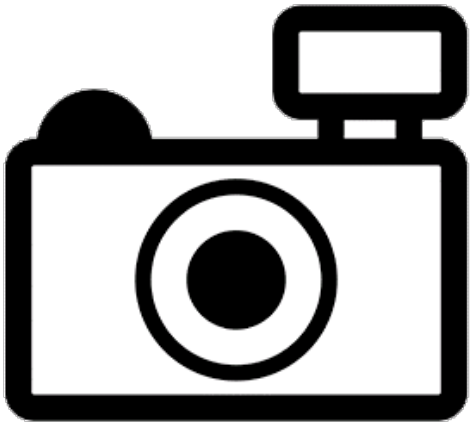
Southeastern Primrose-Willow (*Ludwigia linifolia*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, March 2022
Revised, June 2022
Web Version, 8/10/2022

Organism Type: Plant
Overall Risk Assessment Category: Uncertain



1 Native Range and Status in the United States

Native Range

From Peng (1989):

"*Ludwigia linifolia* ranges along the Atlantic coast from extreme southeastern North Carolina and eastern South Carolina through southern Georgia and peninsular Florida. To the west, its range extends through the Florida panhandle, to extreme southern Alabama and Mississippi. A disjunct population has been collected in northcentral North Carolina […]. It is also known from a disjunct population at Huimanguillo, Tabasco, Mexico, on the Yucata'n Peninsula."

From Munz (1994):

"Found in pine-barrens from North Carolina to Florida and Mississippi."

Status in the United States

From ITIS (2022):
"Jurisdiction/Origin: Continental US, Native"

From Lady Bird Johnson Wildflower Center (2020):

"USA: AL, FL, GA, MS, NC, and SC"

According to NatureServe (2022) *Ludwigia linifolia* is listed as Imperiled in North and South Carolina.

Means of Introductions in the United States

This species is native to the southeastern United States. No records of nonnative introductions of *Ludwigia linifolia* within the United States were found.

Remarks

Additional common names for this species are Flaxleaf Seedbox (Lady Bird Johnson Wildflower Center 2020) and Southeastern Seedbox (NatureServe 2022). A synonym for this species is *Isnardia linifolia* and its basionym is *Ludwigia linifolia* Poiret 1817 (Wunderlin et al 2022).

The name *Ludwigia linifolia* with authorship (Vahl) R.S.Rao is considered a synonym of *Ludwigia hyssopifolia* (G.Don) Exell (World Flora Online 2022a) and is not the same species considered in this screening, *Ludwigia linifolia* Poir (World Flora Online 2022b). World Flora Online (2022b) lists *Isnardia linifolia* (Poir.) Kuntze as a synonym. Every effort has been made to include only information pertaining to *Ludwigia linifolia* Poir in this screening.

From Peng (1989):

"Hybrids between the petaliferous diploids with narrow leaves (*Ludwigia linearis* and *L. linifolia*) are vigorous, have ca. 50% stainable pollen, and produce a moderate amount of viable seeds."

"*Ludwigia curtissii* hybridizes with *L. linifolia* (n = 8) […] to form sterile hybrids."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to World Flora Online (2022b), *Ludwigia linifolia* Poir. is the accepted 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 linifolia* Poir.

Size, Weight, and Age Range

From Lady Bird Johnson Wildflower Center (2020):

"Up to about 3 feet tall"

Environment

From Lady Bird Johnson Wildflower Center (2020):

"OBL [Obligate - Hydrophyte. Almost always occurs in wetlands]"

From Peng (1989):

"A few species grow in brackish marsh or tidal flats ([…] *L. linifolia* […]"

"Plants of *L. linifolia* are often found in drainage ditches, along margins of creeks or swamps, on bottom meadow, on open edges of cypress swamps, in moist pineland, and along edges of brackish lakes."

Climate

No information on climate was found for *Ludwigia linifolia.*

Distribution Outside the United States

Native

From Kew (2022):

"[…] Mexico Southeast, Mexico Southwest […]"

Introduced

L. linifolia is recorded as introduced in Congo and Myanmar (POWO 2022).

De Moura-Júnior et al. (2013) list *Ludwigia linifolia* as present in northeastern Brazil. No comment is made by the authors as to the native or introduced status. Lee et al. (2021) report the use of *Ludwigia linifolia* in traditional medicine in Indonesia. The authors collected specimens of the plant from wild populations. No comment is made regarding the native or introduced status

of the species in Indonesia. These populations are significantly disjunct from the described native range of the species and therefore were included in the introduced section of this screening.

Means of Introduction Outside the United States

Means of introduction outside the United States are unknown for *Ludwigia linifolia.*

Short Description

From Peng (1989):

"Among the diploid species, *L. linifolia* and *L. linearis* have very narrow leaves, petaliferous flowers, and elongate capsules."

"In *L. linifolia* and *L. stricta*, the disc lobes are minutely papillose throughout, as are their fruit and seed surfaces."

"Capsule shape ranges from obpyramidal to subcylindric, oblong-obovate, turbinate, or subglobose, and size ranges from 1 mm long in *Ludwigia microcarpa* to 12 mm long *in L. linearis* and *L. linifolia*."

"Plants glabrous. Stems erect or ascending, usually well branched, 12-55(-62) cm tall, aerenchyma rarely seen. Stolons slender, 4-15(-30) cm long, 0.7-1(-1.5) mm thick, seen in flowering season, the leaves narrowly obovate to narrowly oblanceolate, sometimes spatulate, 4.5-20 mm long, 1.3-6 mm wide, petioles 0.5-5 mm long. Cauline leaves linear or linear-oblanceolate, 15-40 mm long, (0.65-)0.9-4(-6) mm wide, the apex tapering into a sharp point or acute, margin entire with obscure hydathodal glands, the base very narrowly cuneate, sessile. Stipules narrowly ovate to narrowly lanceolate, 0.2-0.3 mm long, 0.1-0.2 mm wide. Flowers many, in leaf axils, their subtending leaves not reduced. Sepals green, narrowly triangular, ascending, (3.3-)4-7 mm long, 1.1-1.7 mm wide, glabrous or minutely papillose, the apex narrowly acute, the margin entire. Petals yellow, narrowly obovate-elliptic, 4-6 mm long, 2-4 mm wide, the apex obtuse or rounded, the base obtuse. Anthers 0.65-1.1 mm long; filaments yellowish, (1.3-)1.5-2.5(-3) mm long. Pollen shed as tetrads. Nectary disc bright yellow, elevated 0.3-0.7 mm on top of the ovary, 0.8-1.5 mm across, prominently 4-lobed, minutely papillose. Style yellow, 1.25-2.5 mm long, glabrous; stigma yellowish, 0.3-0.6 mm long, 0.6-0.8 mm thick, the apex shallowly 4-lobed. Capsules subcylindrical, slightly narrowed toward base, 5-10(-12) cm long, 1.3- 2(-2.2) mm thick, densely minutely papillose, occasionally also remotely minutely scaberulous, the hairs 0.05-0.15 mm long, sessile. Bracteoles attached 0-1.5 mm above capsule base, very narrowly oblanceolate to linear, (1.5-)2.5-9(-13) mm long, 0.15-0.8 mm wide, the margin entire, ascending or spreading. Seeds reddish, oblong-elliptic with curved ends, 0.55-0.6 mm long, 0.2-0.3 mm thick, the surface cells nearly isodiametric."

"Unbranched flowering stems are seen also in some populations of *L. curtissii*, *L. linifolia*, […]"

"*Ludwigia linifolia* is a relatively uniform species. Its variability chiefly affects the size of the capsules and the lengths of the bracteoles, which are attached to the sides of the capsue."

Biology

From Lady Bird Johnson Wildflower Center (2020):

"Duration: Perennial […] Habit: Herb"

"Bloom Time: May, Jun, Jul, Aug, Sep"

"Native Habitat: Wetlands, roadside ditches"

From Peng (1989):

"Flowering from late June through October; fruiting from July through November."

"Herbarium specimens often reveal empty anthers held away from the stigma (mechanical self-pollination has not occurred yet). This observation suggests that *L. linifolia* is probably modally outcrossing, which is corroborated by limited field observations."

Human Uses

According to Lee et al. (2021), *Ludwigia linifolia* is used in traditional medicine in Indonesia.

Diseases

No information on diseases was found for *Ludwigia linifolia*.

Threat to Humans

No information on threats to humans was found for *Ludwigia linifolia.*

3 Impacts of Introductions

Records of introduction were found for *Ludwigia linifolia* but no information on impacts of introduction were found.

4 History of Invasiveness

Ludwigia linifolia is recorded as introduced in Congo and Myanmar and is known from and probably introduced to Brazil and Indonesia. The populations in Brazil and Indonesia are established. Impacts of introduction are unknown. This species is not in trade. The history of invasiveness is classified as Data Deficient.

5 Global Distribution

Figure 1. Known global distribution of *Ludwigia linifolia*. Observations are reported from the Benin, Brazil, Brunei Darussalam, Burkina Faso, Indonesia, Malaysia, Mexico, Nigeria, and the southeast United States, Map from GBIF Secretariat (2022). Observations in Malaysia, Burkina Faso, Nigeria, Benin, and Brunei Darussalam do not represent established populations and were not used in the climate match.

An additional location in Indonesia is given in Lee et al. (2021).

This species is reported as introduced to the Congo and Myanmar (POWO 2022), but no georeferenced observations were found.

6 Distribution Within the United States

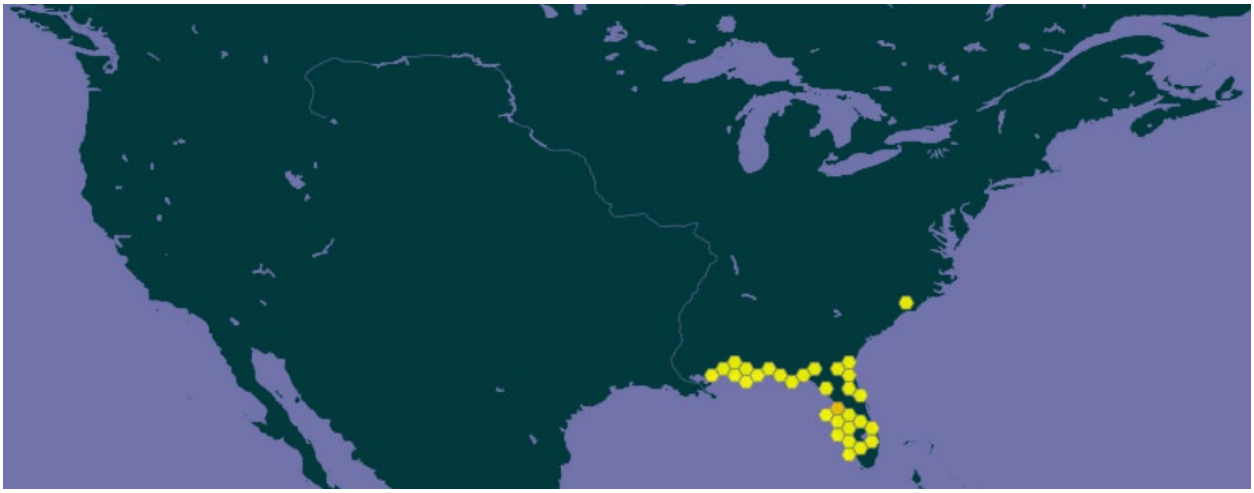


Figure 2. Known distribution of *Ludwigia linifolia* in the United States. Map from GBIF Secretariat (2022).

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Ludwigia linifolia* to the contiguous United States was high along the southeastern coastal areas. High match could be found from eastern Texas to southern Virginia, which encompasses the species' native range and extends slightly outward. There was a stretch of medium match from the southwestern Appalachian Mountains through southern Missouri, and eastern Oklahoma and northeastern Texas. Small patches of medium match were found in southern coastal California and southern Arizona. Everywhere else had a low match. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.242, high. (Scores greater than or equal to 0.103 are classified as high.) States with a high individual Climate 6 score are Alabama, Arkansas, Delaware, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Missouri, Mississippi, North Carolina, New Jersey, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia. Connecticut, Kansas, and New York had a medium individual score. All other States had low individual scores.

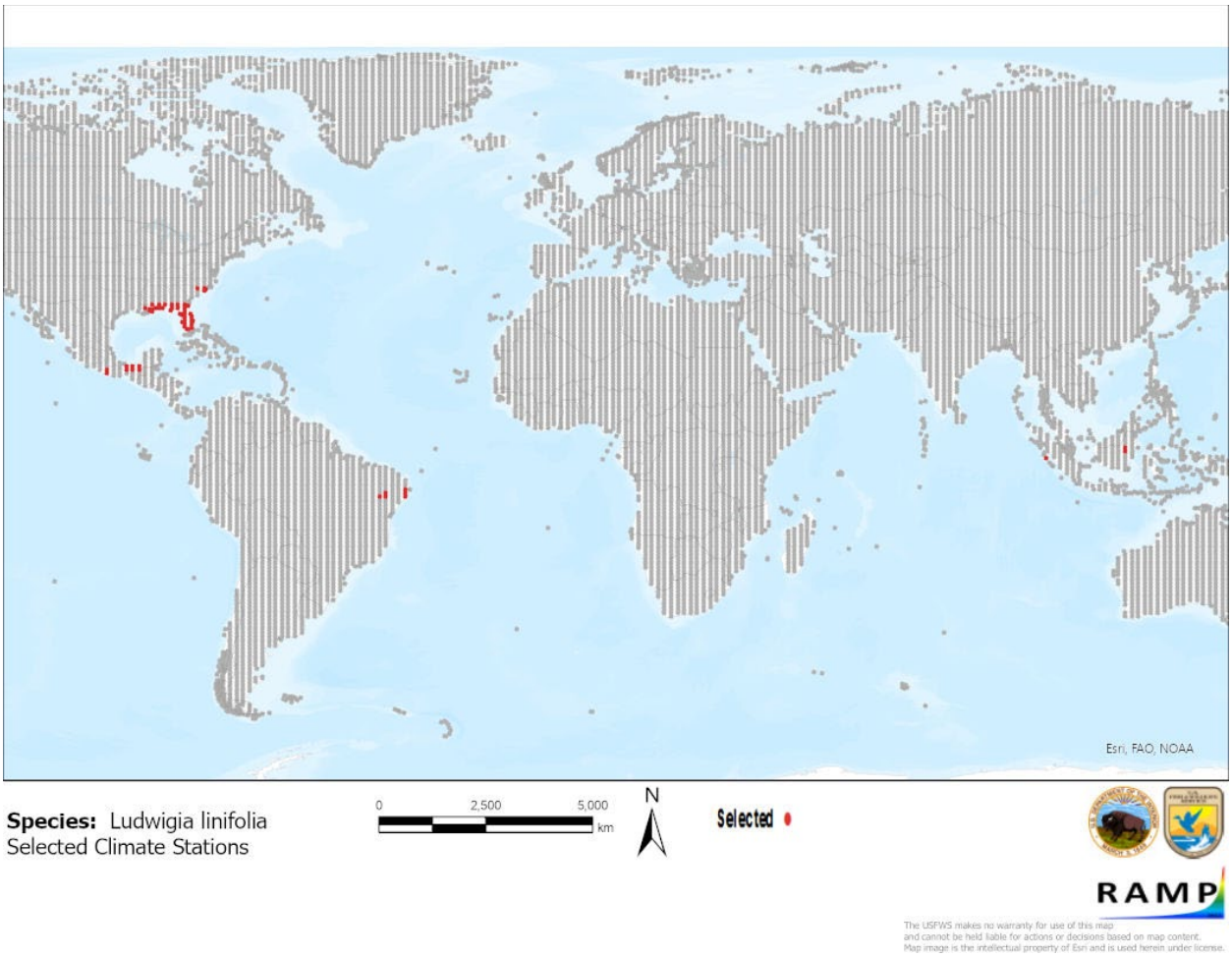


Figure 3. RAMP (Sanders et al. 2021) source map showing weather stations in North and South America, and southeast Asia selected as source locations (red; southeast United States, Mexico, Brazil, and Indonesia) and non-source locations (gray) for *Ludwigia linifolia* climate matching. Source locations from Lee et al. (2021) and GBIF Secretariat (2022). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

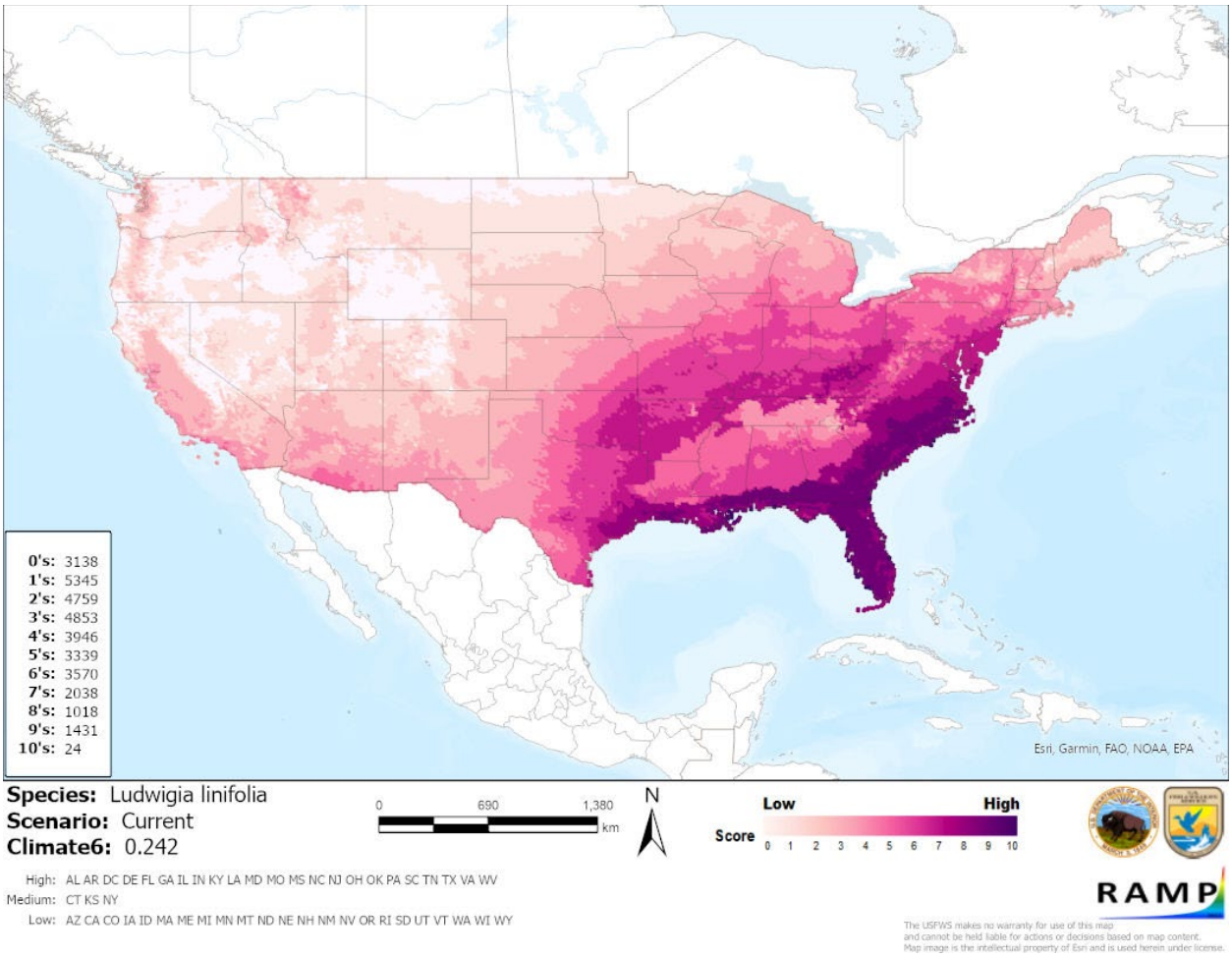


Figure 4. Map of RAMP (Sanders et al. 2021) climate matches for *Ludwigia linifolia* in the contiguous United States based on source locations reported by Lee et al. (2021) and GBIF Secretariat (2022). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = 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 assessment is low. Information regarding the species biology and ecology was found. Records of introductions were found but no information on impacts of introductions was available. The native range of the species is well represented in the climate match but there were no georeferenced observations found for the two introduction records. The issue of the name of

this species, *Ludwigia linifolia* Poir and *Ludwigia linifolia* (Vahl) R.S.Rao, a synonym of *Ludwigia hyssopifolia* (G.Don) Exell, being used simultaneously in the literature and instances of the use of just *Ludwigia linifolia* with no authorship decreases the certainty in the interpretation of the results of this screening.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Ludwigia linifolia is a species of wetland plant native to the southeast United States and southern Mexico. Introductions outside of its native range have been reported in the Congo and Myanmar but establishment is unknown. It is also reported as present in Brazil and Indonesia but there is some uncertainty in the native or introduced status. It is not present in trade. The history of invasiveness is classified as Data Deficient. Overall climate match with the contiguous United States is high. The largest area of high match was centered on and included the species' native range in the southeast, however, it did expand in almost every direction outside the native range. The certainty of this assessment is low due to a lack of information regarding this species' history of invasiveness and issues regarding nomenclature. The overall risk assessment category for *Ludwigia linifolia* is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): Data Deficient**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information: No additional information**
- **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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Wunderlin RP, Hansen BF, Franck AR, Essig FB. 2022. Atlas of Florida plants. *Ludwigia linifolia*. Tampa: University of South Florida, Institute for Systematic Botany. Available: https://florida.plantatlas.usf.edu/plant.aspx?id=521 (March 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.

No references in this section.