# Peruvian Primrose (*Ludwigia peruviana*)

## Ecological Risk Screening Summary

**U.S. Fish & Wildlife Service, July 2015**
**Revised, March 2018**
**Web version, 8/17/2018**

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# 1 Native Range and Status in the United States

## Native Range

GISD (2018) lists *Ludwigia peruviana* as native in Argentina, Belize, Bolivia, Brazil, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela.

## Status in the United States

GISD (2018) lists *Ludwigia peruviana* as alien, invasive, and established in Puerto Rico, Alabama, Florida, Georgia, North Carolina, Texas, and Washington.

From GISD (2018):

"In Washington *L. peruviana* has established in the drainage canals in the Longview/Kelso area. A new site was also recently discovered in King County (Washington State Department of Ecology, 2001)."

"*L. peruviana* is being sold as an ornamental species because of its showy yellow flowers. Lake residents are strongly discouraged from planting water primrose in lakes, private ponds, in a flood zone, or in natural waterbodies. As of January 2001, these plants will no longer be offered for sale in Washington (Washington State Department of Ecology, 2001)."

Clewell (1999) states that *Ludwigia peruviana* is an indigenous species in Florida.

## Means of Introductions in the United States

No information on means of introduction for *Ludwigia peruviana* in the United States was found.

## Remarks

There is some discrepancy as to the native or non-native status of *Ludwigia peruviana* in Florida (Clewell 1999; GISD 2018).

# 2 Biology and Ecology

## Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

"Taxonomic Status:
Current Standing: accepted"

"Kingdom Plantae
Subkingdom Viridiplantae
Infrakingdom Streptophyta
Superdivision Embryophyta
Division Tracheophyta
Subdivision Spermatophytina
Class Magnoliopsida
Superorder Rosanae
Order Myrtales
Family Onagraceae
Genus *Ludwigia*
Species *Ludwigia peruviana* (L.) H. Hara"

## Size, Weight, and Age Range

From GISD (2018):

"*Ludwigia peruviana* as is a perennial, sometimes deciduous, wetland shrub that can grow to 3 and 4 meters."

## Environment

No information on specific environmental requirements of *Ludwigia peruviana* was found.

## Climate/Range

From Chandrasena (2005):

"In Australia, infestations south of Sydney, in Sutherlandshire, latitude ≈30° South, are the southern-most limit of its current spread. The pantropical occurrence, across several continents, and tolerance of conditions from sea level to > 1450 m altitude […]"

## Distribution Outside the United States

### Native

GISD (2018) lists *Ludwigia peruviana* as native in Argentina, Belize, Bolivia, Brazil, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela.

### Introduced

From Chandrasena (2005):

"According to Raven (1963), introduced in the Old World, the species became naturalised in Asia, South India, Sri Lanka (Ceylon), Singapore, Northern Sumatra and Java."

GISD (2018) lists *Ludwigia peruviana* as alien, invasive, and established in Australia, Dominican Republic, Tahiti, India (including Andaman and Nicobar Islands), Indonesia, New Zealand (Canterbury Region), and Sri Lanka, and as alien and established in French Polynesia.

## Means of Introduction Outside the United States

From Chandrasena (2005):

"The history of its introduction in Sydney, first as a Botanical specimen, […]"

"It is possible that *L. peruviana* infestations in Botany Wetlands, which existed for nearly 20 years, may have been the source of infestation of the weed for further spread in the Sydney basin. By late-1980s, infestations were found in Heathcote, about 40 km south of Sydney, and in Gosford, about 80 km north of Sydney (Jacobs et al 1993)."

## Short Description

From GISD (2018):

"*Ludwigia peruviana* as is a perennial, sometimes deciduous, wetland shrub that can grow to 3 and 4 meters. It reproduces by seed and there are many small sand-like seeds in 4 to 5 rows within a capsule and can produce soil seed banks of 1 million seeds /m2. *L. peruviana's* stems are brownish green, heavily branched, and hairy when young. The leaves are alternate, rarely opposite, ovate, 5 to 10cm long, 1 to 3cm wide, and hairy. The solitary flowers are bright yellow and quite showy and bisexual, 2 to 4cm in diameter, but the 4 (-5) petals last for only a day. There are 4 pale green sepals that are typically 8 to 12mm long, and petals 1 to 3cm long and wide. *L. peruviana's* fruit is an erect capsule. The seed is light brown, subglobular, and 0.6 to 0.8mm long. The root system consists of a woody taproot with laterals close to the surface (PIER 2005; Sydney Olympic Park Authority 2004) and sometimes with white spongy vertical pneumatophores, especially in water."

## Biology

From Chandrasena (2005):

"Mature *L. peruviana* stands in Botany Wetlands produced ≈ 450,000 seeds $m^{-2}$ (Jacobs et al 1994). In addition, there were ≈ 65,000 seeds $m^{-2}$ in the soil seed bank and ≈ 300,000 seeds $m^{-2}$ in old fruits, which remained on stems over winter.

Young plants flowered within two years. Within a year, there are two periods of flowering (spring and late summer) in Sydney. Seed viability was extremely high, in the range of 80-99% in the first year, declining significantly within 2 years (Jacobs et al 1993). The small seeds germinate readily in mud throughout spring and summer.

There was some evidence of dormancy, possibly due to the hard-seed component of the seed bank, but this appears to break down after about one year (Jacobs et al 1993).

The seeds of *L. peruviana* are hydrophobic, which make them germinate while afloat or underwater (Jacobs et al 1993). But the seedlings eventually float to the surface for establishment along shorelines, and also allow *L. peruviana* to form floating islands."

## Human Uses

From Dike et al. (2012):

"The investigations revealed that a total of 22 species namely […], *Ludwigia peruviana* (L.) Hara., […], are used in the treatment of malaria in the south-western regions of Nigeria"

## Diseases

No information on parasites or pathogens of *Ludwigia peruviana* was found.

### Threat to Humans

No information on threats to humans from *Ludwigia peruviana* was found.

# 3 Impacts of Introductions

From Barua et al. (2017):

"In the study area, where the wetlands (peatlands and stream beds) and ecotones (marshlands) were infested by primrose-willow [*Ludwigia peruviana*], there was major reduction in the size of indigenous plant community. It was more severe in the marshlands, where the weed attained a near climax state (Figure 8 [in source material]). Such a situation triggered not only the elimination of several resident plant species and increased vulnerability of several other habitat-sensitive plants, but also pose a threat to several animals (Table 5 [in source material]) and other organisms of the ecosystem. The extensive occurrence of primrose-willow has severely disturbed the normal food web of the threatened biota."

From Chandrasena (2005):

"The main potential deleterious effect of both species [*Ludwigia peruviana* and *L. longifolia*] is their ability to supplant native species in wetlands and in riparian zones of waterways, which could result in permanent changes to flora, fauna and ecological diversity in such ecosystems. Dense stands of *L. peruviana* intercepted 93% of incident light (Jacobs *et al.* 1993), which led to dramatic losses of smaller native freshwater wetland plants and a reduction in bird populations.

In the interconnected Botany Ponds, dense *L. peruviana* stands choked water flow between ponds and increased sedimentation.

Reduced water flow increased the risk of flooding of adjacent properties. The addition of vast amounts of organic material, over decades, led to deoxygenation of ponds and wide ranging ecological damage. Recurrent toxic blue-green algal blooms were common in the ponds, which indicated, nutrient enrichment and a breakdown of natural food webs. These adverse changes threatened cultural, social, aesthetic and economic values of the Botany Wetlands (Chandrasena and Sim 1998). Negative social impacts included reduced opportunity for recreational use by the public."

From Chandrasena et al. (2002):

"The potential of *Ludwigia peruviana*, a non-native plant, to become a significant aquatic weed in Australia has been apparent since 1971, when established populations were discovered in the Botany Wetlands in Sydney. In the 1990s, dense *L. peruviana* infestations extended deeply into the ponds covering an estimated 40% of the wetland area, aggressively choking out most other native species (GHD, 1993, Jacobs *et al.* 1995). Declared under the *Noxious Weeds Act* (1993) as a W2 category noxious weed, *L. peruviana* requires to be "….fully and continuously suppressed and destroyed….." by the landowner."

From GISD (2018):

"*L. peruviana* 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."

# 4 Global Distribution

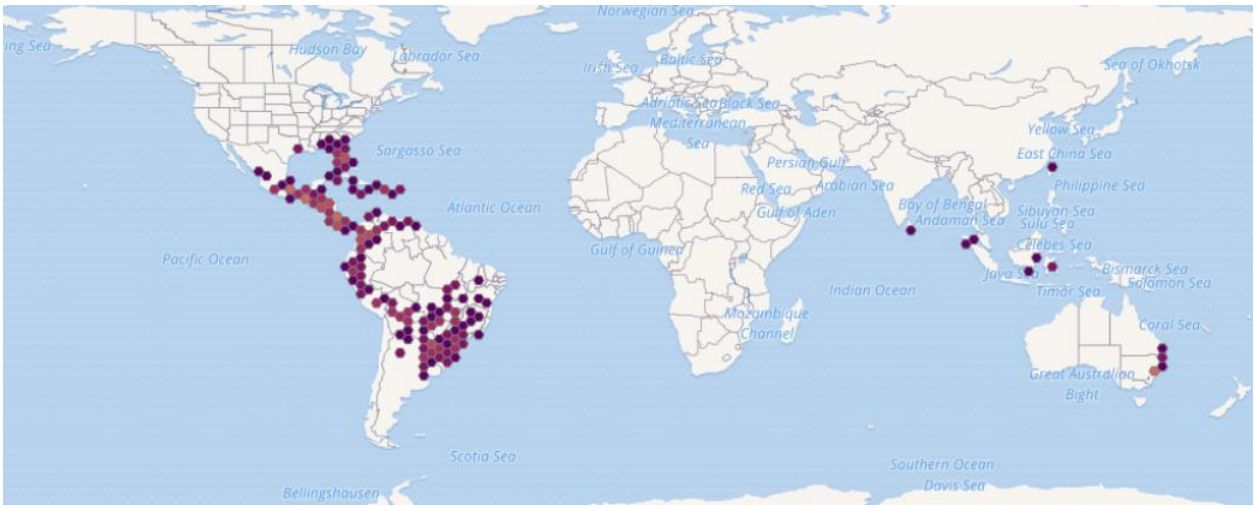


**Figure 1**. Known global distribution of *Ludwigia peruviana*. Locations are in North and South America, southern Asia, and Australia. Map from GBIF Secretariat (2018).


**Figure 2**. Known distribution of *Ludwigia peruviana* in India. Map adapted from India Biodiversity Portal (No date).

Additional known locations were reported in Chowdhury et al. (2013).

# 5 Distribution Within the United States

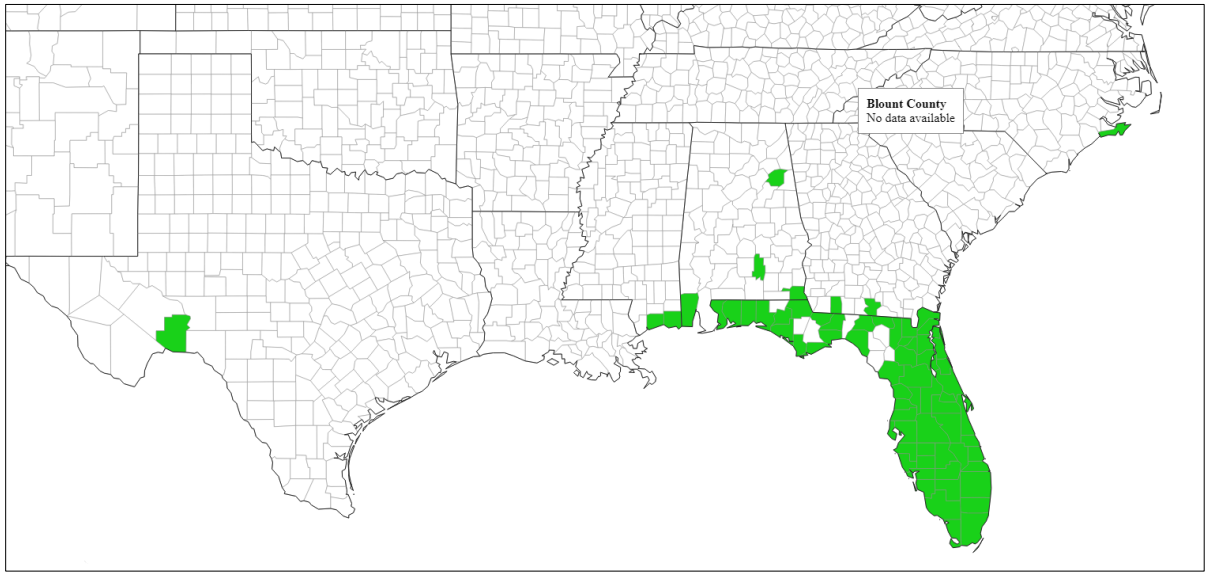


**Figure 3**. Distribution of *Ludwigia peruviana* by county in the United States. Map from EDDMapS (2018).

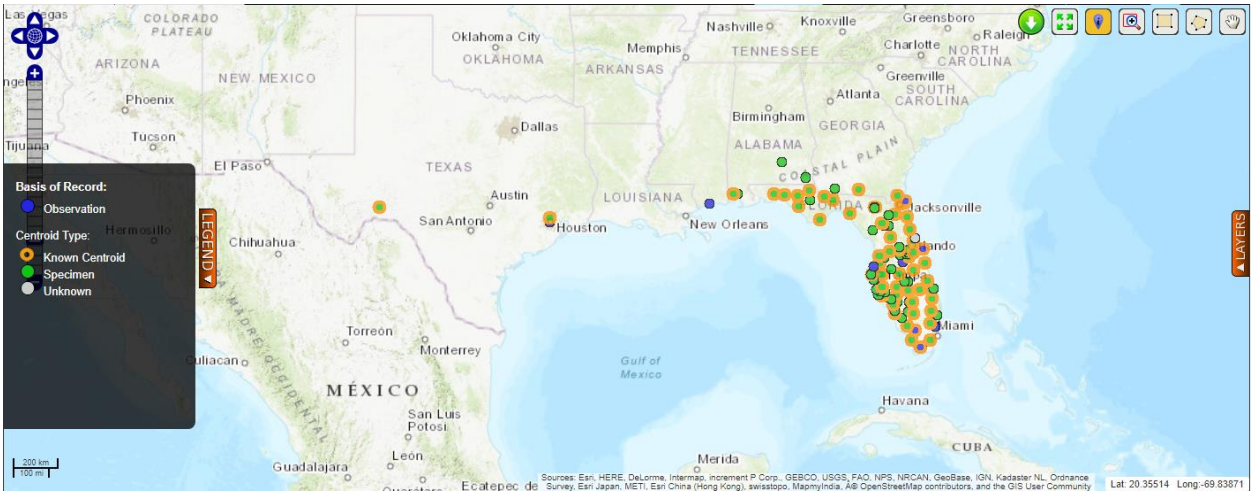


**Figure 4**. Known distribution of *Ludwigia peruviana* in the contiguous United States. Map from BISON (2018).

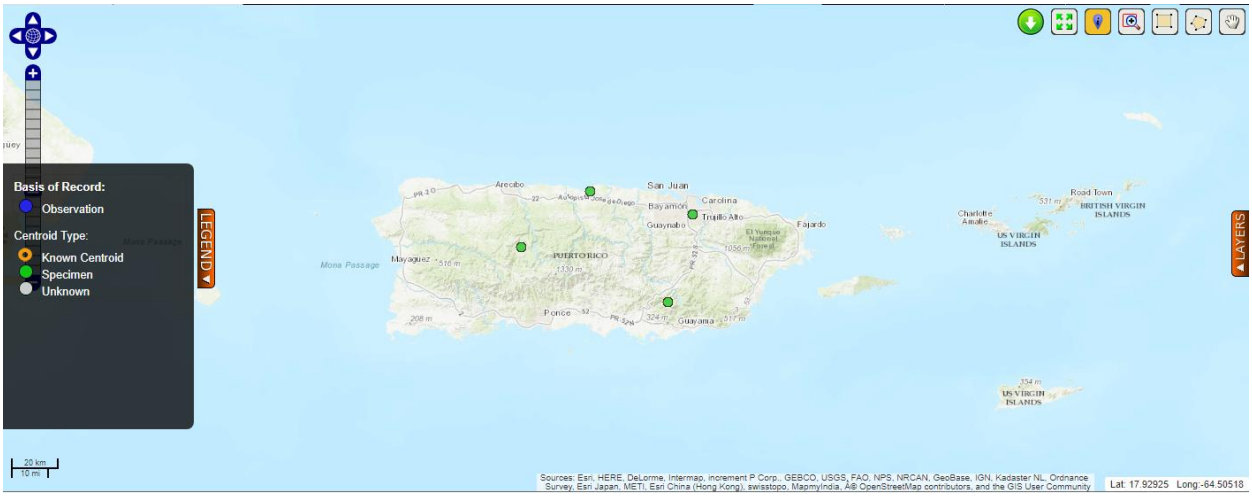


**Figure 5**. Known distribution of *Ludwigia peruviana* in Puerto Rico. Map from BISON (2018).

# 6 Climate Matching

## Summary of Climate Matching Analysis

The climate match for *Ludwigia peruviana* was high in the southeast, western Texas, and parts of the southwest. Most of the west, Great Lakes region, and New England had low matches; everywhere else has a medium match. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous United States was 0.288, high. The following states had individually high climate scores: Alabama, Arizona, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

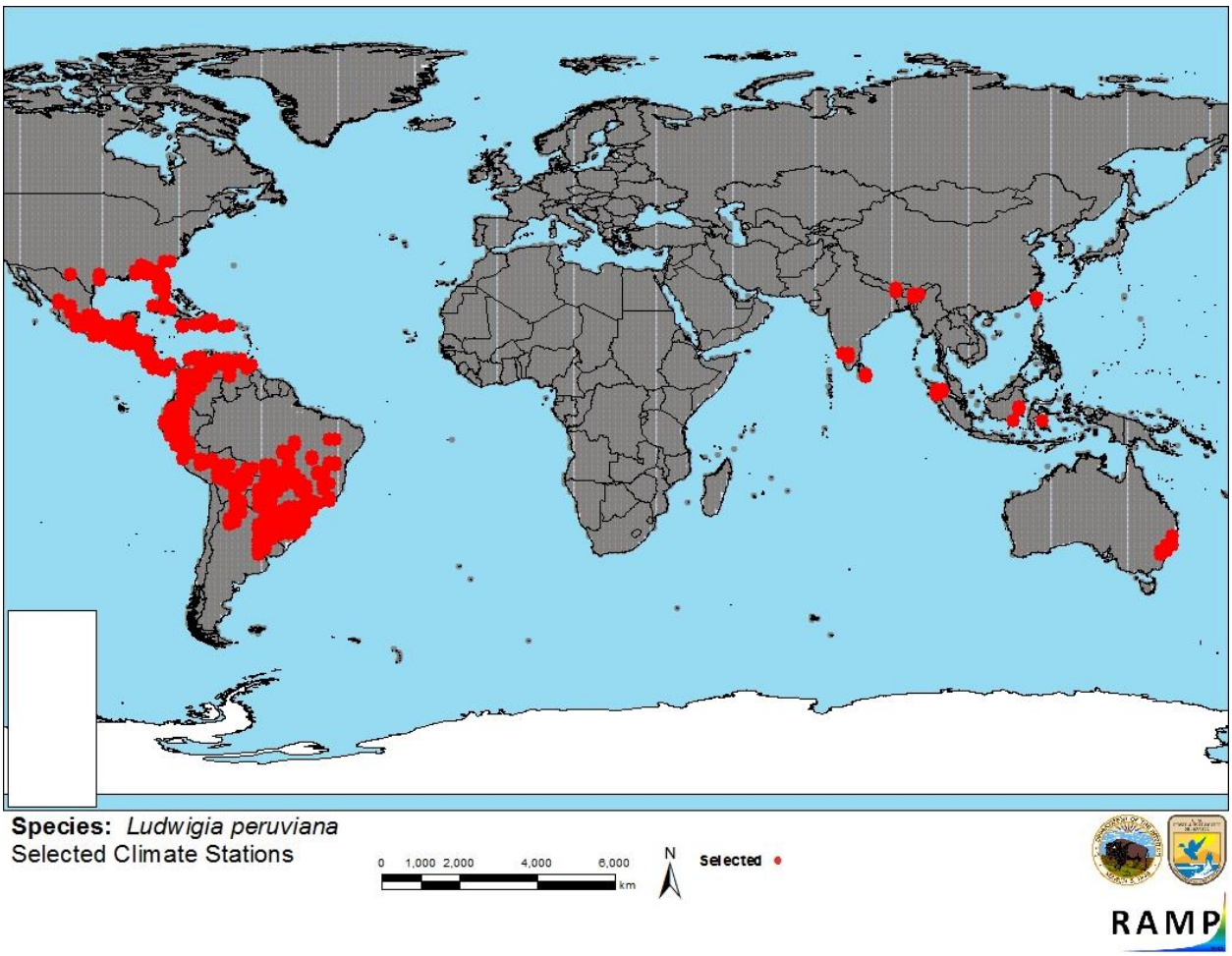


**Figure 6**. RAMP (Sanders et al. 2014) source map showing weather stations in North and South America, southern Asia, and Australia selected as source locations (red) and non-source locations (gray) for *Ludwigia peruviana* climate matching. Source locations from Chowdhury et al. (2013), BISON (2018), EDDMapS (2018), GBIF Secretariat (2018), and India Biodiversity Portal (No date).

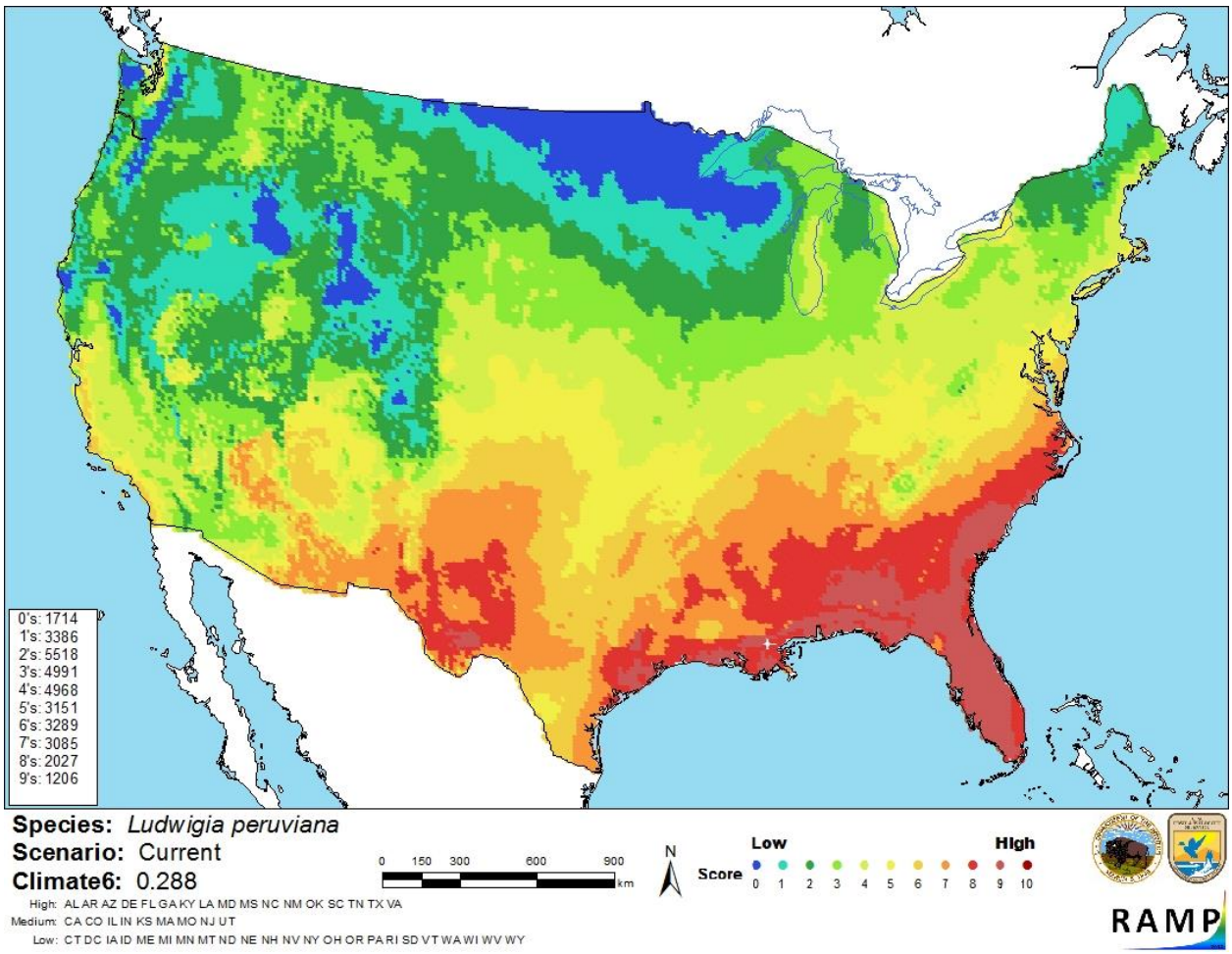


**Figure 7**. Map of RAMP (Sanders et al. 2014) climate matches for *Ludwigia peruviana* in the contiguous United States based on source locations reported by Chowdhury et al. (2013), BISON (2018), EDDMapS (2018), GBIF Secretariat (2018), and India Biodiversity Portal (No date). 0 = Lowest match, 10 = Highest match. Counts of climate match scores are tabulated on the left.

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 available, with some peer-reviewed literature that specifically concern impacts. There is enough information available to describe the risks posed by this species.

# 8 Risk Assessment

## Summary of Risk to the Contiguous United States

*Ludwigia peruviana* is an obligate wetland plant native to South America. The history of invasiveness of *L. peruviana* is high. *L. peruviana* has spread into parts of Oceania, Asia, and North America. The species was introduced as an ornamental. This aquatic plant has been highly successful supplanting native vegetation in ecosystems in India. The Australian and New Zealand governments have listed *L. peruviana* as a noxious weed, and has spent substantial resources in efforts to control this invasive plant. Climate matching indicated the contiguous United States has a high climate match with already established *L. peruviana* populations in the southeast. Certainty of this assessment is medium. 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:** Listed as a noxious weed in Australia and New Zealand.
- **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.**


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Barua, I. C., J. Deka, M. Devi, R. L. Deka, and J. Moran. 2017. Weeds as emerging threat to biodiversity: a consequence of spread of *Ludwigia peruviana* in Dhansiri and Kopili catchement areas of Assam, North East India. Current Science 112(9):1904–1914.

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EDDMapS. 2018. Early Detection & Distribution Mapping System. University of Georgia, Center for Invasive Species and Ecosystem Health, Tifton, Georgia. Available: http://www.eddmaps.org/. (August 2018).

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

# 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.**

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GHD. 1993. Botany Wetlands- Environmental management plan (EMP). Gutteridge, Haskins & Davey, Water Resources Consulting Service. Prepared for the Botany Wetlands Ministerial Task Force, Australia.

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