

Climbing Seedbox (*Ludwigia prostrata*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, March 2022

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Web Version, 7/22/2022

Organism Type: Plant

Overall Risk Assessment Category: High



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<https://commons.wikimedia.org/w/index.php?curid=7883093> (June 2022).

1 Native Range and Status in the United States

Native Range

From POWO (2022):

“[...] its native range is S. Russian Far East to Tropical & Subtropical Asia.”

“Native to:

Andaman Is. [India], Assam [India], Bangladesh, Borneo [includes Brunei and parts of Indonesia and Malaysia on the island of Borneo, also known as Kalimantan], Cambodia, China South-

Central, China Southeast, East Himalaya [includes Bhutan and parts of northeastern India], Hainan [China], India, Jawa [Indonesia], Laos, Lesser Sunda Is. [Indonesia], Malaya [peninsular Malaysia], Myanmar, Nepal, Nicobar Is. [India], Philippines, Primorye [Russia], Sri Lanka, Thailand, Vietnam, West Himalaya [includes parts of northern India and northeastern Pakistan]”

From WSSA and APHIS (no date):

“*Ludwigia prostrata* is native in Asia (Bangladesh, Bhutan, Burma, Cambodia, China, India, Indonesia, Japan, Korea, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Taiwan, and Vietnam) (Hoch and Boufford, 1991; Holm et al., 1979; Moody, 1989; Reed 1977).”

eFloras (2022) reports the native range in China as including Guangxi, Hainan, and Yunnan provinces.

Status in the United States

No records were found of *Ludwigia prostrata* introduction to the wild or trade in the United States. There are no known trade regulations for this species in the United States.

Means of Introductions in the United States

From WSSA and APHIS (no date):

“Because *Ludwigia prostrata* is a weed of rice, there is a risk of accidental introduction with crop seed or agricultural produce.”

Remarks

From Wagner et al. (2007):

“Although found in the same region and often confused with it, *L. prostrata* [sic] differs from *L. epilobioides* (sect. *Nipponia*) by its free (vs. embedded) seeds and pollen in tetrads (vs. monads).”

From Brenan (1953):

“This plant [*Jussiaea abyssinica*] has been regularly confused with the Asiatic *Ludwigia prostrata* [sic] Roxb., which is indeed uncommonly similar in general facies, but has the young parts of the plant puberulous, the seeds free and not encased in pieces of endocarp, and 4-angled fruits only about 1 mm. thick.”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to WFO (2022), the accepted scientific name for this species is *Ludwigia prostrata* Roxb.

From GBIF Secretariat (2021):

Kingdom: Plantae
Phylum: Tracheophyta
Class: Magnoliopsida
Order: Myrtales
Family: Onagraceae
Genus: *Ludwigia* L.
Species: *Ludwigia prostrata* Roxb.

From WFO (2022):

“Synonyms

Isnardia prostrata (Roxb.) Kuntze
Jussiaea prostrata (Roxb.) H.Lév.
Ludwigia diffusa Hem.
Ludwigia fruticulosa Blume
Nematopyxis fruticulosa Miq.
Nematopyxis prostrata Miq.
Nematopyxis pusilla Miq.”

The above synonyms were used, along with the name *Ludwigia prostrata*, in searching for information for this report.

Size, Weight, and Age Range

From eFloras (2022):

“[...] annual or short-lived perennial. [...] 10-60 cm tall [...]”

Environment

From Barua (2010):

“It prefers to grow in shaded and marshy places.”

From eFloras (2022):

“Wet sites such as rice paddies, flood plains, streamsides; near sea level to 800 m.”

From WSSA and APHIS (no date):

“[...] semi-aquatic [...]”

Climate

From Randall (2017):

“Preferred Climate/s: Subtropical, Tropical”

Distribution Outside the United States

Native

From POWO (2022):

“[...] its native range is S. Russian Far East to Tropical & Subtropical Asia.”

“Native to:

Andaman Is. [India], Assam [India], Bangladesh, Borneo [includes Brunei and parts of Indonesia and Malaysia on the island of Borneo, also known as Kalimantan], Cambodia, China South-Central, China Southeast, East Himalaya [includes Bhutan and parts of northeastern India], Hainan [China], India, Jawa [Indonesia], Laos, Lesser Sunda Is. [Indonesia], Malaya [peninsular Malaysia], Myanmar, Nepal, Nicobar Is. [India], Philippines, Primorye [Russia], Sri Lanka, Thailand, Vietnam, West Himalaya [includes parts of northern India and northeastern Pakistan]”

From WSSA and APHIS (no date):

“*Ludwigia prostrata* is native in Asia (Bangladesh, Bhutan, Burma, Cambodia, China, India, Indonesia, Japan, Korea, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Taiwan, and Vietnam) (Hoch and Boufford, 1991; Holm et al., 1979; Moody, 1989; Reed 1977).”

eFloras (2022) reports the native range in China as including Guangxi, Hainan, and Yunnan provinces.

Introduced

Kull et al. (2012) report *L. prostrata* as naturalized in Madagascar.

From Chong et al. (2009):

“*Ludwigia prostrata* Roxb.; Onagraceae; weed of uncertain origin [in Singapore]”

The remaining quotations in this section describe populations of *L. prostrata* in provinces of China outside the native range:

From Zhuang et al. (2019):

“[...] *Leptochloa chinensis*, *Ludwigia prostrata*, and *Echinochloa crusgalli* were the most harmful and widespread [rice field] weeds through the province [Zhejiang Province, China].”

From Xiang (2002):

“Twelve species of pathogenic fungi were isolated from weeds in Guangdong, China [including] from *Ludwigia prostrata* [...]”

Zhang et al. (2019) collected *L. prostrata* from a riparian zone on the Le'an River, which runs primarily through Jiangxi Province, China. The authors described *L. prostrata* as “the dominant species” at this location.

Wang et al. (2011) report *L. prostrata* as introduced and naturalized in Beijing Municipality, China.

Deng et al. (2021) report *L. prostrata* as established in a rice field in Jiangsu Province, China.

Chang et al. (2009) report an *L. prostrata* population in Hubei Province, China, where it is a rice field weed.

Means of Introduction Outside the United States

From Wang et al. (2011):

“A[ccidental or unintentional] (by introduction of crop seeds) (Liu et al. 2002)”

From Randall (2017):

“Major Pathway/s: Contaminant, Crop, Herbal, Ornamental
Dispersed by: Humans, Water”

Short Description

From eFloras (2022):

“Herbs erect [...] Stems often red tinged, [...] often branched, subglabrous. Petiole 4-25 mm; leaf blade elliptic to narrowly elliptic, 1-13 × 0.3-2.7 cm, glabrous or with few hairs on veins, lateral veins 8-12 per side, submarginal vein inconspicuous, base narrowly cuneate, apex acute. Sepals 4, deltate, 1.3-2.5 mm, glabrous. Petals yellow, narrowly spatulate, 1.3-2.2 mm. Stamens as many as sepals; filaments 0.4-0.6 mm; anthers 0.3-0.4 mm; pollen in tetrads. Style 0.8-1 mm; stigma globose. Capsule pale brown, subcylindric, slightly 4-angled, 1.2-2.2 cm, glabrous, thinly walled, readily and irregularly dehiscent, seeds clearly visible in outline through walls, sessile or pedicel to 1.5 mm. Seeds in one row per locule, free, pale brown with darker specks or transverse fine stripes, 0.5-0.6 mm, raphe narrow, inconspicuous.”

Biology

From Barua (2010):

“Flowering & Fruiting: August – February.”

From WSSA and APHIS (no date):

“*Ludwigia prostrata* is a sub-tropical semi-aquatic plant of river banks, wet places and rice fields. It flowers between August and October in Japan. Seeds do not show dormancy (Ku et al., 1996).”

According to CABI (2022), *L. prostrata* is a host plant for the tobacco whitefly (*Bemisia tabaci*).

From Xiao-Shui (1990):

“[The beetle species] *Altica cyanea* (Weber) damages *Ludwigia prostrata* Roxb in China. [...] it was demonstrated that *A. cyanea* occurs on and attacks the main host *L. prostrata* and another weed, *Rotala indica* Koehne. Its ability to damage *L. prostrata* was studied in field cages in Nanchang. *A. cyanea* [sic] was shown to damage these caged plants heavily [...]”

From Zhang et al. (2019):

“This study explored the waterlogging mechanism and survival strategy of riparian plants under water flooding stress in the typical riparian zone of the Le'an River [China]. [...] *L. prostrata* is a herbaceous species with strong flood resistance, which is achieved by increasing the activity of protective enzymes and the amount of osmotic regulation substances. However, more intense flooding and longer flooding times may still cause significant damage.”

Human Uses

Zhang et al. (2014) report that *L. prostrata* has traditional uses in China as medicine and fodder.

From Wang et al. (2020):

“In our study, we examined dominant weeds in the Dabaoshan mine located in Guangdong province, China to test their abilities as heavy metal accumulators and excluders. Results suggest that *Ludwigia prostrata* exhibited the highest potential for accumulating Cu [copper], Pb [lead] and Zn [zinc] compared with the other plants. [...] Our results suggest that *Ludwigia prostrata* hyperaccumulates Zn and may also serve as a potential candidate remediation plant for Cu and Pb due to its high absolute accumulation amount of Cu and Pb [...]”

Diseases

Guatimosim et al. (2016) report *L. prostrata* as a host of the fungus *Pseudocercospora jussiaeae* in South Korea.

From WSSA and APHIS (no date):

“In south China it is host to the fungus *Pseudocercospora oenotherae* (Xiang, 2002).”

Threat to Humans

From WSSA and APHIS (no date):

“*Ludwigia prostrata* is listed by Holm et al. (1979) as a “serious” weed in Japan, and a “principal” weed of Taiwan. It is also among the most damaging weeds of rice in southern China (Wang, 2000) and in both direct-sown and transplanted rice in Korea (Kim et al., 1997; Kim and Pyon, 1998; Kim [et al.] 1999). *Ludwigia prostrata* poses a significant threat to rice crops and wetlands in sub-tropical regions of the United States.”

Randall (2017) reports *L. prostrata* as both an agricultural and environmental weed within its native range.

3 Impacts of Introductions

Although there is documentation of *Ludwigia prostrata* introductions and establishment outside the native range, there was limited information available on impacts of those introductions.

From Zhuang et al. (2019):

“In order to clarify current infestation status of major weeds in rice fields of Zhejiang Province [China], the weed species and community characteristics were investigated with the seven scales with visualization of weed dominance to rice. [...] The results showed that the weeds belonged to 22 families and 62 species (including varieties). Among them, *Leptochloa chinensis*, *Ludwigia prostrata*, and *Echinochloa crusgalli* were the most harmful and widespread weeds through the province.”

From Deng et al. (2021):

“*Ludwigia prostrata* is a problematic weed in rice fields in China, where acetolactate synthase (ALS)-inhibiting herbicides (e.g., bensulfuron-methyl) are widely used for the management of broadleaf weeds. [...] Recently, farmers have found that bensulfuron-methyl at the recommended dose cannot effectively control *L. prostrata* in a rice field near Yangzhou City in Jiangsu Province, which seriously compromised rice production.”

4 History of Invasiveness

The history of invasiveness for *Ludwigia prostrata* is classified as High. This species has been introduced outside its native range in China and Madagascar, and its native status in Singapore is uncertain. In all these locations, the species has established new populations successfully. However, there is limited information available on impacts of introductions in these locations. The clearest evidence of the harmful impact of *L. prostrata* comes from Deng et al. (2021), where herbicide resistance in *L. prostrata* “seriously compromised rice production.” Harm to rice agriculture was also reported from Zhejiang Province (Zhuang et al. 2019).

5 Global Distribution



Figure 1. Known global distribution of *Ludwigia prostrata*. Observations are reported from South and Southeast Asia. Map from GBIF Secretariat (2021).

There were no georeferenced occurrences available for parts of the native range in Bangladesh, Bhutan, Cambodia, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, or Vietnam.

A reported occurrence in Mexico was excluded from the above map and from the climate matching analysis because of issues with the record. A reported occurrence in the Netherlands was excluded from the above map and from the climate matching analysis because it represented a preserved specimen in a bonsai center. Reported occurrences in several provinces of China outside the native range (Fujian, Hunan, Sichuan, Shaanxi, Anhui, Liaoning, and Jilin Provinces; included in figure 1) were excluded from the climate matching analysis because no information was available to confirm establishment of the species (GBIF Secretariat 2021).

6 Distribution Within the United States

Ludwigia prostrata has not been reported in the wild within the United States.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Ludwigia inclinata* to the contiguous United States was highest in two distinct regions: the southeastern Atlantic coast from Virginia to Florida, and the northern Great Plains in eastern North Dakota and northwestern Minnesota. The climate match was also high in the central Appalachian Mountains, the central Great Plains (Oklahoma, Nebraska, Missouri), along the Atlantic coast from Maryland to New York, and in scattered patches mostly along the eastern edge of the Southern Rocky Mountains. The climate match was medium across much of the rest of the contiguous United States east of the Rockies. The climate match was low in northern New England and from the Rockies to the Pacific coast. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.423, high. (Scores greater than or equal to 0.103 are classified as high.) A majority of States had high individual Climate 6 scores. Arizona, Connecticut, Michigan, New York, Utah, and Wyoming had medium individual Climate 6 scores, while California, Idaho, Massachusetts, Maine, New Hampshire, Nevada, Oregon, Rhode Island, Vermont, and Washington had low individual Climate 6 scores.

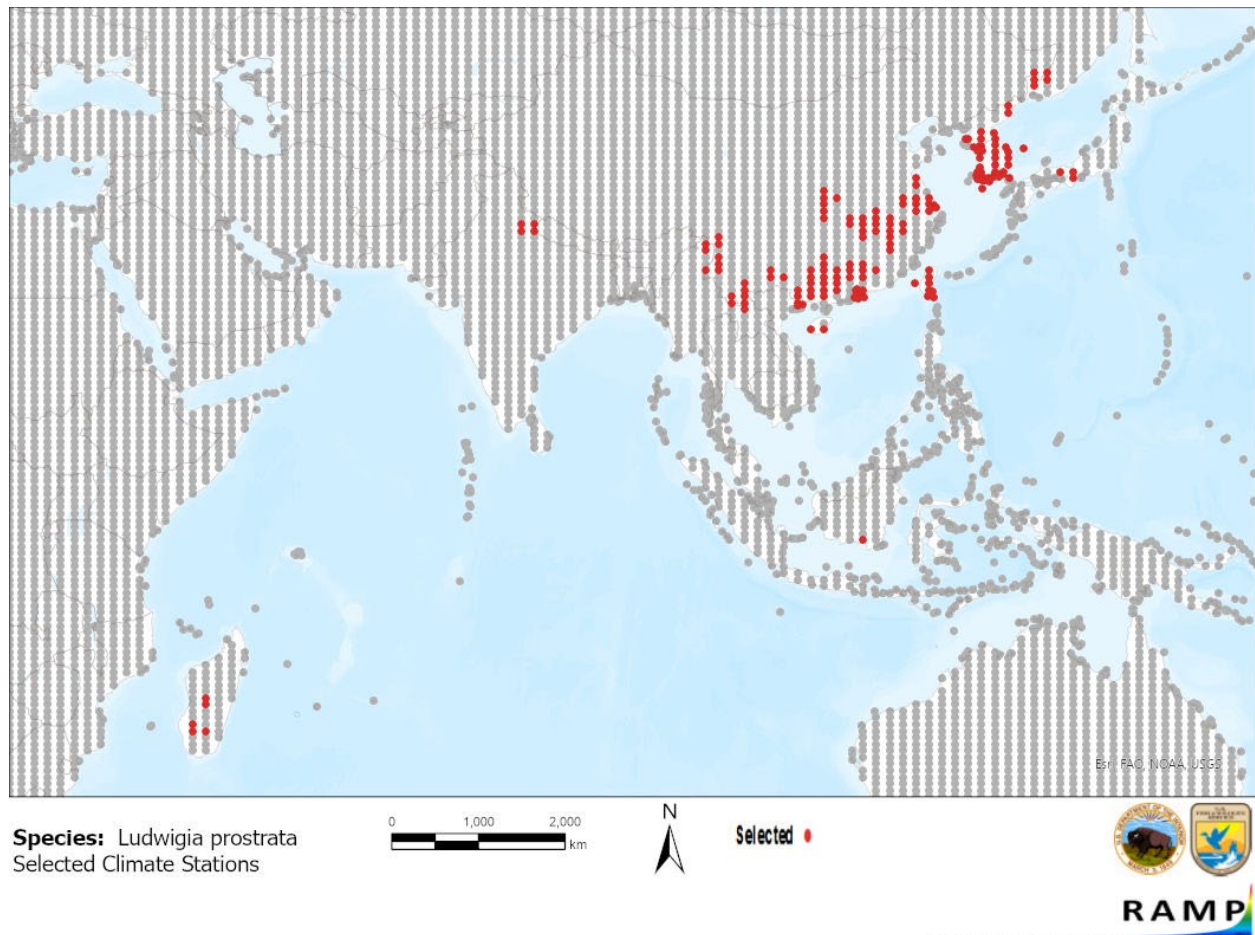


Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in Asia and Africa selected as source locations (red; China, India, Indonesia, Japan, Laos, Madagascar, Myanmar, North Korea, Russia, South Korea, Taiwan, Vietnam) and non-source locations (gray) for *Ludwigia prostrata* climate 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.

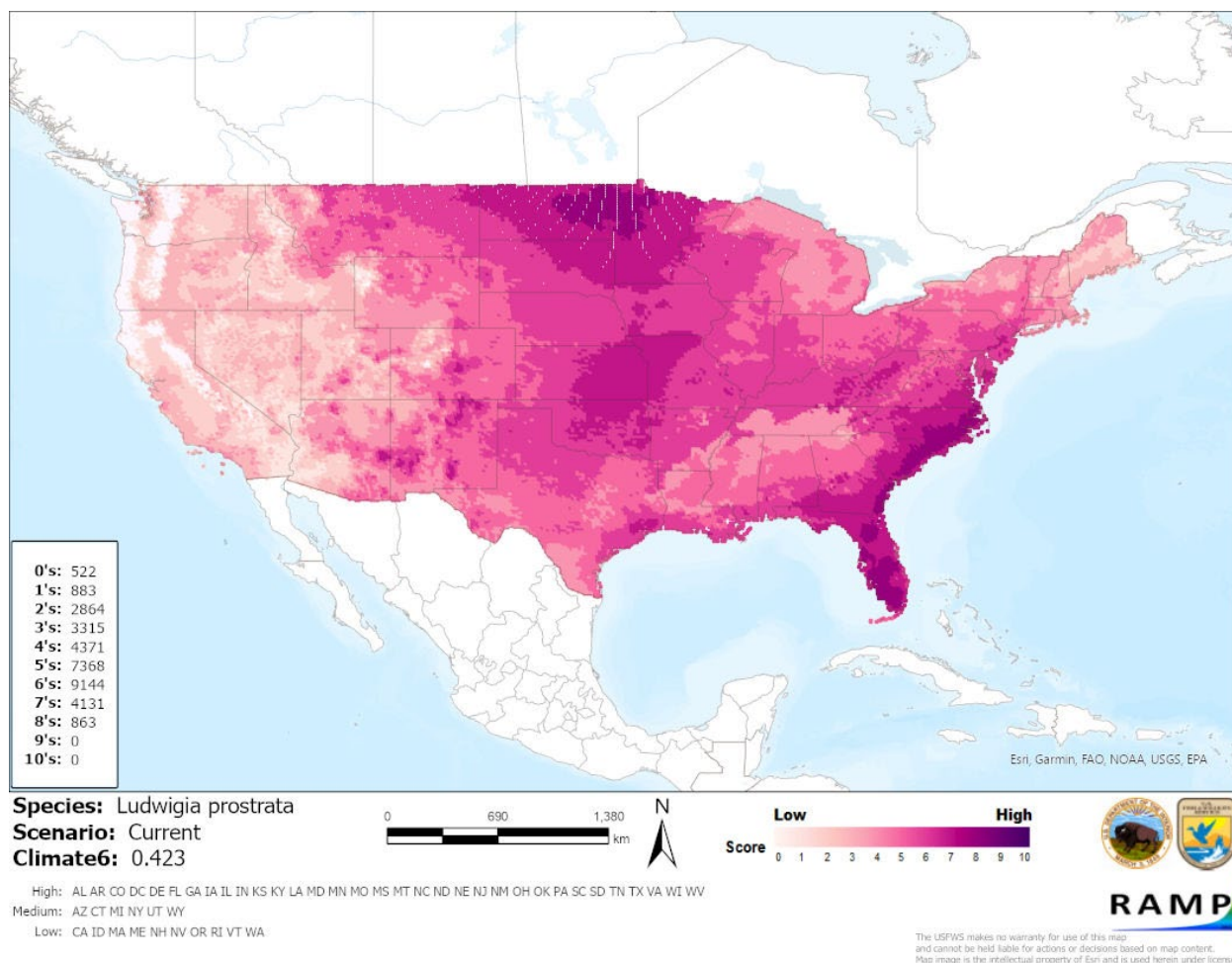


Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Ludwigia prostrata* in the contiguous United States based on source locations reported by GBIF Secretariat (2021). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

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
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

8 Certainty of Assessment

Information is available on the biology, ecology, and distribution of *Ludwigia prostrata*, and introductions and harm to agriculture outside its native range have been documented. However, limited information about the harm caused by *L. prostrata* is available in the English-language scientific literature; much of the literature on the numerous introduced *L. prostrata* populations in China is available only in Chinese. Furthermore, georeferenced occurrence data were not available for substantial portions of the species native range in South Asia and Southeast Asia, so these portions of the range could not be represented among the source locations used in climate matching. The certainty of this assessment is low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Ludwigia prostrata is a semi-aquatic annual plant native to southern and eastern Asia. It is not present in trade in the United States, but it is used in China as medicine, fodder for animals, and is a candidate for bioremediation uses. This species has been introduced outside its native range in China and Madagascar, and its native status in Singapore is uncertain. Established nonnative populations in China are reported to seriously diminish rice production, so the history of invasiveness is classified as High. Overall climate match with the contiguous United States is high, with the highest matches occurring along the southeastern Atlantic coast from Virginia to Florida, and in the northern Great Plains of eastern North Dakota and northwestern Minnesota. The certainty of this assessment is low due to limited information on impacts of introduction in the English-language literature and a lack of georeferenced occurrence data for portions of the species range. The overall risk assessment category for *Ludwigia prostrata* is High.

Assessment Elements

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

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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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.

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