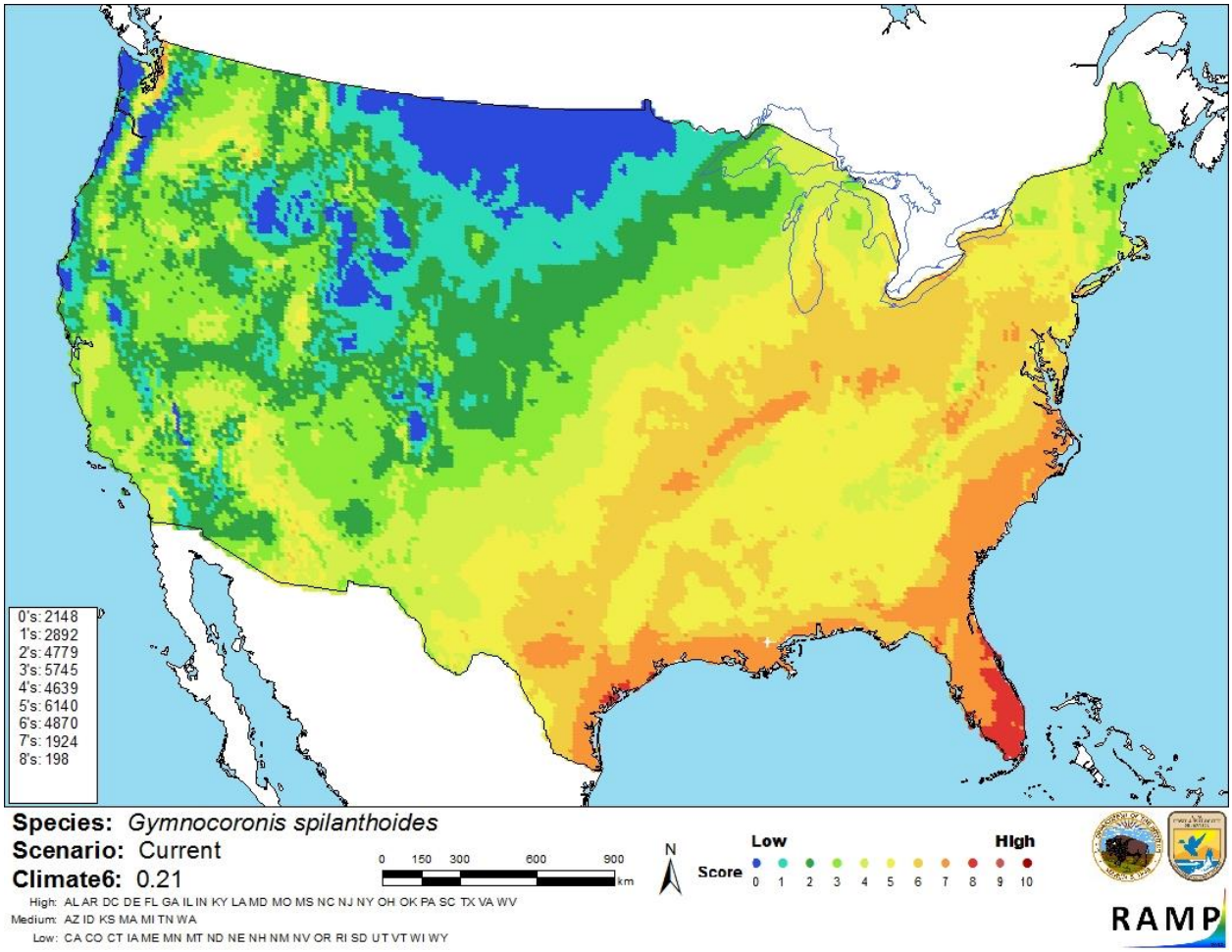

Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *Gymnocoronis spilanthoides* in the contiguous United States based on source locations reported by Ardenghi et al. (2016) and GBIF Secretariat (2018). Counts of climate match scores are tabulated on the left. 0 = Lowest match, 10 = Highest match.

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

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

7 Certainty of Assessment

Certainty of this assessment is medium. Information on the biology, invasion history and impacts of this species is minimal, with little peer-reviewed literature. Information on impacts of introductions were found, including one peer-reviewed article.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Senegal tea plant (*Gymnocoronis spilanthoides*) is a prolific, ornamental plant with broad climate suitability. The species is a declared weed in New Zealand and Australia, and eradication programs have been initiated in both countries. The history of invasiveness is high. *G. spilanthoides* displaces native species in New Zealand that are traditionally used by the Maori people. There are also reports of infestations of this species increasing the severity of flooding. The climate match was high. The areas of high climate match were concentrated in the eastern United States. The certainty of assessment is medium. There is a negative impact of invasion reported in peer reviewed literature but the remainder of the impact information comes from invasive species databases. The overall risk assessment category is high.

Assessment Elements

- **History of Invasiveness (Sec. 3): High**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Medium**
- **Remarks/Important additional information** No additional remarks.
- **Overall Risk Assessment Category: High**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

Ardenghi, N. M. G., G. Barcheri, C. Ballerini, P. Cauzzi, and F. Guzzon. 2016. *Gymnocoronis spilanthoides* (Asterceae, Eupatorieae), a new naturalized and potentially invasive aquatic alien in S Europe. Willdenowia 46(2):265–273.

CABI. 2018. *Gymnocoronis spilanthoides* (Senegal Tea Plant) [original text by L. Gunasekera]. *In* Invasive Species Compendium. CAB International, Wallingford, U.K. Available: http://www.cabi.org/isc/datasheet/26246. (March 2018).

Flann, C. 2009. *Gymnocoronis spilanthoides* (D.Don ex Hook. & Arn.) DC. *In* World Register of Marine Species. Available: http://www.marinespecies.org/aphia.php?p=taxdetails&id=1092339. (March 2018).

GBIF Secretariat. 2018. GBIF backbone taxonomy: *Gymnocoronis spilanthoides* DC. Global Biodiversity Information Facility, Copenhagen. Available: http://www.gbif.org/species/6063677. (March 2018).

GISD (Global Invasive Species Database). 2018. Species profile: *Gymnocoronis spilanthoides*. Invasive Species Specialist Group, Gland, Switzerland. Available: http://www.iucngisd.org/gisd/speciesname/Gymnocoronis+spilanthoides. (March 2018).

NIES (National Institute for Environmental Studies). 2018. *Gymnocoronis spilanthoides*. *In* Invasive species of Japan. National Research and Development Agency, National Institute for Environmental Studies, Tsukuba, Japan. Available: http://www.nies.go.jp/biodiversity/invasive/DB/detail/81120e.html. (March 2018).

Pagad, S., P. Genovesi, L. Carnevali, D. Schigel, and M. A. McGeoch. 2018. Introducing the Global Register of Introduced and Invasive Species. Scientific Data 5:170202.

Pfeiffer, J. M., and R. A. Voeks. 2008. Biological invasions and biocultural diversity: linking ecological and cultural systems. Environmental Conservation 35(4):281–293.

Sanders, S., C. Castiglione, and M. Hoff. 2014. Risk assessment mapping program: RAMP, version 2.81. U.S. Fish and Wildlife Service.

Vivian-Smith, G., D. Hinchliffe, and J. Weber. 2005. Fecundity and germination of the invasive aquatic plant, Senegal tea (*Gymnocoronis spilanthoides* (D.Don) DC.). Plant Protection Quarterly 20(4):145–147.

10 References Quoted But Not Accessed

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.

Csurhes, S., and R. Edwards. 1998. Potential environmental weeds in Australia: candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra.

DEH (Department of the Environment and Heritage). 2003. Senegal tea plant (*Gymnocoronis spilanthoides*). Alert list of environmental weeds: weed management guide. Department of Environment and Heritage, Canberra, Australia.

Dematteis, M., J. Molero, M. B. Angulo, and A. M. Rovira. 2007. Chromosome studies on some Asteraceae from South America. Botanical Journal of the Linnean Society 153(2):221–230.

Gunasekera, L., K. Krake, and P. Pigott. 2002. New aquatic weed threats in northern Victoria. Pages 124–125 *in* H. S. Jacob, J. Dodd, and J. H. Moore, editors. Weeds "threats now and forever?" Papers and proceedings of the 13th Australian Weeds Conference, Perth, Western Australia. Plant Protection Society of Western Australia, Victoria Park.

Hussner, A. 2012. Alien aquatic plant species in European countries. Weed Research 52:297–306.

Land Protection. 2004. Senegal tea *Gymnocoronis spilanthoides*. Natural Resources and Mines, Queensland Government.

Lukács, B. A., A. Mesterházy, R. Vidéki, and G. Király. 2014. Alien aquatic vascular plants in Hungary (Pannonian ecoregion): historical aspects, data set and trends. Plant Biosystematics 150:388–395.

Parsons, W. T., and E. G. Cuthbertson.1992. Noxious weeds of Australia. Inkata Press, Melbourne, Australia.

Parsons, W. T., and E. G. Cuthbertson. 2001. Noxious weeds of Australia. CSIRO Publishing.

PIER (Pacific Island Ecosystems at Risk). 2005. *Gymnocoronis spilanthoides*. Available from: http://www.hear.org/pier/species/gymnocoronis_spilanthoides.htm. (February 2005).

Szabó, I. 1998. Termofitonok Hévíz és Keszthely meleg vizeiben. Kitaibelia 3:295−297.

Torok, K., Z. Duckat, I. Dancza, I. Nemeth, J. Kiss, B. Mihaly, and D. Magyar. 2003. Invasion gateways and corridors in the Carpathian Basin: biological invasions in Hungary. Biological Invasions 5:349–356.

Waikato Regional Council. 2005. Senegal tea (*Gymnocoronis spilanthoides*). Regional Pest Management Strategy 2002-2007. Available: http://www.ew.govt.nz/policyandplans/rpmsintro/rpms2002/operative5.2.11.htm. (February 2005).

Weeds CRC. 2008. Weed management guide: *G. spilanthoides* - *Gymnocoronis spilanthoides*. Available: http://www.weeds.au/documents/wmg_senegal_tea.pdf.

WSSA. 2010. *Gymnocoronis spilanthoides*. Weed Science Society of America invasive plant fact sheets. Available: http://www.wssa.net/Weeds/Invasive/FactSheets/Gymnocoronis%20spilanthoides.pdf.