Globefruit Primrose-willow (*Ludwigia sphaerocarpa*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, May 2022
Revised, May 2022
Web Version, 8/12/2022

Organism Type: Plant
Overall Risk Assessment Category: Uncertain

Photo: Celeste Ray. Licensed under Creative Commons BY-NC. Available: https://www.inaturalist.org/photos/155704482 (May 2022).

1 Native Range and Status in the United States

Native Range

From Hoch (2022):

"Ludwigia sphaerocarpa [sic] has its primary distribution along the Atlantic coastal plain, from Massachusetts to north-central Florida, and west along the Gulf coastal plain sporadically to southeastern Texas. Disjunct populations occur in south-central Tennessee, extreme southwestern Indiana, along Lake Michigan in northeastern Illinois and northwestern Indiana,

and in west-central New York. In Michigan, L. sphaerocarpa is known from Allegan and Berrien counties, as reported by Reznicek and Voss in the Michigan Flora [Reznicek et al. 2011]."

Status in the United States

From POWO (2022):

"Native to:
Alabama, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, New York, North Carolina, Pennsylvania, Rhode I., South Carolina, Tennessee, Texas, Virginia"

From NatureServe (2022):

"Widespread in eastern U.S. but regarded as rare in Conneticut [sic], Indiana, Massachusetts, Michigan, New York North Carolina, Rhode Island, Tennessee, and Virginia. Extirpated from Pennsylvania. Regarded as secure in Delaware, somewhat secure in New Jersey, and without abundance data elsewhere in range."

No introductions are known outside the native range within the United States.

From Anonymous (2021):

"*Ludwigia sphaerocarpa* was introduced to the aquarium hobby by aquarists from Houston, Texas in 2008 and was, until recently, thought to be the related *L. pilosa*. It has already proven to be quite popular."

Despite the assertion in the above quotation that *L. sphaerocarpa* is popular in the aquarium hobby, active U.S.-based sellers of this plant were not found through online searches.

Means of Introductions in the United States

No introductions known outside the native range within the United States.

Remarks

WFO (2022a) reports *Isnardia sphaerocarpa* as a synonym of *L. sphaerocarpa*. Information searches for this report were conducted using each name. As mentioned under Status in the United States, there has been some confusion about whether *L. sphaerocarpa* and *L. pilosa* are synonymous; WFO (2022b) recognizes *L. pilosa* as a separate, valid species and it is treated as such in this report.

Other common names applied to this species include globe-fruited seedbox (MSU Extension 2022), round-fruited seedbox (Massachusetts Division of Fisheries and Wildlife 2019), globe-fruit false loosestrife (NatureServe 2022), and round-pod water-primrose (Native Plant Trust 2022).

This species is legally protected under State threatened and endangered species laws in Connecticut, Indiana, Massachusetts, Michigan, New York, Pennsylvania, Rhode Island, and Tennessee (USDA, NRCS 2022).

From Peng (1988):

"[The group *Ludwigia glandulosa* subsp. *glandulosa*, *L. glandulosa* subsp. *brachycarpa*, *L. lanceolata*, *L. pilosa*, *L. polycarpa*, *L. ravenii*, *L. sphaerocarpa*, and *L. suffruticosa*] is a group of eight diverse and morphologically well-delimited taxa. Artificial hybridization between any two species nearly always resulted in vigorously growing individuals with nearly complete chromosome pairing, high levels of stainable pollen, and abundant seeds. Many vigorous F_2 plants were raised that exhibited various degrees of intermediacy between the parents."

"It is of interest to note that some of the hybrid populations [of *Ludwigia pilosa* × *L. sphaerocarpa*] occur in central and southern Florida where typical *L. pilosa* and *L. sphaerocarpa* are absent; this suggests that physiological characteristics, and thereby ecological tolerances, may recombine into novel adaptive combinations in the hybrids also."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to WFO (2022a), *Ludwigia sphaerocarpa* Elliott is the valid scientific name for this species.

From ITIS (2022):

Kingdom Plantae
Subkingdom Viridiplantae
Infrakingdom Streptophyta
Superdivision Embryophyta
Division Tracheophyta
Subdivision Spermatophytina
Class Magnoliopsida
Superorder Rosanae
Order Myrtales
Family Onagraceae
Genus *Ludwigia* L.
Species *Ludwigia sphaerocarpa* Elliott

Size, Weight, and Age Range

From New York Natural Heritage Program (2022):

"Globe-fruited Ludwigia is a perennial herbaceous plant that is usually between 60 and 110 cm. tall."

Environment
USDA, NRCS (2022) reports *L. sphaerocarpa* as an obligate wetland plant.

From Hoch (2022):

"Habitat: Drainage ditches, shores of slow-moving streams or ponds, marshes, swales, swamp forests, edges of limestone sinks, peaty bogs in pastures, interdunal marshes.
Elevation: 0–300 m."

From Aquasabi (2022):

"Temperature tolerance: 18 – 28°C [aquarium setting]"

From Duke (1955):

"Only three collections have been seen from North Carolina and all these were from an acid bog […] whether it is typical for this species is not certain."

Climate
From Liu et al. (2020):

"[…] north-temperate distribution […]"

Distribution Outside the United States
Native
Native range of *L. sphaerocarpa* is entirely within the United States. See Native Range in Section 1.

Introduced
No introductions known outside the United States.

Means of Introduction Outside the United States
No introductions known outside the United States.

Short Description
From MSU Extension (2022):

"Tall forb […]; stems branched, with a submerged spongy portion; leaves lanceolate, alternate and narrowly tapering, bearing single stalkless flowers in the axils; fruit spherical and finely hairy, subtended by tiny bracts (1 mm)."

From Anonymous (2021):

"Nearly all species of *Ludwigia* in section *Microcarpium* grow stolons that grow along the ground or below water and eventually transition into more adult plants. Stolon leaves in *L. sphaerocarpa* are quite different in appearance from mature plants. In this case, they are rounded and with distinct hydathodal teeth, which are the end points of a mechanism used to transport nutrients through the leaves. It is these leaves, rather than those of the mature plant, that are grown in submersed culture. In wild plants, the stolon leaves are somewhat widely spaced, but in submersed cultivated specimens, a very compact plant forms."

From Hoch (2022):

"**Herbs** often with prominent aerenchyma when base submerged, forming stolons 20–90 cm, 2–3.5 mm thick, floating, sometimes branched. **Stems** erect, slightly ridged, well branched, (40–)60–110 cm, densely strigillose or glabrous. **Leaves** alternate; stipules lanceolate-deltate, 0.1–0.4 × 0.1–0.2 mm; stolons: petiole ± winged, 0.1–0.3 cm, blade narrowly elliptic to oblanceolate or spatulate, 0.9–3 × 0.4–0.8(–1.3) cm, base attenuate, margins subentire with hydathodal glands, apex acute or obtuse; stems: petiole 0.1–0.4(–1) cm, blade narrowly elliptic or lanceolate to sublinear, on main stem (2.6–)6–10 × 0.5–1.1(–1.6) cm, on branches 2–5(–6) × 0.3–0.5(–0.6) cm, base attenuate or narrowly cuneate, margins entire with hydathodal glands mainly on primary cauline leaves, apex acute to very narrowly acute, surfaces glabrous or densely strigillose; bracts not much reduced. **Inflorescences** open, leafy racemes, more congested on branches, flowers solitary in leaf axils; bracteoles attached in subopposite pairs near base of ovary, usually linear to very narrowly lanceolate, rarely lanceolate, 0.5–1.5 × 0.1–0.3 mm, apex acuminate. **Flowers**: sepals ascending, yellow or cream adaxially, ovate-deltate, 2–3.5(–4) × 1.6–3(–3.3) mm, margins entire, apex acuminate, surfaces glabrous or densely strigillose; petals 0; filaments yellow, 1–1.7 mm, slightly dilated toward base, anthers 0.5–0.8 × 0.4–0.7 mm; pollen shed in tetrads; ovary broadly obovoid or cup-shaped, 1.5–3.5 × 2–3 mm; nectary disc elevated 0.4–0.6 mm on ovary apex, bright yellow, 1.5–3 mm diam., 4-lobed, glabrous or short-hirtellous between lobes; style yellow, 0.6–1(–1.3) mm, glabrous or strigillose proximally, stigma yellow, capitate to subglobose, 0.3–0.5 × 0.4–0.7 mm, not exserted beyond anthers. **Capsules** sometimes tinged pink, subglobose, subterete, 2–4(–4.5) × 2–4 mm, hard-walled, irregularly dehiscent, pedicel 0.5–1.2(–2.3) mm. **Seeds** brown to light brown, elliptic, 0.4–0.7 × 0.3–0.4 mm, surface cells transversely elongate to seed length, sometimes oblique."

Biology

From Hoch (2022):

"Phenology: Flowering Jun–Sep."

From Massachusetts Division of Fisheries & Wildlife (2019):

"Except for the semi-woody base, the plant dies back each winter."

"Its associates [in Massachusetts] include Plymouth Gentian (*Sabatia kennedyana*), Common Threesquare (*Schoenoplectus pungens*), Golden Pert (*Gratiola aurea*), Marsh Rush (*Juncus canadensis*), and Bayonet Rush (*Juncus militaris*)."

Poelen et al. (2014) report that the flowers of *L. sphaerocarpa* are visited by yellowjackets (genus *Vespula*), and that the plant is eaten by the beetle species *Tyloderma sphaerocarpae*.

From Peng (1984):

"By contrast, mechanical self-polination is rare in *L. pilosa* and *L. sphaerocarpa*, […]"

Human Uses

This species is present in the aquarium trade outside the United States, including from online sellers based in Australia (Aquatic Swan Design 2021), Germany (Aquasabi 2022), Malaysia (Shopee 2022), and the Philippines (Aquascape Philippines 2022).

From Aquasabi (2022):

"This is an uncommon Ludwigia [sic], not long known in the aquarium hobby."

From Anonymous (2021):

"*Ludwigia sphaerocarpa* was introduced to the aquarium hobby by aquarists from Houston, Texas in 2008 and was, until recently, thought to be the related *L. pilosa*. It has already proven to be quite popular."

Diseases

Poelen et al. (2014) report that *L. sphaerocarpa* is host to the fungal species *Melanops ludwigiae* and *Puccinia jussiaeae*.

Threat to Humans

No information available.

3 Impacts of Introductions

No records of introductions were found for *L. sphaerocarpa*; therefore there is no information on impacts of introduction.

4 History of Invasiveness

The history of invasiveness is classified as No Known Nonnative Population for *L. sphaerocarpa*. This species has not been reported as introduced anywhere outside its native range. *L. sphaerocarpa* is a recent addition to the aquarium trade. No quantitative data on trade volume was found, so the lack of reported introductions cannot be considered an indicator of low invasiveness.

5 Global Distribution

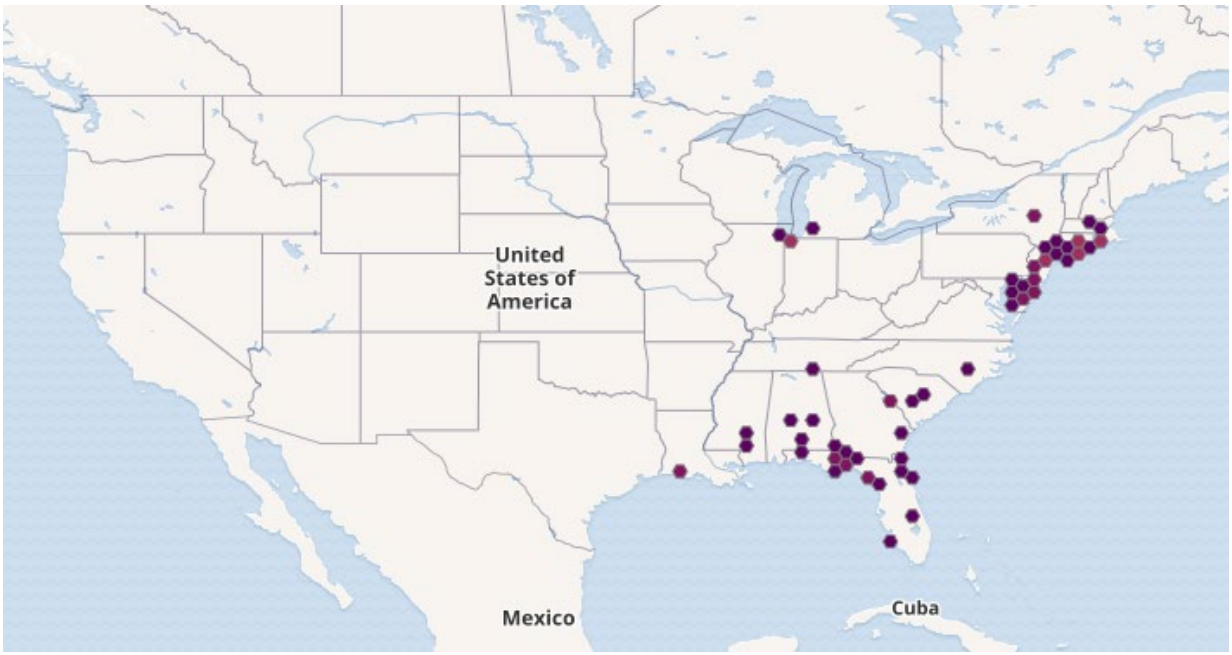

Figure 1. Known global distribution of *Ludwigia sphaerocarpa*. Observations are reported from the eastern United States. Map from GBIF Secretariat (2021). Two occurrences reported from central and southern Florida were excluded from the climate matching analysis because they most likely represent hybrid populations (see Remarks; Peng 1988).

6 Distribution Within the United States

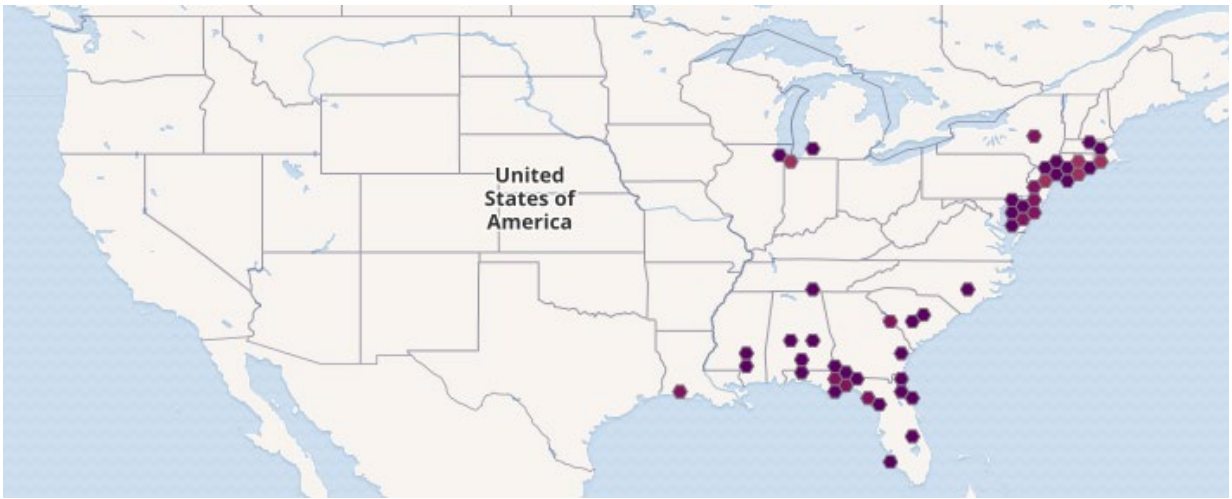

Figure 2. Known distribution of *Ludwigia sphaerocarpa* in the United States. Observations are reported from the eastern United States. Map from GBIF Secretariat (2021). Two occurrences reported from central and southern Florida were excluded from the climate matching analysis because they most likely represent hybrid populations (see Remarks; Peng 1988).

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *L. sphaerocarpa* was high in the eastern United States where the species is native. Areas of high match extended along the Atlantic coast and west to the Midwest region and eastern Texas, with slightly lower match in the southern Appalachian Mountains. The climate match was medium across the central United States into the Rocky Mountains, and low along the Pacific coast. Small areas of high climate match were found in the Rocky Mountains, particularly along the range's eastern margin in Montana, Colorado, and New Mexico. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.536, indicating a High overall climate match (scores of 0.103 and greater are classified as high). Only California had a low individual Climate 6 score. Eight States had medium individual Climate 6 scores: Arizona, Idaho, North Dakota, Nevada, Oregon, Utah, Washington, and Wyoming. All other States had high individual Climate 6 scores.

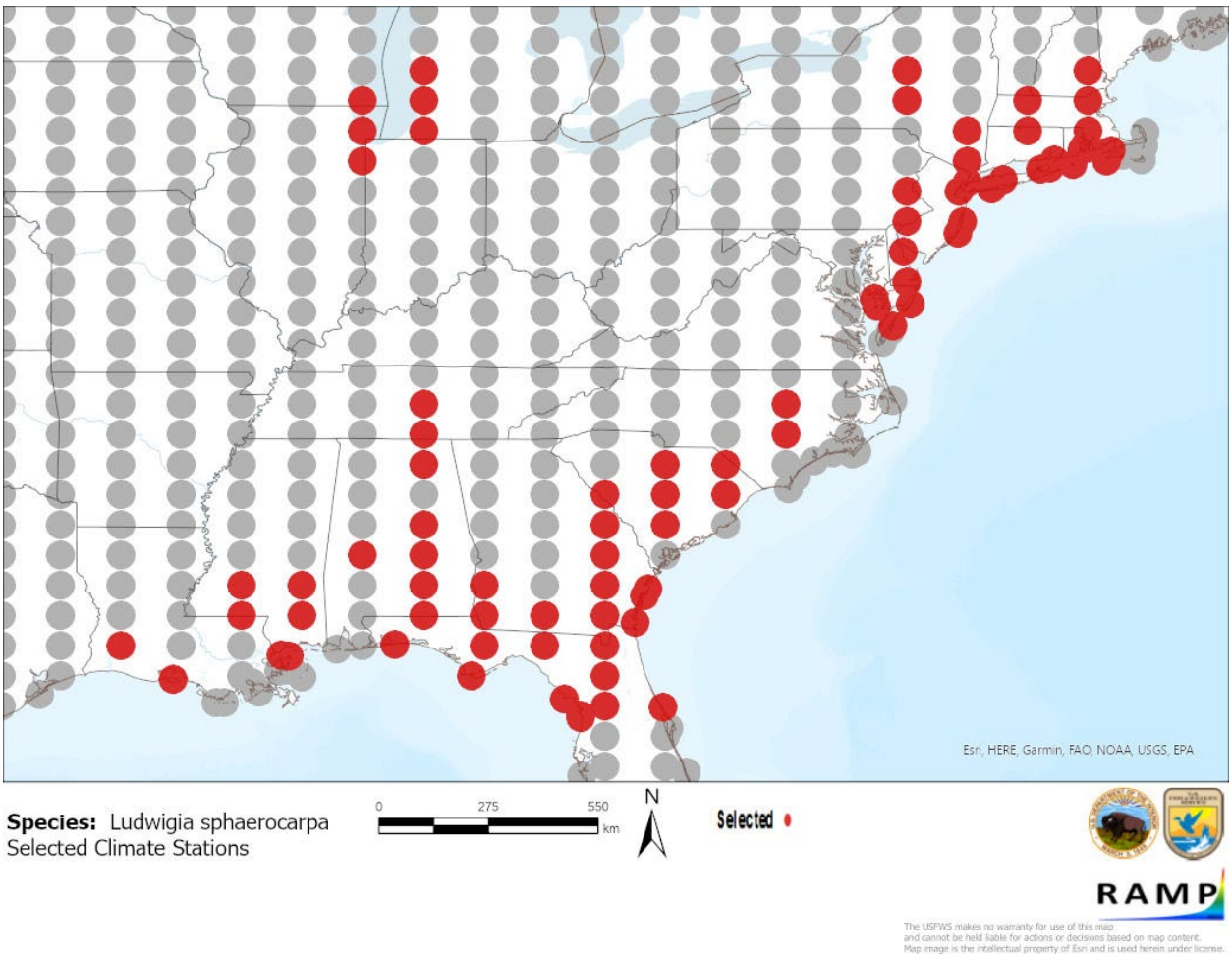

Figure 3. RAMP (Sanders et al. 2021) source map showing weather stations in the eastern United States selected as source locations (red) and non-source locations (gray) for *Ludwigia sphaerocarpa* climate matching. Source locations from GBIF Secretariat (2021). Selected source

locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

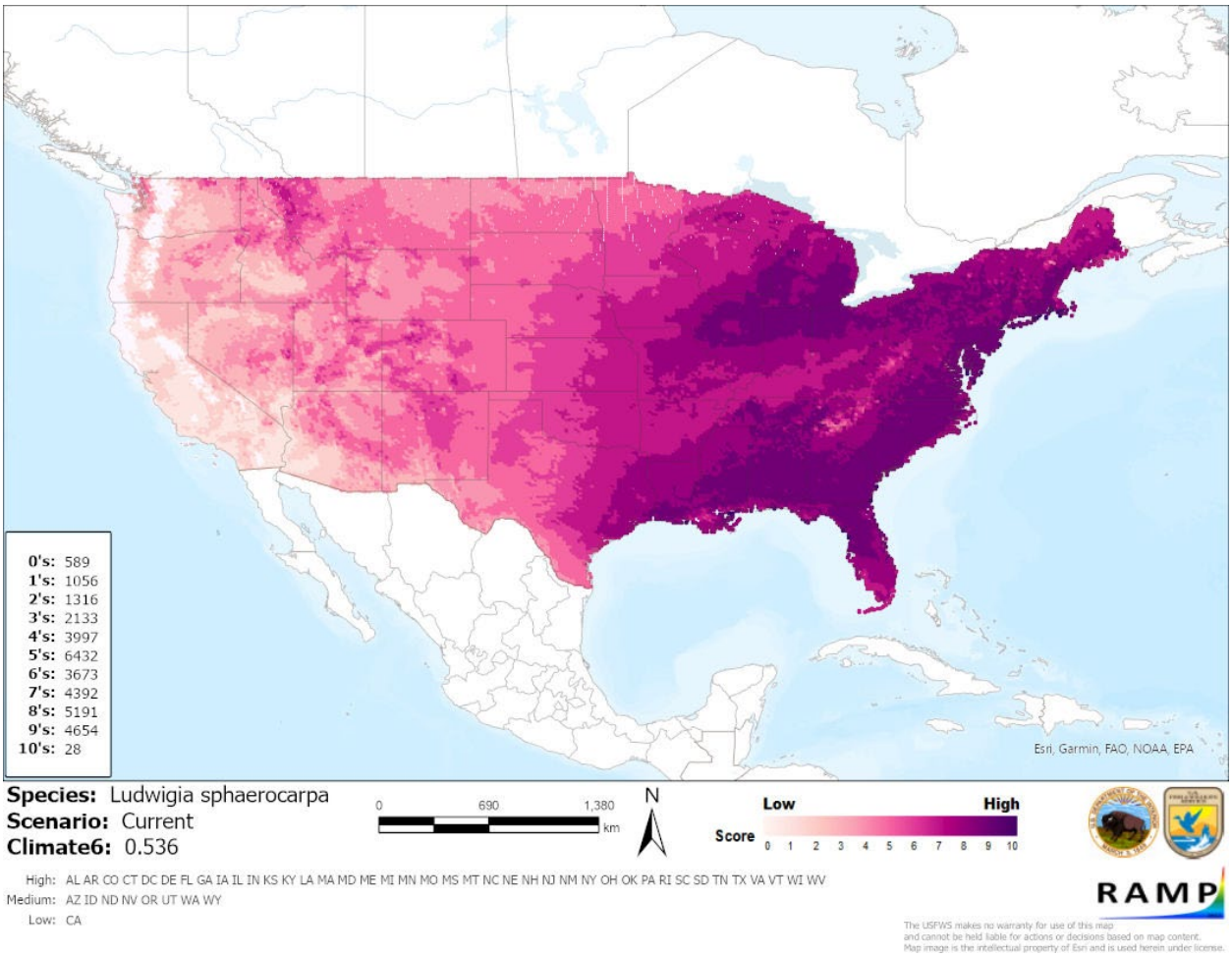

Figure 4. Map of RAMP (Sanders et al. 2021) climate matches for *Ludwigia sphaerocarpa* in the contiguous United States based on source locations reported by GBIF Secretariat (2021). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

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 this assessment is classified as Low. A modest amount of information is available on the distribution and biology of *L. sphaerocarpa*. However, the species has not been reported as introduced outside its native range, so there is no information available on impacts of introductions. Little of the information available on this species comes from peer-reviewed sources, especially information about its presence in trade. There has been confusion within the aquarium trade about the synonymy of *L. sphaerocarpa* with *L. pilosa*, casting doubt on the reliability of seller identification of the species when in trade.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Globefruit Primrose-willow, *Ludwigia sphaerocarpa*, is an obligate wetland plant native to Atlantic coastal plain, Gulf coastal plain, and Great Lakes region of the United States. The species has been extirpated from Pennsylvania and is designated as a threatened or endangered species in six other northern States plus Tennessee. According to an aquarium forum post, the species first appeared in the aquarium trade in 2008. It is now present in trade in several countries around the world, although no quantitative data are available on trade volume. *L. sphaerocarpa* has not been reported as introduced anywhere outside its native range, so the history of invasiveness is classified as No Known Nonnative Population. Climate match to the contiguous United States was High, especially in the eastern United States where the species is native. The certainty of this assessment is Low due to the absence of data on trade volume or impacts of introductions. The Overall Risk Assessment Category for *L. sphaerocarpa* for the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): No Known Nonnative Population**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information:** Within the aquarium trade, this species was initially synonymized with *Ludwigia pilosa*. The two species are now each recognized as separate and valid.
- **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.

Anonymous. 2021. *Ludwigia sphaerocarpa* [discussion post]. Aquatic Plant Forum. Available: https://www.aquaticplantcentral.com/threads/ludwigia-sphaerocarpa.146289/#post-1016974 (May 2022).

Aquasabi. 2022. *Ludwigia sphaerocarpa*. Aquasabi – Aquascaping Shop. Available: https://www.aquasabi.com/Ludwigia-sphaerocarpa (May 2022).

Aquascape Philippines. 2022. *Ludwigia sphaerocarpa* red for sale. Parañaque, Philippines: Aquascape Philippines. Available: https://aquascape.ph/product/ludwigia-sphaerocarpa-red/ (May 2022).

Aquatic Swan Design. 2021. *Ludwigia sphaerocarpa*—"super rare." Brisbane, Australia: Duckaroo. Available: https://duckaroo.com.au/products/ludwigia-sphaerocarpa-super-rare (May 2022).

Duke JA. 1955. Distribution and speciation of the genus *Ludwigia* in North Carolina. Journal of the Elisha Mitchell Scientific Society 71(2):255–269.

GBIF Secretariat. 2021. GBIF backbone taxonomy: *Ludwigia sphaerocarpa* Elliott. Copenhagen: Global Biodiversity Information Facility. Available: https://doi.org/10.15468/dl.35rpah (May 2022).

Hoch PC. 2022. *Ludwigia sphaerocarpa*. Flora of North America. Available: http://floranorthamerica.org/Ludwigia_sphaerocarpa (May 2022).

[ITIS] Integrated Taxonomic Information System. 2022. *Ludwigia sphaerocarpa* Elliott. Reston, Virginia: Integrated Taxonomic Information System. Available: https://itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=27337#null (May 2022).

Liu SH, Yang HA, Kono Y, Hoch PC, Barber JC, Peng CI, Chung KF. 2020. Disentangling reticulate evolution of north temperate haplostemonous *Ludwigia* (Onagraceae). Annals of the Missouri Botanical Garden 105(2):163–182.

Massachusetts Division of Fisheries & Wildlife. 2019. Round-fruited seedbox *Ludwigia sphaerocapra* Ell. fact sheet. Westborough: Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. Available: https://www.mass.gov/doc/round-fruited-seedbox/download (May 2022).

MSU Extension. 2022. *Ludwigia sphaerocarpa* (globe-fruited seedbox). Lansing: Michigan Natural Features Inventory. Available: https://mnfi.anr.msu.edu/species/description/14470/Ludwigia-sphaerocarpa (May 2022).

Native Plant Trust. 2022. *Ludwigia sphaerocarpa* – round-pod water-primrose. Go Botany. Framingham, Massachusetts: Native Plant Trust. Available: https://gobotany.nativeplanttrust.org/species/ludwigia/sphaerocarpa/ (May 2022).

NatureServe. 2022. *Ludwigia sphaerocarpa* globe-fruit false loosestrife. NatureServe Explorer: an online encyclopedia of life, version 7.1. Arlington, Virginia: NatureServe. Available: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.150428/Ludwigia_sphaerocarpa (May 2022).

New York Natural Heritage Program. 2022. Globe-fruited seed-box *Ludwigia sphaerocarpa* Ell. Albany: New York Natural Heritage Program. Available: https://guides.nynhp.org/globe-fruited-ludwigia/ (May 2022).

Peng C-I. 1984. *Ludwigia ravenii* (Onagraceae), a new species from the coastal plain of the southeastern United States. Systematic Botany 9(2):129–132.

Peng C-I. 1988. The biosystematics of *Ludwigia* sect. *Microcarpium* (Onagraceae). Annals of the Missouri Botanical Garden 75(3):970–1009.

Poelen JH, Simons JD, Mungall CJ. 2014. Global Biotic Interactions: an open infrastructure to share and analyze species-interaction datasets. Ecological Informatics 24:148–159.

POWO. 2021. *Ludwigia sphaerocarpa* Elliott. Plants of the World Online. Royal Botanic Gardens, Kew. Available: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:613441-1 (May 2022).

Sanders S, Castiglione C, Hoff M. 2021. Risk Assessment Mapping Program: RAMP. Version 4.0. U.S. Fish and Wildlife Service.

Shopee. 2022. *Ludwigia sphaerocarpa* 10btg (aquatic plants). Shopee Malaysia. Available: https://shopee.com.my/Ludwigia-sphaerocarpa-10btg-(Aquatic-plants)-i.24016498.6284103438 (May 2022).

[USDA, NRCS] U.S. Department of Agriculture, Natural Resources Conservation Service. 2022. *Ludwigia sphaerocarpa* (globefruit primrose-willow). The PLANTS database. Greensboro, North Carolina: National Plant Data Team. Available: https://plantsorig.sc.egov.usda.gov/core/profile?symbol=LUSP (May 2022).

[WFO] World Flora Online. 2022a. *Ludwigia sphaerocarpa* Elliott. World Flora Online – a project of the World Flora Online Consortium. Available: http://www.worldfloraonline.org/taxon/wfo-0001087435 (May 2022).

[WFO] World Flora Online. 2022b. *Ludwigia pilosa* Walter. World Flora Online – a project of the World Flora Online Consortium. Available: http://www.worldfloraonline.org/taxon/wfo-0001087432 (May 2022).

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.

Reznicek AA, Voss EG, Walters BS. 2011. *Ludwigia sphaerocarpa* Elliott. Michigan Flora Online. Ann Arbor: University of Michigan. Available: https://michiganflora.net/species.aspx?id=1757 (May 2022).