Tropical American Watergrass (*Luziola subintegra*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, March 2023
Revised, June 2023
Web Version, 3/19/2025

Organism Type: Flowering Plant
Overall Risk Assessment Category: High

Photo: Bradley K. Licensed under CC BY-NC 4.0. Available: https://www.inaturalist.org/photos/143040908 (March 2023).

1 Native Range and Status in the United States

Native Range

From Kunzer and Bodle (2008):

"*Luziola subintegra* has a known distribution from Mexico southward through Central America and South America southward to Argentina, and the Caribbean basin (Judziewicz et al. 2000). It

is apparently rare in Central America, at least in Costa Rica and Nicaragua (Morales 2003; Pohl & Davidse 2001)."

From Martínez-y-Pérez et al. (2008):

"*Luziola subintegra* occurs in Bolivia, Brazil, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, French Guiana, Guatemala, Guiana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Republica Dominicana, Suriname, Tobago, Trinidad, and Venezuela."

Status in the United States

From USDA, APHIS (2014):

"This species occurs in three sites in south Florida. The principal population is in Fisheating Bay, Lake Okeechobee, in southern Florida (Kunzer and Bodle, 2008). There, it occurs in two monospecific populations occupying areas of 2 and 80 hectares. It also occurs at one site on the Caloosahatchee River (downriver from Lake Okeechobee) and one site in Miami-Dade County (Bodle, 2009 [South Florida Water Management District, personal communication]). Populations at all three sites are being controlled and monitored by the South Florida Water Management District, which has already spent approximately $631,000 in control costs since the species' discovery in Lake Okeechobee (SFWMD, 2014)."

"This species established a breeding population in a relatively remote area of Florida, and rapidly expanded its population over a two-year period (Bodle, 2009 [personal communication]). A second population was later discovered further south near Everglades National Park (Bodle, 2009 [personal communication]; Wunderlin and Hansen, 2014)."

"The U.S. population is the first one known outside of its native range (Kunzer and Bodle, 2008; Martínez-y-Pérez et al., 2008)."

USGS (2023) lists observations of established populations in Brevard and St. John's counties in Florida in addition to the populations mentioned above.

No records of *Luziola subintegra* in trade in the United States were found.

Regulations

From USDA, APHIS (2014):

"The Florida Exotic Pest Plant Council placed this species in Category 1 of their list of invasive species (FLEPPC, 2013). Category 1 corresponds to "[i]nvasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives."

APHIS-PPQ designates *Luziola subintegra* as "Not Authorized Pending Pest Risk Analysis (NAPPRA)", effective July 2, 2021 (USDA, APHIS 2022). Please refer back to agency regulatory documents for details on the regulations, including restrictions on activities involving this species. While effort was made to find all applicable regulations, the set of regulations

mentioned here may not be comprehensive. Notably, it does not include regulations that do not explicitly name this species or its genus or family, for example, when omitted from a list of authorized species with blanket regulation for all unnamed species.

Means of Introductions within the United States

From Kunzer and Bodle (2008):

"Fisheating Creek is the only remaining unregulated inflow to Lake Okeechobee. Based upon this information and the fact that *L. subintegra* is present in the creek, we speculate that Fisheating Creek is its point of introduction into Fisheating Bay and Lake Okeechobee."

From USDA, APHIS (2014):

"A secondary colony of *L. subintegra* was found in a disturbed area of Miami-Dade County. Mike Bodle believes that it was likely transported there as a contaminant on contractor equipment; this contractor works in both areas where the plant is established (Bodle, 2009 [personal communication])."

From Overholt and Franck (2017):

"The FLEPPC [Florida Exotic Pest Plant Council] list includes 16 grasses […] and the remaining four may have been accidental introductions (*Dactyloctenium aegyptium* (L.) Willd., *Hymenachne amplexicaulis* (Rudge) Nees, *Luziola subintegra* Swallen, and *Sporobolus jacquemontii* Kunth)."

Remarks

No additional remarks.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2023):

Kingdom Plantae
  Subkingdom Viridiplantae
    Infrakingdom Streptophyta
      Superdivision Embryophyta
        Division Tracheophyta
          Subdivision Spermatophytina
            Class Magnoliopsida
              Superorder Lilianae
                Order Poales
                  Family Poaceae
                    Genus *Luziola*
                      Species *Luziola subintegra*

According to WFO (2023), *Luziola subintegra* Swallen is the current valid name for this species.

Size, Weight, and Age Range

From Kunzer and Bodle (2008):

"Stoloniferous perennial […]. Culms prostrate, to ca. 1 m long or more, 3-10 mm diameter, […]."

Environment

From Martínez-y-Pérez et al. (2008):

"The majority of the [*Luziola*] species occurs in Brazil, growing in wetlands and in the standing or slow moving water of ponds, lakes, swamps, pools, and sluggish streams (Hoyer et al. 1996)."

Climate

From POWO (2023):

"It […] grows primarily in the wet tropical biome."

Distribution Outside the United States

Native

From Kunzer and Bodle (2008):

"*Luziola subintegra* has a known distribution from Mexico southward through Central America and South America southward to Argentina, and the Caribbean basin (Judziewicz et al. 2000). It is apparently rare in Central America, at least in Costa Rica and Nicaragua (Morales 2003; Pohl & Davidse 2001)."

From Martínez-y-Pérez et al. (2008):

"*Luziola subintegra* occurs in Bolivia, Brazil, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, French Guiana, Guatemala, Guiana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Republica Dominicana, Suriname, Tobago, Trinidad, and Venezuela."

Introduced

From Cayon and Aristizabal (1990):

"The weed *Luziola subintegra* (fam. Gramineae) was reported for the first time in Colombia in 1980, infesting rice fields."

Luziola subintegra is reported as native to Colombia (Martínez-y-Pérez et al. 2008). The above reference may refer to a new report of the species as an agricultural weed, rather than an introduction to a new geographical area.

Means of Introduction Outside the United States

No information on means of introduction outside the United States was found.

Short Description

From Martínez-y-Pérez et al. (2008):

"Culms 22-100 cm tall, 4-5 mm in diameter, decumbent, robust, simple or branched; nodes 5-10, yellowish to purple, terete, glabrous, intemodes 5-25 cm long. Sheaths 8.5-24 cm long, spongy, shorter than intemodes, glabrous. Auricles absent. Ligules 0.7-5 cm long, apex entire, acuminate, glabrous. Dewlap 6-10 mm wide, brownish. Leaf blades 11.5-71.5 cm long, 3-11 mm wide, adaxial and abaxial side scabrous or glabrescent, margins glabrous, apex acuminate, base obtuse. Staminate inflorescence a terminal panicle, 11-36 cm long, florets 22-180; peduncles 17.5-19 cm long, terete, glabrous; rachises 8.5 cm long, 3-4.5 mm wide, cylindrical, yellowish; pulvinus conspicuous, globose, glabrous or pilose; pedicels 0.2-12 mm long, terete, glabrous, terminal appendage absent. Male florets 5.2-7 mm long, glabrous. Lemmas 5.2-7 mm long, 1-2.5 mm wide, 5-7-nerved, membranous, glabrous, apex acute. Paleas 4.5-7 mm long, 0.8-1.5 mm wide, 3-5-nerved, apex acute. Stamens 3-7, filaments, 1.5-2 mm long, anthers 3-5 mm long. Pistillate inflorescence an axillary glomerate panicle, 6-17 cm long, florets 85-280, a single floret at apex of branches; peduncles 4-11 cm long, angulate, longitudinally striate or smooth; rachis reduced or to 3 cm long, base of the branch pilose, pulvinus conspicuous, globose, glabrous or pilose; pedicels 0.2-16.5 mm long, angulate, terminal appendage absent, glabrous. Female florets 2.5-6.5 mm long, brownish, lanceolate, glabrous. Lemmas 2.5-6.5 mm long, 0.5-1.5 mm wide, brownish, lanceolate, 7-nerved, chartaceous, apex acute, glabrous; callus ca. 2 mm long, sharp, hairy. Paleas 2.1-5 mm long, 0.5-1.2 mm wide, brownish, lanceolate, 3-5-nerved, chartaceous, glabrous, apex acute. Lodicules 1.5 mm long, apex acute. Achenes 1.2-2 mm long, brownish to black, ovoid, striate […]."

From Kunzer and Bodle (2008):

"*Luziola subintegra* is unlike any other *Luziola* currently known to the United States. It is robust, with large, thick culms, and has leaves with inflated, spongy sheaths and long, broad blades. All of our other *Luziola* taxa [in the United States] can be described as delicate, slender plants with narrow culms, and shorter, narrower leaves."

Biology

From USDA APHIS (2014):

"*Luziola subintegra* reproduces through vegetative fragmentation and by seed (Cayon and Aristizabal, 1990). It is very likely wind pollinated (Faegri and Van der Pijl, 1979; Martínez-y-Pérez et al., 2008; Zomlefer, 1994), which implies it does not depend on specialist pollinators. Seeds are spread by water (Bodle, 2009 [personal communication]; Martínez-y-Pérez et al., 2008; Piepenbring and Stein, 2000) and unintentionally by people planting rice or moving contaminated equipment (Bodle, 2009 [personal communication]; Tascon and Fischer, 1997). Seeds can remain viable for 2.5 years under flooded conditions, with some likely persisting for

up to 6.5 years (Hutchinson and Langeland, 2012). Because this species is stoloniferous and roots from nodes (Kunzer and Bodle, 2008), it is likely to respond well to mutilation by regrowing from cut fragments."

Human Uses

No information was found on human uses of *Luziola subintegra*.

Diseases

No information was found on diseases associated with *Luziola subintegra*.

Threat to Humans

No information on threats to humans from *Luziola subintegra* was found.

3 Impacts of Introductions

From USDA, APHIS (2014):

"In the United States, *L. subintegra* creates dense mats on the water surface that change habitat structure and crowd out native species (Bodle, 2009 [personal communication]; Kunzer and Bodle, 2008). The thick mat of vegetation, [sic] it creates restricts recreational access to areas (Bodle, 2009 [personal communication]). The South Florida Water Management District is controlling this species in Lake Okeechobee (Bodle, 2009 [personal communication], 2012; Ferriter et al., 2009)."

"*Luziola subintegra* has already demonstrated its invasive potential in southern Florida, where over a period of a few years it spread across 3,000 acres of a lake shore (Bodle, 2009 [personal communication])."

"[…] the South Florida Water Management District […] has already spent approximately $631,000 in control costs since the species' discovery in Lake Okeechobee (SFWMD, 2014)."

4 History of Invasiveness

The History of Invasiveness for *Luziola subintegra* is classified as High. Although the pathway of its introduction is not clear, this species is established and spreading in Florida. It forms dense monospecific stands that outcompete native plant species and restrict recreational water access.

5 Global Distribution

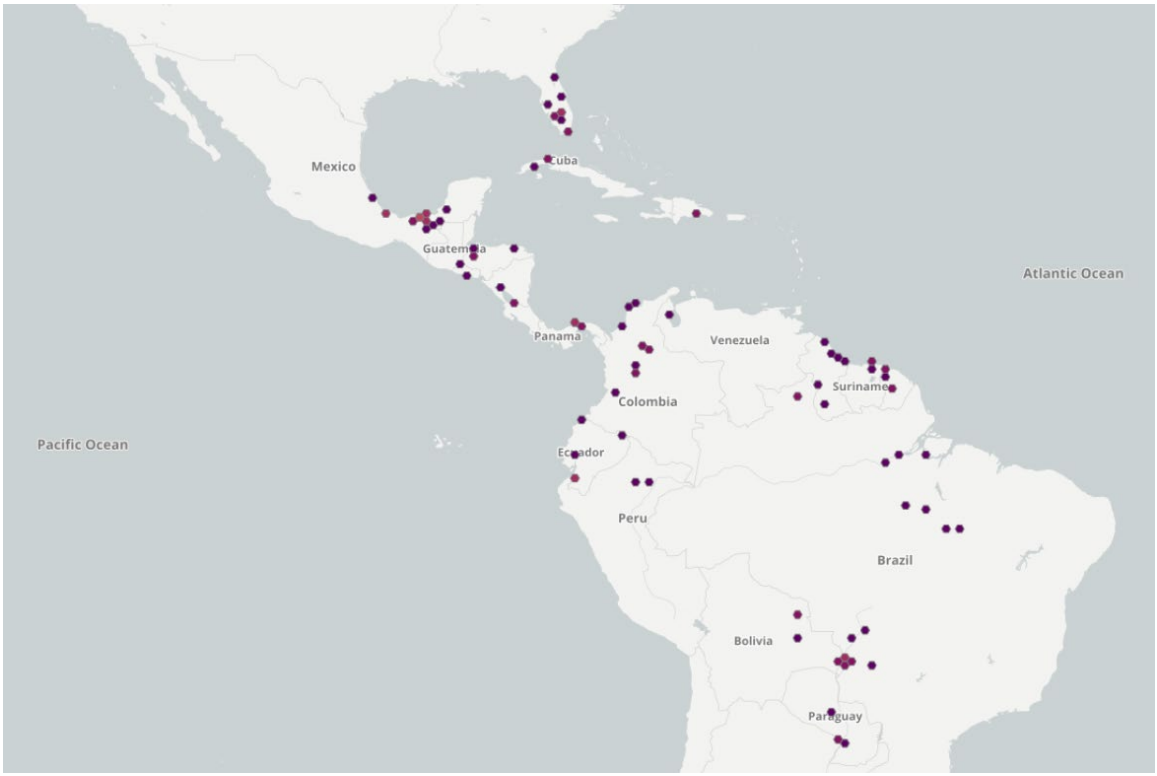

Figure 1. Reported global distribution of *Luziola subintegra*. Map from GBIF Secretariat (2023). Observations are reported from the Caribbean, Florida, southern Mexico, Central America, and northern and central South America. The western-most observation in Florida was not used in the climate matching analysis as the coordinates did not match the described observation location in the record.

6 Distribution Within the United States

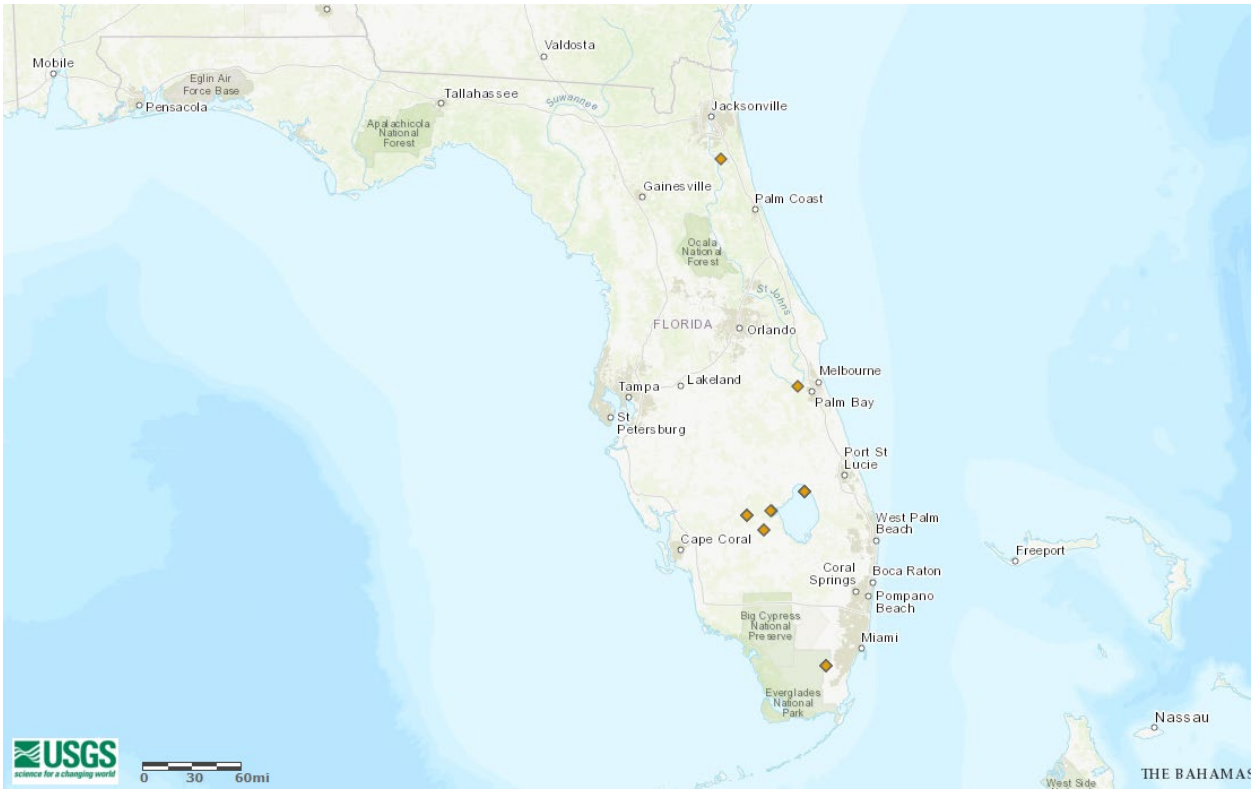

Figure 2. Reported distribution of *Luziola subintegra* in the United States. Map adapted from USGS (2023). Observations are reported from Florida.

7 Climate Matching

Summary of Climate Matching Analysis

The climate matching analysis indicated high match in Florida and surrounding areas in the coastal Southeast United States. Inland areas in the Southeast had a medium climate match. There was also an area of medium-low match extending from central Texas to the Ohio River Basin. The climate match across most of the rest of the contiguous United States was low. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.070, indicating that Yes, there is establishment concern for this species. The Climate 6 score is calculated as: (count of target points with scores ≥ 6)/(count of all target points). Establishment concern is warranted for Climate 6 scores greater than or equal to 0.002 based on an analysis of the establishment success of 356 nonnative aquatic species introduced to the United States (USFWS 2024).

Projected climate matches in the contiguous United States under future climate scenarios are available for *Luziola subintegra* (see Appendix). These projected climate matches are provided as additional context for the reader; future climate scenarios are not factored into the Overall Risk Assessment Category.

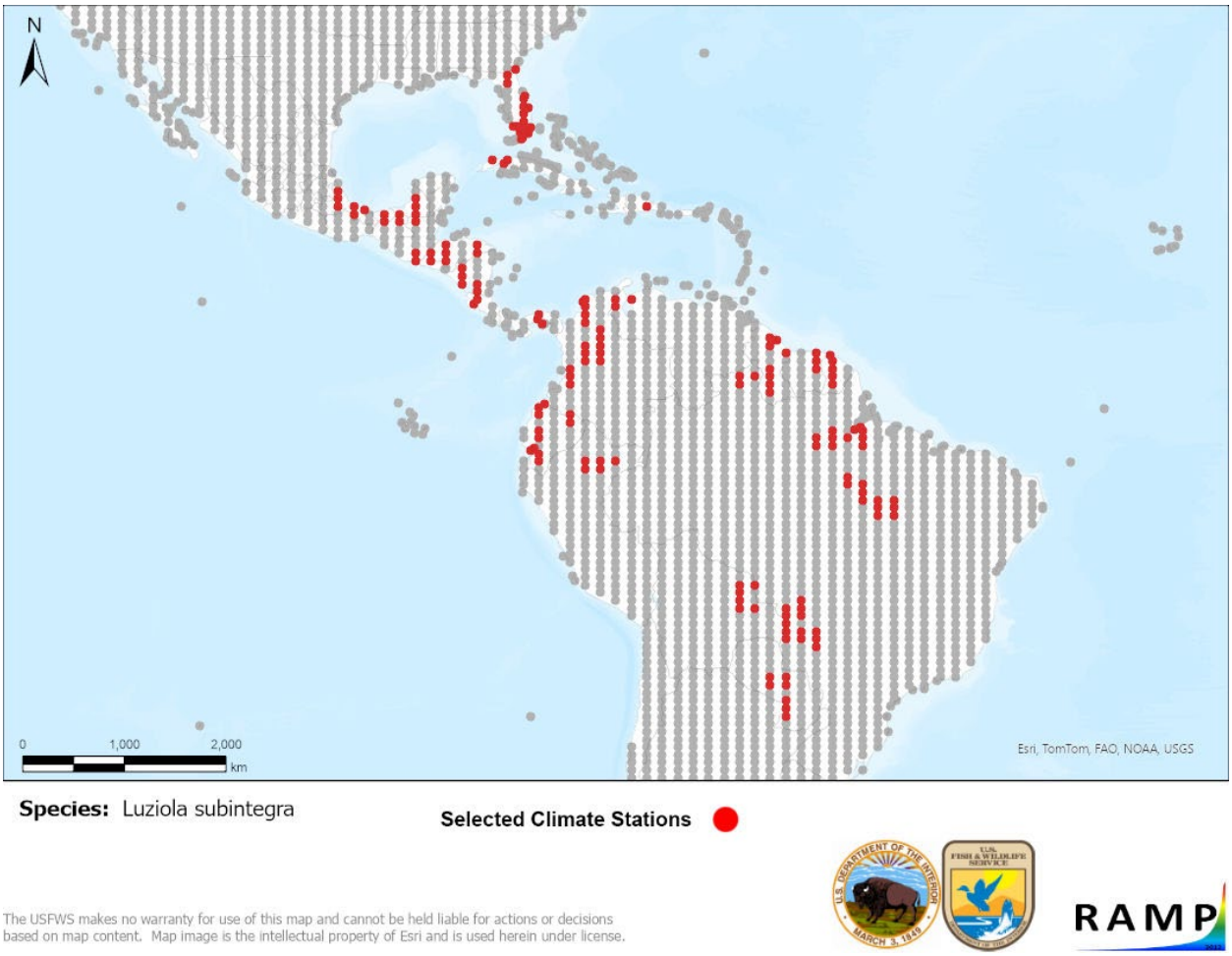

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in North and South America selected as source locations (red; United States, Cuba, Dominican Republic, Mexico, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Brazil, Ecuador, Peru, Guyana, Suriname, French Guiana, Bolivia, Paraguay) and non-source locations (gray) for *Luziola subintegra* climate matching. Source locations from GBIF Secretariat (2023). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

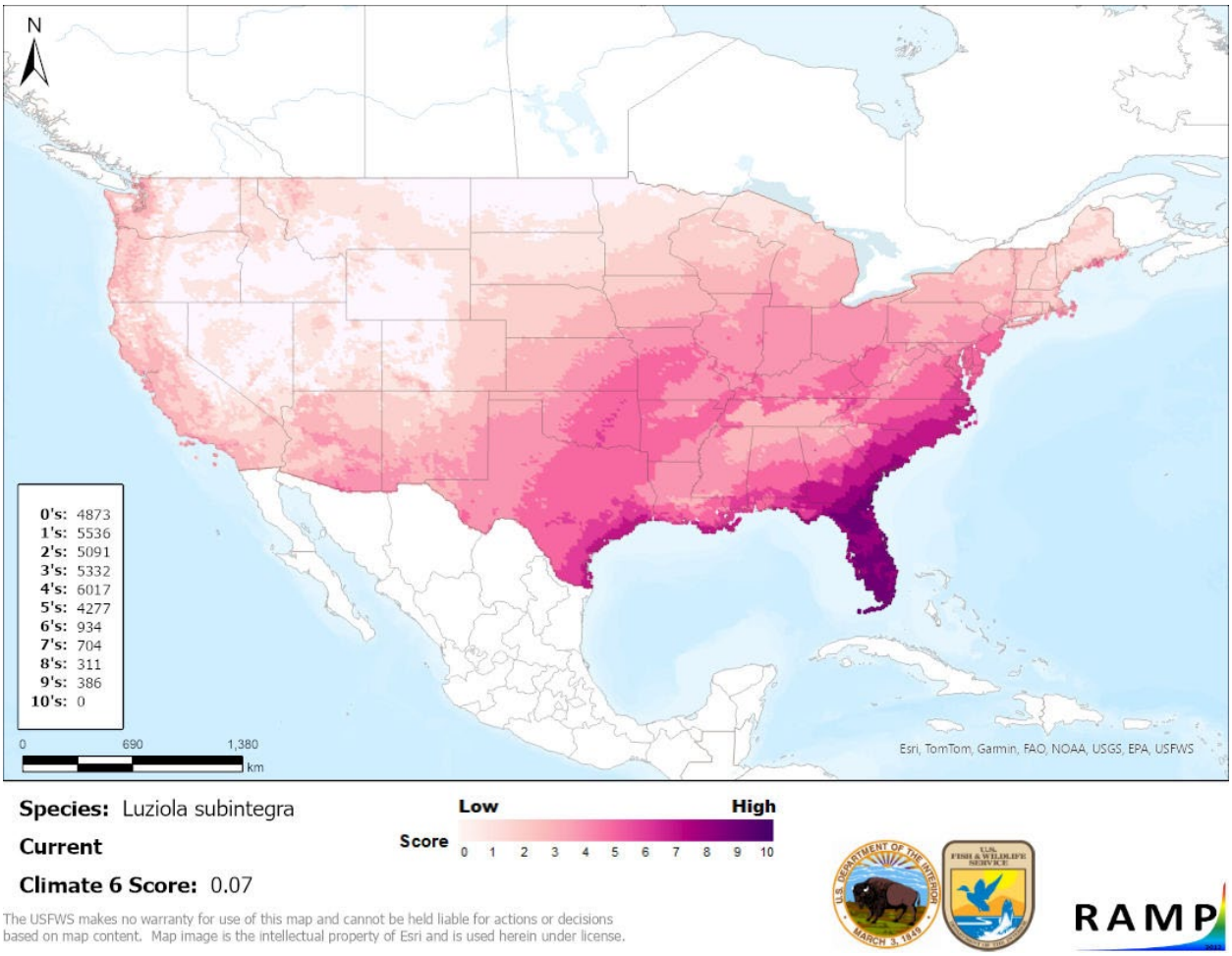

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Luziola subintegra* in the contiguous United States based on source locations reported by GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Luziola subintegra* is classified as Medium. General information is available regarding the distribution, biology, and ecology of the species. Records of introduction resulting in established populations and impacts from those populations were found, but the information on impacts relied heavily on personal communications rather than peer-reviewed sources.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Luziola subintegra, Tropical American Watergrass, is a grass species that is native to Mexico, Central America, South America, and the Caribbean. It is introduced in the United States and established in Florida. The means of its introduction is unknown but likely accidental; *L. subintegra* is not documented in trade. The History of Invasiveness for *L. subintegra* is

classified as High due to its establishment, spread, and impacts in Florida, where it forms dense stands that outcompete native plants and is costly to control. The climate matching analysis for the contiguous United States indicates establishment concern for this species. The highest match is along the Gulf and Atlantic coasts in the Southeast. The Certainty of Assessment is classified as Medium due to the quality of the information sources available for determining History of Invasiveness. The Overall Risk Assessment Category for *L. subintegra* in the contiguous United States is High.

Assessment Elements

- **History of Invasiveness (see section 4): High**
- **Establishment Concern (see section 7): Yes**
- **Certainty of Assessment (see section 8): Medium**
- **Remarks, Important additional information: None**
- **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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Appendix

Summary of Future Climate Matching Analysis

Future climate projections represent two Shared Socioeconomic Pathways (SSP) developed by the Intergovernmental Panel on Climate Change (IPCC 2021): SSP5, in which emissions triple by the end of the century; and SSP3, in which emissions double by the end of the century. Future climate matches were based on source locations reported by GBIF Secretariat (2023).

Under the future climate scenarios (figure A1), on average, high climate match for *Luziola subintegra* was projected to occur in the Southern Atlantic Coast and Southern Florida regions of the contiguous United States. There were also small areas of high match along the Gulf Coast. Areas of low climate match were projected to occur in the Colorado Plateau, Great Basin, Northern Plains, Southwest, and Western Mountains regions. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.035 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.179 (model: MRI-ESM2-0, SSP3, 2055). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there is establishment concern for this species under future scenarios. The Climate 6 score for the current climate match (0.070, figure 4) falls within the range of scores for future projections. The time step and climate scenario with the most change relative to current conditions was SSP5, 2085, the most extreme climate change scenario. Under one or more time step and climate scenarios, areas within the Great Lakes saw a large increase in the climate match relative to current conditions. Additionally, areas within the Appalachian Range, California, Colorado Plateau, Great Basin, Northeast, Northern Pacific Coast, Northern Plains, Southern Plains, and Western Mountains saw a moderate increase in the climate match relative to current conditions. No large decreases were observed regardless of time step and climate scenarios. Under one or more time step and climate scenarios, areas of the Gulf Coast, Southeast, Southern Atlantic Coast, and Southern Florida saw a moderate decrease in the climate match relative to current conditions. Additional, very small areas of large or moderate change may be visible on the maps (figure A3).

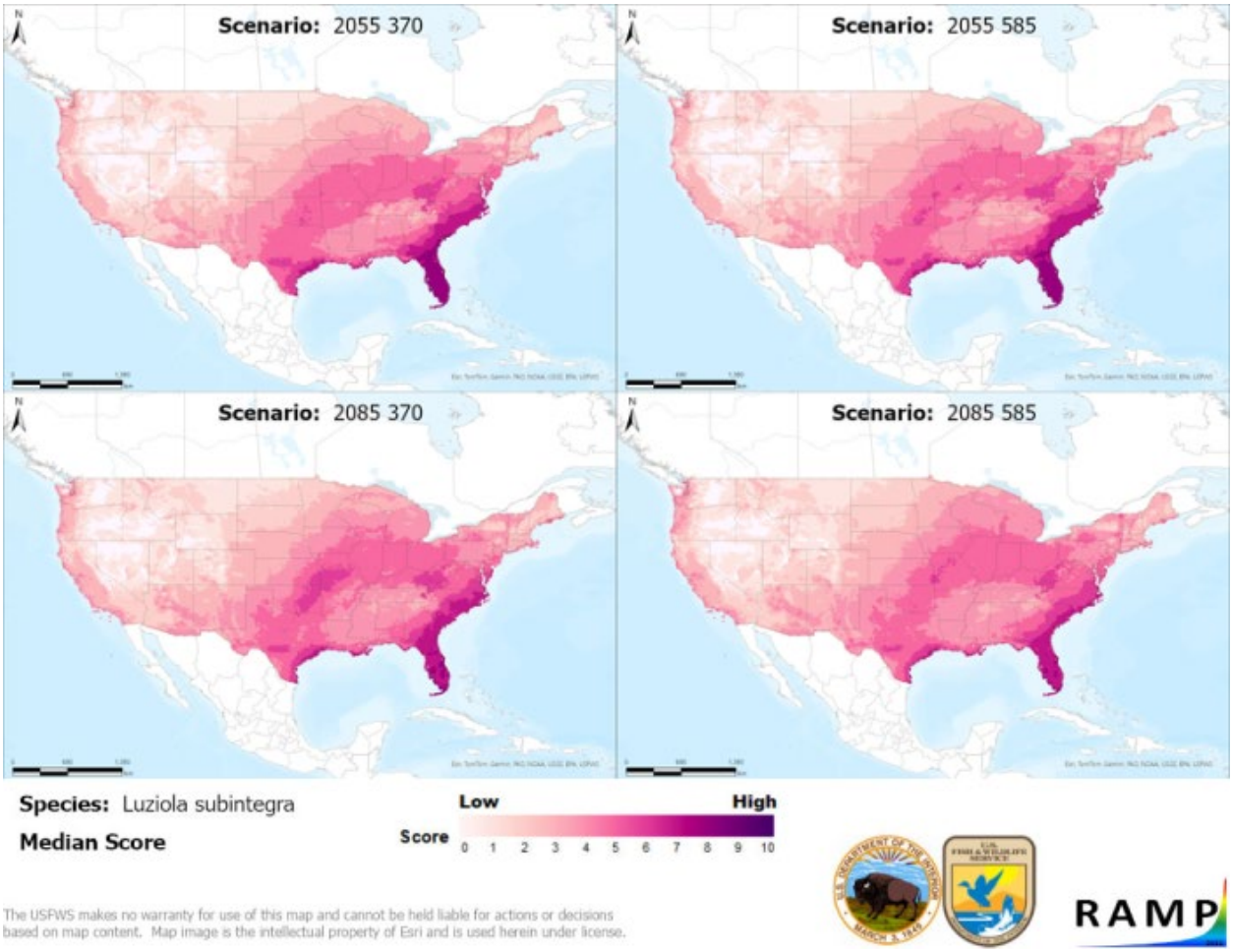

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Luziola subintegra* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

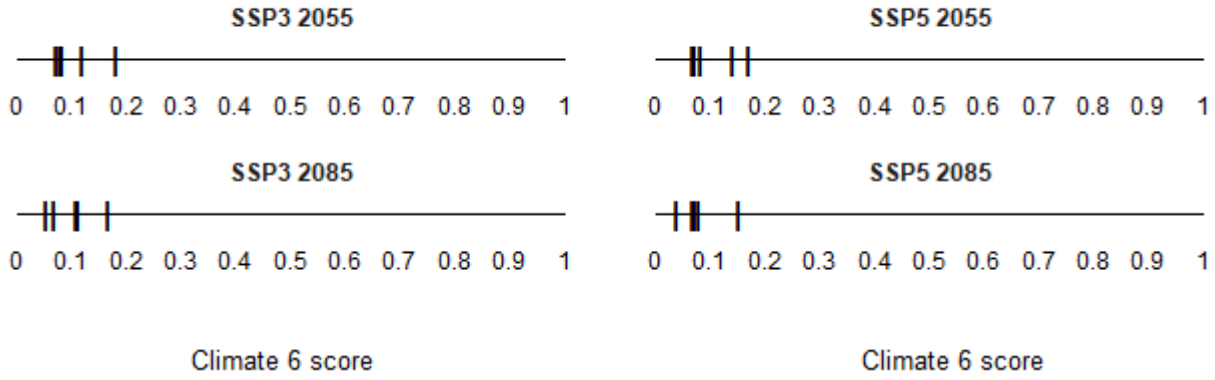

Figure A2. Comparison of projected future Climate 6 scores for *Luziola subintegra* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0.

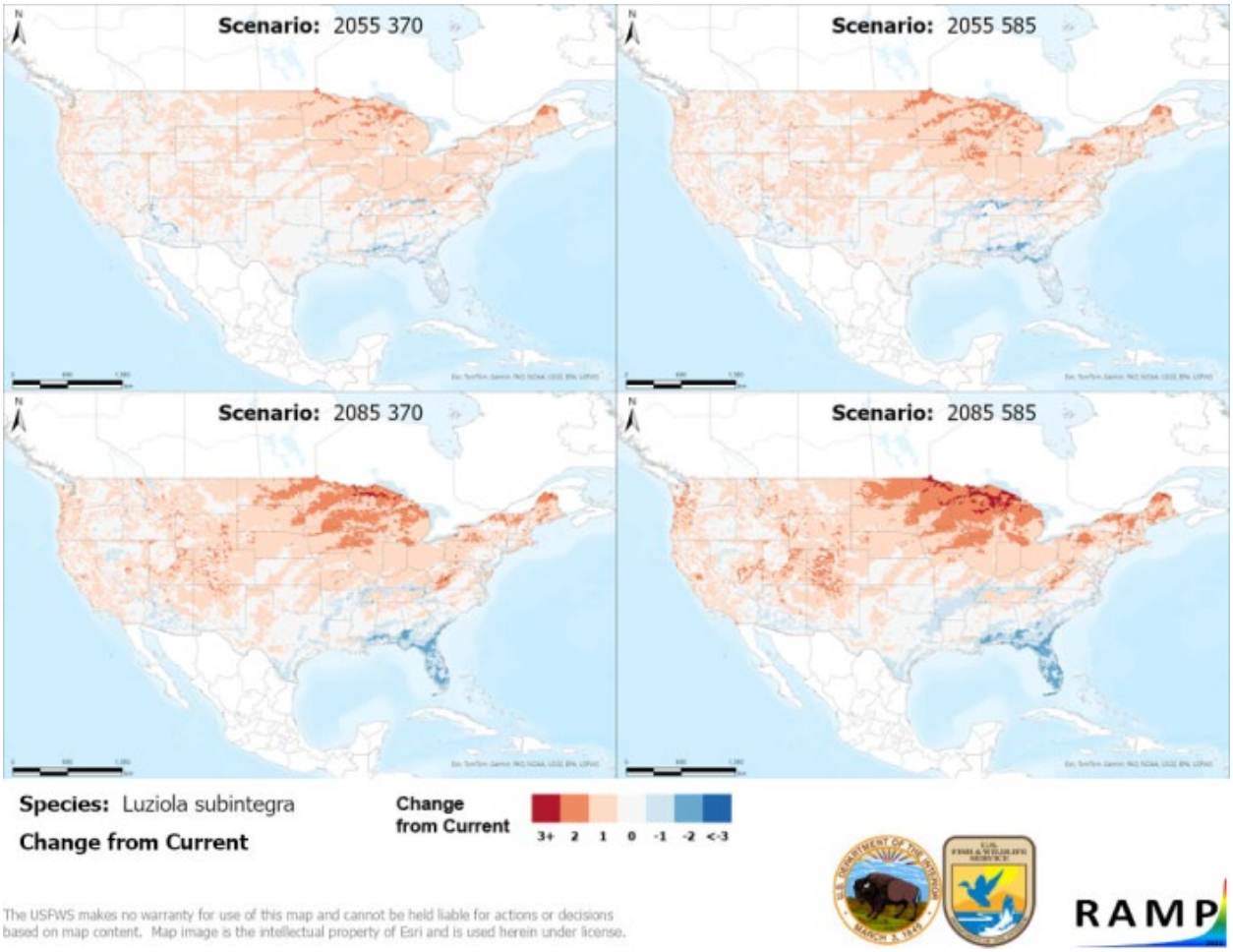

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Luziola subintegra* based on source locations reported by GBIF Secretariat (2023). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. Shades of blue indicate a lower target point score under future scenarios than under current conditions. Shades of red indicate a higher target point score under future scenarios than under current conditions. Darker shades indicate greater change.

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