# Torpedo Grass (*Panicum repens*)
## Ecological Risk Screening Summary

**U.S. Fish and Wildlife Service, January 2024**
**Revised, February 2024**
**Web Version, 3/12/2026**

Organism Type: Flowering Plant
Overall Risk Assessment Category: High


Photo: Graves Lovell, Alabama Department of Conservation and Natural Resources. Licensed under Creative Commons BY-NC. Available: https://www.invasive.org/browse/detail.cfm?imgnum=5400726 (March 2026).

# 1 Native Range and Status in the United States

## Native Range

From CAIP (2024):

"[Native to] tropical and subtropical regions of Europe, Asia, and Africa"

GISD (2017) lists *Panicum repens* native to the following countries, organized by continent: **Africa** (Algeria, Angola, Botswana, Cameroon, Cote D'ivoire, Egypt, Eswatini [Swaziland], Ethiopia, Ghana, Guinea, Kenya, Liberia, Libya, Madagascar, Malawi, Mali, Morocco, Mozambique, Namibia, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Tunisia, Uganda, Zambia, Zimbabwe), **Asia** (China, India, Indonesia, Iraq, Israel, Japan, Jordan, Lebanon, Malaysia, Nepal, Philippines, Saudi Arabia, Sri Lanka, Syria, Taiwan, Thailand, Turkey, Yemen), and **Europe** (Albania, Cyprus, France, Greece, Italy, Portugal, Spain, former Yugoslavia).

In addition to the countries listed by GISD (2017), POWO (2024) lists *Panicum repens* native to the following geographical locations: **Africa** (Aldabra atoll, Benin, Burundi, Canary Is., Chad, Congo, Gabon, Gambia, Guinea-Bissau, Mauritania, Niger, Rwanda, Seychelles, Togo), **Asia** (Andaman Is., Bangladesh, Borneo, Cambodia, Cocos (Keeling) Is., Java, Laos, Lesser Sunda Is., Myanmar, Palestine, Pakistan, Sulawesi, Sumatera, Vietnam), **Europe** (Balearic Islands, Corsica, Crete, East Aegean Is., Sardegna, Sicilia), and **Oceania** (Australia, New Guinea).

## Status in the United States

From Newman et al. (2006):

"Torpedo grass is found in marshy shores along the Gulf Coast from Florida to Texas […] It was first collected in North America near Mobile, Alabama in 1876."

USGS (2026) reports nonindigenous occurrences of *Panicum repens* with a status of 'established' in Alabama, Florida, Louisiana, Mississippi, North Carolina, South Carolina, and Texas; and with a status of 'unknown' in Connecticut.

From CAIP (2024):

"Considered one of Florida's most troublesome invasive grasses, it can be found in over 70% of the state's public waters."

Pratt et al. (2012) indicate that *Panicum repens* is widespread along roadways in and near Hawai`i Volcanoes National Park in Hawaii.

Additionally, USDA, NRCS (2024) reports *Panicum repens* as introduced to California. POWO (2024) reports *P. repens* as introduced to Puerto Rico. GISD (2017) reports *P. repens* as introduced to the Northern Mariana Islands. No information on establishment status is given for any of these locations.

No records of *Panicum repens* in trade in the United States were found.

### Regulations

*Panicum repens* is regulated in Alabama (Alabama Department of Agriculture and Industries 2006), Hawaii (HDOA 1992), Louisiana (LDAF 2022), and Texas (TDPW 2022). Please refer back to state agency regulatory documents for details on the regulations, including restrictions on activities involving this species. While effort was made to find all applicable regulations, this list 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 CAIP (2024):

"It was introduced to the United States before 1876, primarily through seed used for forage crops. In the early 1900's the United States Department of Agriculture imported and distributed torpedo grass seed for planting in pasturelands, providing forage for cattle."

From Byrd and Maddox (2009):

"Similar to cogongrass [*Imperata cylindrica* (L.) Beauv.], the introduction of torpedograss to the [United States] was either by accident as ballast water contamination or as an introduction for forage uses sometime before 1876 when it was first collected in Mobile, Alabama. The extensive distribution of this plant is due in part to its ability to reproduce via seeds and rhizomes. Both rhizomes and seed can be moved in water, soil, or turfgrass sod to new locations."

## Remarks

This ERSS was previously published in January 2020. Revisions were completed to incorporate new information and conform to updated standards.

*Panicum repens* has been intentionally planted within the United States by pastureland managers to meet agricultural objectives. Management agencies are responsible for balancing multiple ecological and agricultural management objectives. The potential for a species to become invasive is now one important consideration when balancing multiple management objectives and advancing sound, science-based management of fish and wildlife and their habitat in the public interest.

# 2 Biology and Ecology

## Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2024):

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

Genus *Panicum* L.
Species *Panicum repens* L.

According to WFO (2024), *Panicum repens* L. is the current valid name for this species.

## Size, Weight, and Age Range

From EDDMapS (2024):

"*Panicum repens* is a perennial grass that can reach up to 3 ft. (1 m) tall."

## Environment

From EDDMapS (2024):

"Plants are salt-tolerant."

From Rojas-Sandoval (2023):

"[…] prefers open sunny conditions but persists in semi-shaded situations. It occurs in a wide range of soil types with pH in the range 4.5-6.2 (tolerates 4-7.7). Although adapted to wet conditions, once established, *P. repens* can survive moderately prolonged drought conditions and can also survive several days of standing water [Stone, 2011; Useful Tropical Plants, 2014; PROSEA, 2018; USDA-NRCS, 2018]. It can grow in soils with moderate to high salinity) [Peng et al., 1977; Peng and Twu, 1979; Nemoto et al., 1987]. It is resistant to fire [Weber, 2003]."

## Climate

From Stone (2011):

"Torpedo grass is limited to tropical and subtropical climates [Godfrey & Wooten 1979]. Its sensitivity to prolonged cold temperature limits the spread of torpedo grass into upper latitudes or altitudes [Bodle and Hanlon 2001]. In the United States, torpedo grass establishes in subtropical climates such as those found in Florida [Huffman & Judd 1998, Myers & Wunderlin 2003], Georgia [Zomlefer et al. 2008], and Louisiana [Dutton & Thomas 1991, Nolfo-Clements 2006]. […] Areas where torpedo grass establishes generally have high annual precipitation."

From Rojas-Sandoval (2023):

"*Panicum repens* grows best in areas with mean annual temperatures of 18°-26°C (tolerates 13°-35°C) and mean annual rainfall of 800-1800 mm (tolerates 550-4300 mm). Optimum temperatures for growth are 30°-35°C and it is killed by persistent frost [Wilcut et al., 1988]."

## Distribution Outside the United States

### Native

From CAIP (2024):

"[Native to] tropical and subtropical regions of Europe, Asia, and Africa"

GISD (2017) lists *Panicum repens* native to the following countries: **Africa** (Algeria, Angola, Botswana, Cameroon, Cote D'ivoire, Egypt, Eswatini [Swaziland], Ethiopia, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Morocco, Mozambique, Namibia, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Tunisia, Uganda, Zambia, Zimbabwe), **Asia** (China, India, Indonesia, Iraq, Israel, Japan, Jordan, Lebanon, Malaysia, Nepal, Philippines, Saudi Arabia, Sri Lanka, Syria, Taiwan, Thailand, Turkey, Yemen), and **Europe** (Albania, Cyprus, France, Greece, Italy, Portugal, Spain, former Yugoslavia).

In addition to the countries listed by GISD (2017), POWO (2024) lists *Panicum repens* native to the following geographical locations: **Africa** (Aldabra atoll, Benin, Burundi, Canary Is., Chad, Congo, Gabon, Gambia, Guinea-Bissau, Mauritania, Niger, Rwanda, Seychelles, Togo), **Asia** (Andaman Is., Bangladesh, Borneo, Cambodia, Cocos (Keeling) Is., Java, Laos, Lesser Sunda Is., Myanmar, Palestine, Pakistan, Sulawesi, Sumatera, Vietnam), **Europe** (Balearic Islands, Corsica, Crete, East Aegean Is., Sardegna, Sicilia), and **Oceania** (Australia, New Guinea).

### Introduced
From Rojas-Sandoval (2023):

"*Panicum repens* […] has been introduced in North America, Mexico, Central America, the Caribbean, South America, Australia and the Pacific region (Clayton et al., 2018; GRIIS, 2018; PROSEA, 2018; USDA-ARS, 2018; USDA-NRCS, 2018)."

"[…] invasive in China, Singapore, Paraguay, […] the Virgin Islands and the Bahamas (Kairo et al., 2003; Xu et al., 2012; Rojas-Sandoval and Acevedo-Rodríguez, 2015; IABIN, 2017; PIER, 2018)."

POWO (2024) lists *Panicum repens* as introduced to the following geographical locations: Argentina, Azores, Bahamas, Belize, Brazil, Caroline Is. (western Pacific), Cayman Is., Cuba, Honduras, Leeward Is. (Caribbean), Marianas, Mexico, Nicaragua, Saudi Arabia, Trinidad-Tobago, and Yemen.

GISD (2017) lists *P. repens* as introduced to Australia, Cambodia, Palau, and Vietnam. Additionally, GBIF Secretariat (2024) lists *P. repens* as introduced to Angola, Argentina, Bangladesh, Bolivia, Brazil, Burundi, Egypt, Indonesia, Iraq, Malaysia, Mexico, Myanmar, Sri Lanka, Sudan, and Thailand.

## Means of Introduction Outside the United States
According to Rojas-Sandoval (2023), *Panicum repens* has been introduced in seed for forage crops and used for grazing livestock, resulting in dispersal or escape from cultivation.

From Rojas-Sandoval (2023):

"Seed may have been transported via ballast from sailing vessels carrying lumber from the Mediterranean."

## Short Description
From USDA, NRCS (2024):

"The rhizomes have characteristic torpedo-like apexes, hence the common name torpedo grass. The culms are erect, glabrous, and rigid and range in height from 12 to 31 inches. The sheaths are glabrous or pubescent with thin and dry margins. The leaf blades are mostly short, flat, or rolled in tightly. If flat, the blades are approximately ⅛ inch wide and if folded, the blades are approximately ¼ inch wide. The ligules are membranous with fringed hair surrounding them. The panicles are open, loose, 4 to 7 inches long, and with strongly ascending branches. The spikelets are straw-colored and 1⁄16 inch long. The first glume is short and truncated. The second glume and sterile lemma are about equal 1 cabin size and apically acute to acuminate with 7 to 9 weak nerves. The sterile pale is thin and dry. The fertile lemma and palea are straw-colored and sharply angled. The caryopsis is pale yellow and oval in shape."

## Biology
From Stone (2011):

"Torpedo grass occurs in both aquatic and terrestrial plant communities [Hall et al. 1998], including coastal sand, wetland, and forested plant communities."

From Rojas-Sandoval (2023):

"It is a weed found most frequently on sandy soils (both coastal and inland) or in poorly drained heavy soils. It is a common weed of marshy places along the edges of rivers, irrigation channels, lakes and brackish shorelines, moist open or partially shaded meadows and prairies, sand dunes, wetlands and coastal thickets at elevations from sea level up to 2000 m. It may also occur as a component of floating mats and as a weed in cultivated lands (e.g., rice paddies), grasslands, roadsides and gardens (Stone, 2011; PIER, 2018; PROSEA, 2018)."

"*Panicum repens* reproduces sexually though the principal means of propagation is reported to be rhizome extension and fragmentation (Holm et al., 1977). Small stem fragments can give rise to dense clonal stands through vegetative growth and rhizome fragments buried as deep as 50 cm can send up new shoots. Seed production is very variable and apparently dormancy is high in young seeds (Langeland and Burks, 1998; Weber, 2003)."

"Flowering in *P. repens* often starts 3-4 weeks after seedling emergence and continues throughout the year, but seed production is very variable. Vegetative growth by rhizomes is very fast and a dense sward may develop within 5-6 months (Langeland and Burks, 1998; PROSEA, 2018). In cultivation, *P. repens* develops rhizomes when around 50 days old in the summer season (24°-30°C), and primary and secondary branches of the rhizome usually develop 70 and 130 days after planting, respectively. Rhizomes can penetrate into soil up to 50 cm deep, and require up to 120 days after planting to complete emergence depending on their burial depth. A single culm emerging from a single rhizome bud produced about 23,000 rhizome buds in 1 year (ISSG, 2018)."

From Hanlon and Brady (2005):

"Although torpedograss [*Pancium repens*] flowers and produces seed, most seeds are believed to be sterile (Peng 1984, Haroun 1995). Reproduction of torpedograss primarily occurs vegetatively from rhizomes and small fragments (Chandrasena and Dhammika 1988, Smith et al. 2004). Rhizomes can grow rapidly throughout the year in the subtropics (Sutton 1996), reaching lengths of 3 m within six months (Hossain et al. 1999)."

## Human Uses

From USDA, NRCS (2024):

"[Livestock:] It was once used for cattle in the 1920s and is resistant to grazing and trampling; however, better forages are now available that has higher quality and does not create the potential weed problems that torpedo grass did."

"[Erosion Control:] Torpedo grass is recommended for the use of shoreline stabilization. It may be used in areas that have periods of both inundation as well as drought."

"[Conservation Practices:] Torpedo grass, because of its growth habit, potentially has application when established with certain conservation practices; however, conservation practice standards vary by state."

From Rojas-Sandoval (2023):

"*Panicum repens* has been widely used as a forage species. Its salt tolerance makes it a useful species for reclaiming saline soils (Ghaly, 2002). It is a source of ethnomedicines in India (Kumar, 2002)."

From Stone (2011):

"Torpedo grass may be used as a soil binder [Datta and Banerjee 1978; Hall et al. 1998] or for erosion control [Hossain et al. 2001; Weber 2003]. It has been evaluated for use in improving water quality; in laboratory experiments, torpedo grass was credited with adjusting pH and reducing toxic chemicals and dissolved minerals in water supplies [Wolverton and Bounds 1988]. In Taiwan, torpedo grass was evaluated for use as a substrate for oyster mushroom (*Pleurotus citrinopileatus*) cultivation [Liang et al. 2009]. In Indonesia, torpedo grass rhizomes are used to treat abnormal menstruation [Datta and Banerjee 1978]."

## Diseases

From Rojas-Sandoval (2023):

"It may also act as an alternative host to rice leafhopper species, and pathogens such as *Ustilago* and *Pyricularia* spp. (Holm et al., 1977)."

## Threat to Humans

No information was found on threats to humans from *Panicum repens*.

# 3 Impacts of Introductions

From Hanlon and Brady (2005):

"In Lake Okeechobee, Florida, torpedograss [*Panicum repens*] has severely impacted the lake's 40,000 ha marsh landscape by displacing more than 6,700 ha of native plants and shallow areas of open water. Two of the most impacted native species include spikerush and beakrush (*Rhynchospora* spp.) (Richardson et al. 1995)."

"In the middle site [of Lake Okeechobee, Florida], 8 ha of spikerush and open water were displaced as torpedograss coverage increased by 32%, from 25 ha to 33 ha […]"

From Rojas-Sandoval (2023):

"*Panicum repens* is a troublesome weed in a wide range of perennial crops (Holm et al., 1977). It is as a serious weed of sugarcane in […] Hawaii; pineapple in West Africa; tea in […] Indonesia and Sri Lanka; various orchard crops in Thailand; rubber, coconut and oil palm in Malaysia; and rice in Indonesia and Sri Lanka. In a number of these situations, it is listed as one of the three most serious weeds. […] *P. repens* is also reported to have allelopathic effects (Chon, 1989; Perera et al., 1989). It may also act as an alternative host to rice leafhopper species, and pathogens such as *Ustilago* and *Pyricularia* spp. (Holm et al., 1977)."

"In Florida (USA), *P. repens* has cost an estimated US $2 million a year for its management in flood control systems and it has seriously infested citrus groves and golf courses throughout the state (Langeland and Burks, 1998)."

"*Panicum repens* is an invasive grass that quickly forms dense and extensive monospecific stands that displace native vegetation, particularly in areas in or near shallow waters. […]; in Florida, where it is regarded as one of the most detrimental invasive weeds, it can be found in more than 70% of all public water bodies. In this state, the largest *P. repens* infestation occurs in the Lake Okeechobee, where it has displaced nearly 6000 ha (14,000 acres) of native marshes (Schardt, 1994; Langeland and Burks, 1998) with the loss of the valuable fish and wildlife habitat that they once provided (Stone, 2011; Langeland and Burks, 1998; USDA-NRCS, 2018). It has also been reported invading parks and preserves throughout Florida (FLEPPC, 2018)."

"The impressive vegetative reproductive capacity of *P. repens* allows it to quickly produce dense and extensive monocultures capable of displacing native vegetation and completely disrupt crucial habitats such as wetlands, marshes and riparian areas. Consequently, *P. repens* is considered one of the most noxious invasive grasses of riparian, wetland and terrestrial habitats across tropical and subtropical regions (Langeland and Burks, 1998; Weber, 2003; ISSG, 2018; USDA-NRCS, 2018)."

“*Panicum repens* invades cultivated lands and displaces more desirable forage species. This species also interferes with flood control systems, navigation, irrigation, recreation and turf production. It can build up along irrigation canals and drainage ditches, requiring costly control programmes. It has also been reported invading parks, golf courses and preserves throughout the USA (Langeland and Burks, 1998; FLEPPC, 2018; USDA-NRCS, 2018).”

From Stone (2011):

“[…] torpedo grass was reported as poisonous to horses in Florida [Smith 1993, Wilcut 1986].”

“In coastal areas of South Carolina, torpedo grass established in sand dune restoration areas and was expected to replace the desired planted species [Conner and Socha 2003].”

“In the Everglades drainage basin, persistent high cover of nonnative macrophytes, including torpedo grass, resulted in a high accumulation of organic materials that depressed dissolved oxygen concentrations. In Lake Istokpoga, Florida, hypoxic conditions occurred in areas densely vegetated by torpedo grass and other nonnative macrophytes [Bunch et al. 2010]. Areas with dense stands of torpedo grass are considered poor habitat for fish because high stem densities inhibit fish movement, and dissolved oxygen concentrations are too low [Hanlon and Langeland 2000].”

From Wilcut et al. (1988):

“Two years after planting, competition from johnsongrass and torpedograss had reduced common bermudagrass yields by 99 and 38%, respectively.”

*Panicum repens* is regulated in four U.S. States, see section 1.

# 4 History of Invasiveness

The History of Invasiveness for *Panicum repens* is classified as High. Torpedo grass has been introduced in nonnative areas, resulting in established populations, including within the southeastern United States. It has been introduced both intentionally as a forage or pasture plant and unintentionally through seed contamination. Introduced populations of *P. repens* have had negative impacts on native vegetation, hydrology, water quality, recreation, agriculture, and possibly livestock.

# 5 Global Distribution

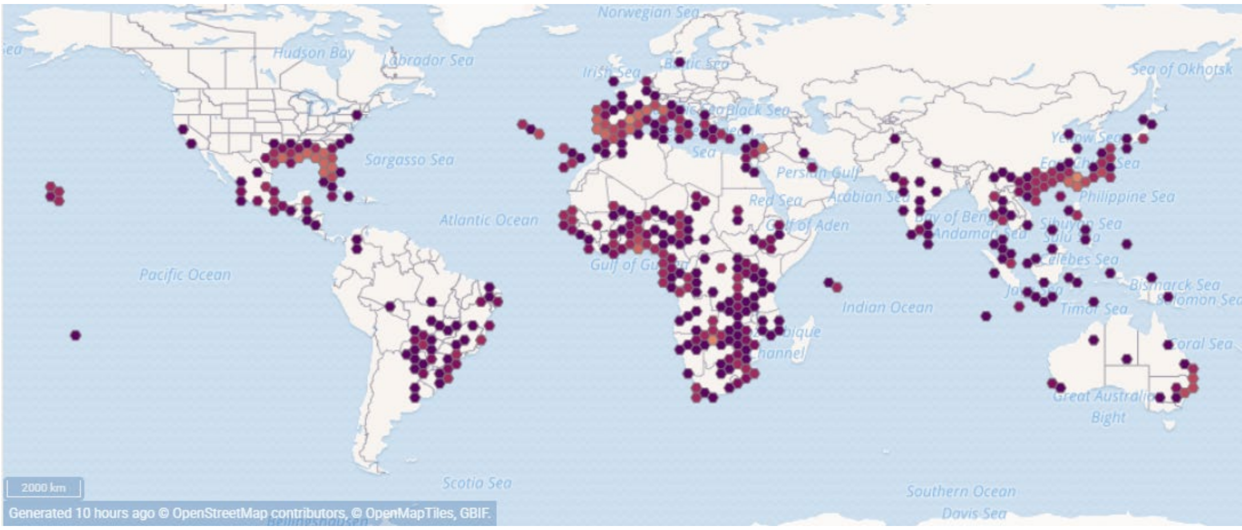


**Figure 1.** Reported global distribution of *Panicum repens*. Map from GBIF Secretariat (2023). Observations are reported from North America, South America, Africa, Europe, Australia, Asia, and throughout the Oceania. Observations in Sweden, the United Kingdom, and parts of the United States (see section 6) do not represent established populations and were therefore excluded from climate matching analysis.

# 6 Distribution Within the United States

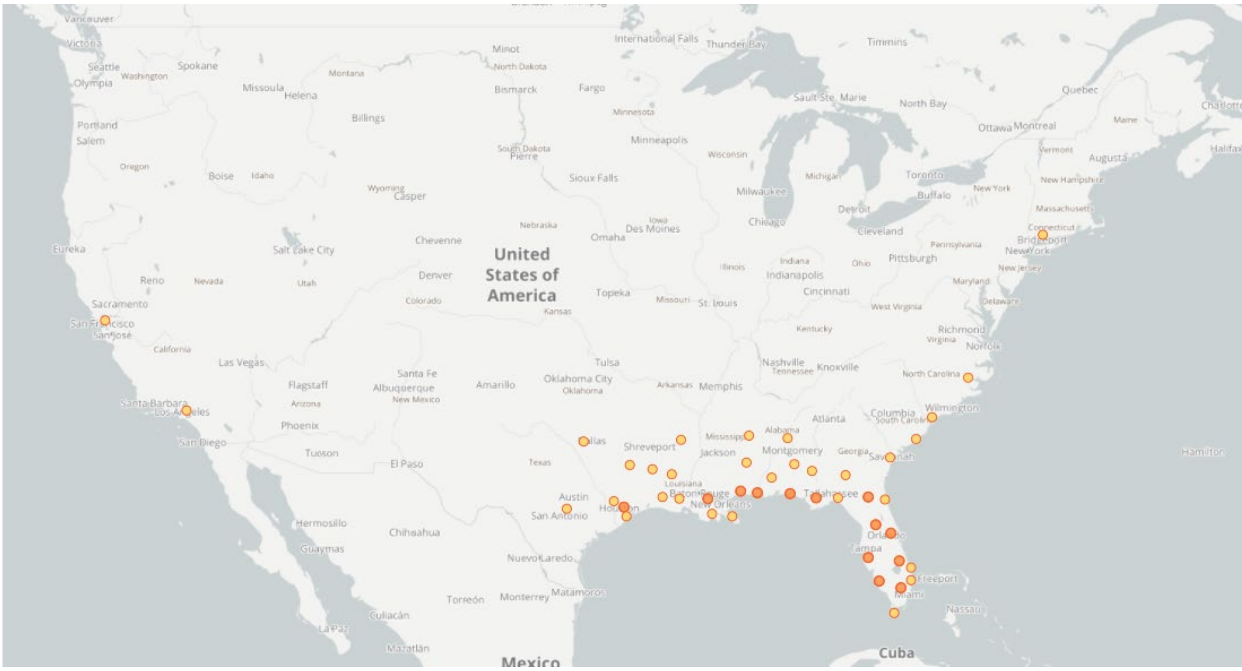


**Figure 2.** Reported distribution of *Panicum repens* in the contiguous United States. Map from GBIF-US (2024). Observations are reported from Alabama, California, Connecticut, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Texas. The observations in California and Connecticut do not represent established populations and were not used in the climate matching analysis.

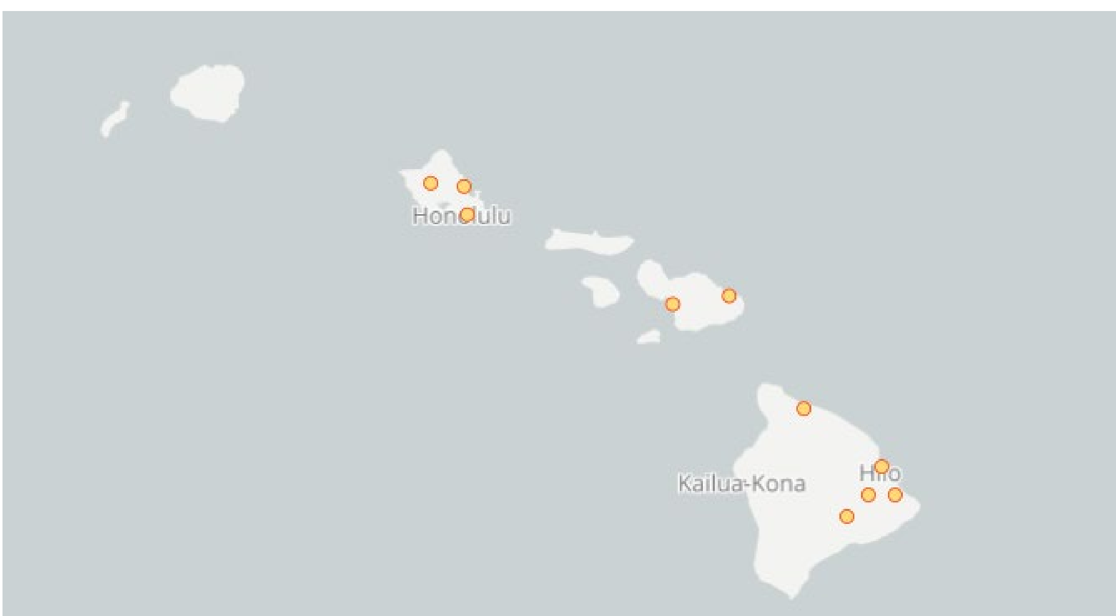


**Figure 3.** Reported distribution of *Panicum repens* in Hawaii. Map from GBIF-US (2024).

# 7 Climate Matching

## Summary of Climate Matching Analysis

The climate matching analysis for *Panicum repens* to the contiguous United States found areas of high match across the Appalachian Range, across the Southeast from Texas to Virginia, and in scattered patches in the Southwest. Most of the remainder of the contiguous United States had a medium climate match with very few small areas of low match. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.859, indicating that yes, there is establishment concern for this species. The Climate 6 score is calculated as: (count of target points with scores $\geq 6$)/(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 *Panicum repens* (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.

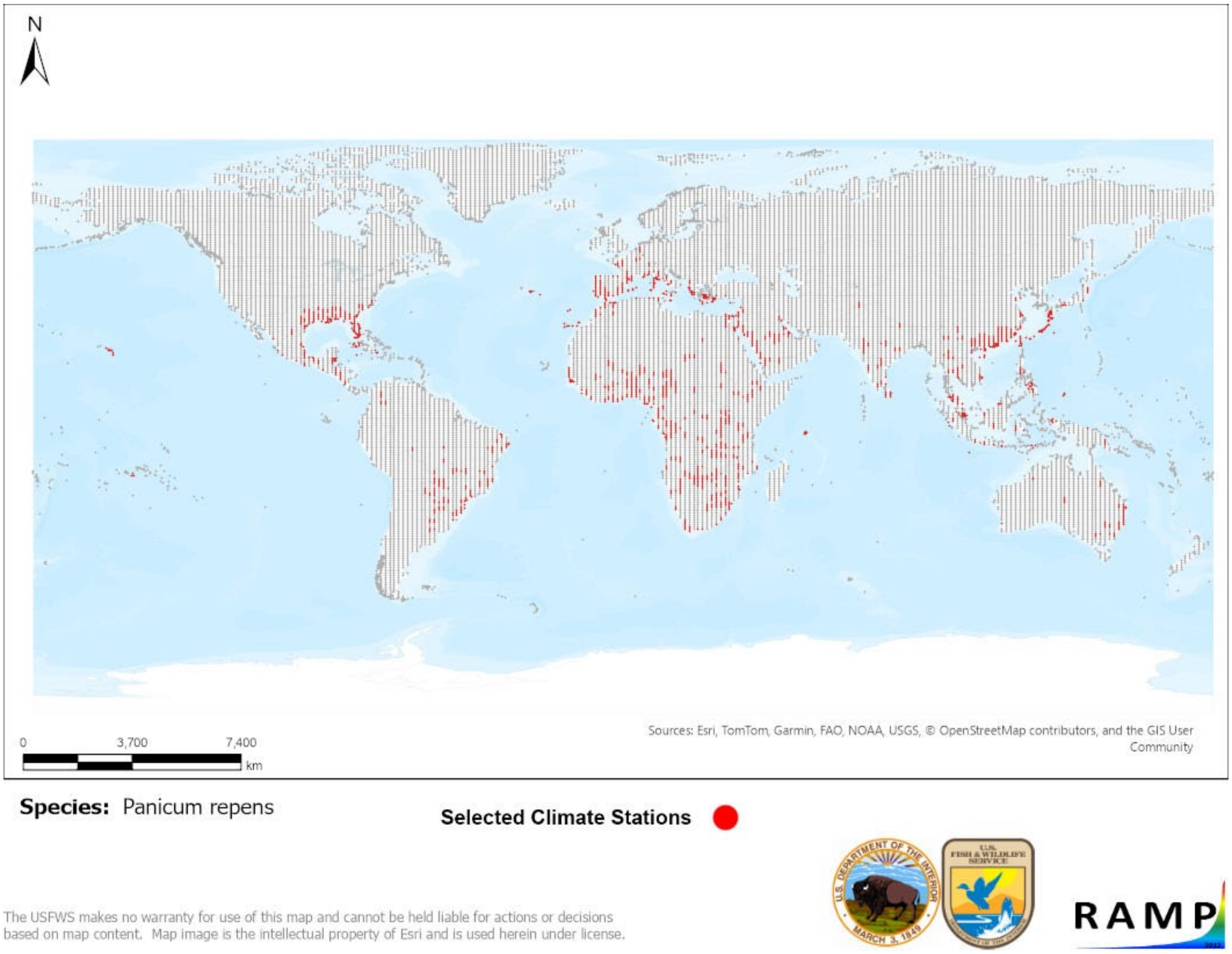


**Figure 4.** RAMP (Sanders et al. 2023) source map showing weather stations in North and South America, Africa, Australia, Europe, and Asia selected as source locations (red; Albania, Algeria, Andorra, Angola, Argentina, Australia, Azores Islands, Bahrain, Belgium, Belize, Benin, Botswana, Brazil, Brunei Darussalam, Burkina Faso, Burundi, Cameroon, Cayman Islands, Central African Republic, Chad, China, Christmas Island, Colombia, Congo, Costa Rica, Cote d'Ivoire, Cuba, Cyprus, Democratic Republic of the Congo, Egypt, El Salvador, Equatorial Guinea, Ethiopia, France, French Polynesia, Gabon, Gambia, Gaza Strip, Ghana, Gibraltar, Greece, Guantanamo, Guatemala, Guinea-Bissau, Honduras, Hong Kong, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Italy, Japan, Jordan, Kenya, Kuwait, Lebanon, Liberia, Libyan Arab Jamahiriya, Macao, Madeira Islands, Malawi, Malaysia, Mali, Malta, Mexico, Monaco, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, Nicaragua, Niger, Nigeria, Pakistan, Palau, Papua New Guinea, Paraguay, Philippines, Portugal, Rwanda, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Swaziland, Switzerland, Syrian Arab Republic, Taiwan, Thailand, Timor-Leste, Togo, Tunisia, Turkey, Uganda, United Republic of Tanzania, United States, Uruguay, Vietnam, West Bank, Yemen, Zambia, and Zimbabwe) and non-source locations (gray) for *Panicum repens* 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.

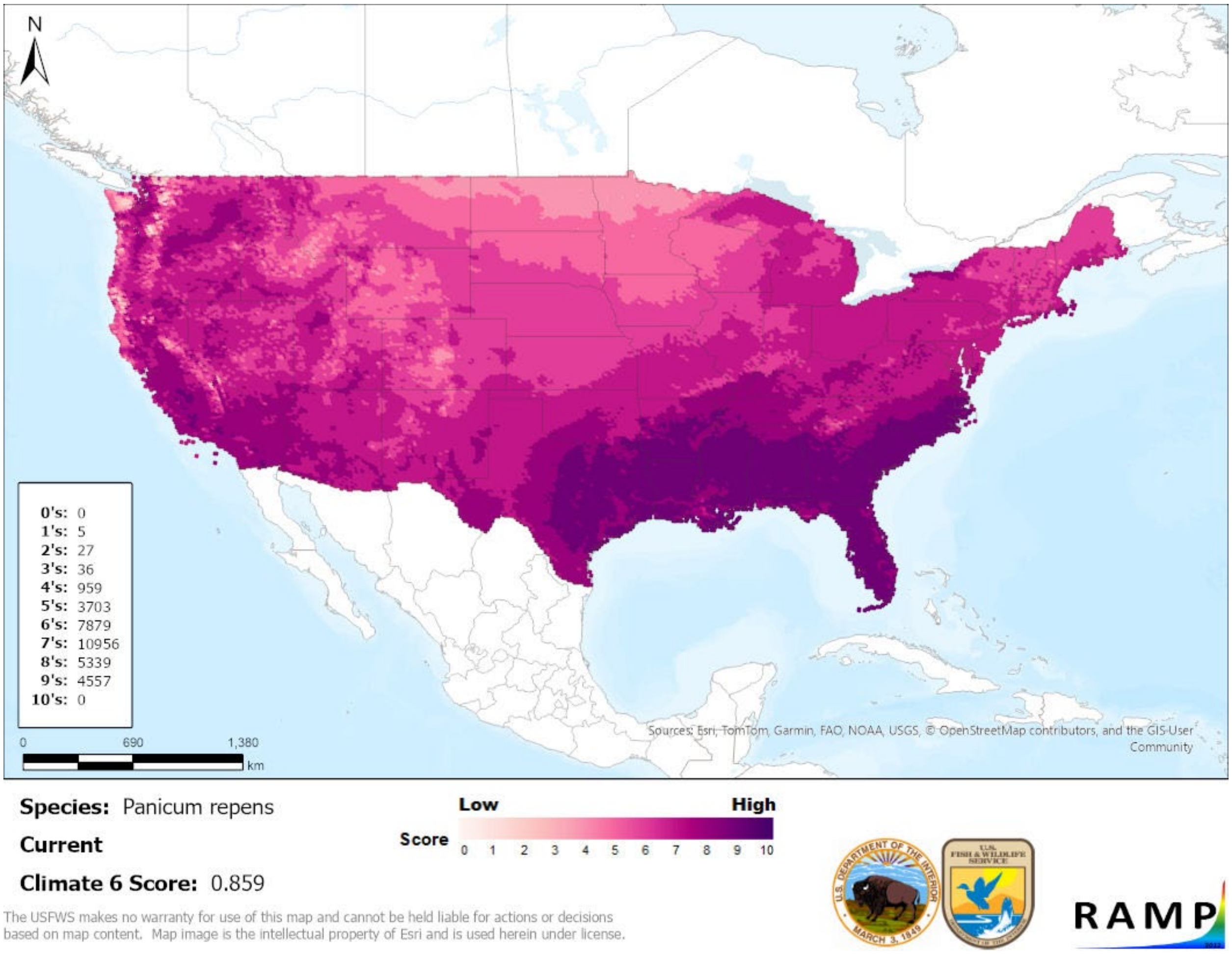

**Figure 5.** Map of RAMP (Sanders et al. 2023) climate matches for *Panicum repens* in the contiguous United States based on source locations reported by GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

# 8 Certainty of Assessment

The Certainty of Assessment for *Panicum repens* is classified as High. There was abundant information on the distribution, ecology, and biology of *Panicum repens*. Records of introductions and established populations were found including information from reliable sources regarding negative impacts from those populations.

# 9 Risk Assessment

## Summary of Risk to the Contiguous United States

*Panicum repens*, Torpedo grass, is a plant that is native to Africa, Asia, and Europe. Torpedo grass is a blade-like grass that grows in tropical and subtropical regions. It has been introduced intentionally and unintentionally in multiple countries with established populations in North and South America as well as elsewhere. There are recorded negative impacts on native vegetation, hydrology, water quality, recreation, agriculture, and possibly livestock. The History of

Invasiveness for *Panicum repens* is classified as High. The climate matching analysis for the contiguous United States indicates establishment concern for this species. Areas of high match were mainly found in the southeastern United States. The Certainty of Assessment for this ERSS is classified as High due to having abundant information regarding *Panicum repens* including reliable sources showing negative impacts. The Overall Risk Assessment Category for *Panicum repens* 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): High**
- **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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# 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 *Panicum repens* was projected to occur in the Appalachian Range, California, Gulf Coast, Mid-Atlantic, Southeast, Southern Atlantic Coast, Southern Florida, and Southwest regions of the contiguous United States. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.826 (model: MPI-ESM1-2-HR, SSP5, 2085) to a high of 0.966 (model: GFDL-ESM4, SSP5, 2085). 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 (0.859, figure 5) 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 Colorado Plateau, Great Lakes, Northeast, Northern Plains, and Southeast saw a moderate increase in the climate match relative to current conditions. No large increases were observed regardless of time step and climate scenarios. Primarily under time step 2085, areas within California, the Gulf Coast, Southeast, Southern Atlantic Coast, Southern Florida, Southern Plains, and Southwest saw a moderate decrease in the climate match relative to current conditions. No large decreases were observed regardless of time step and climate scenarios. Additional very small areas of large or moderate change may be visible on the maps (figure A3).

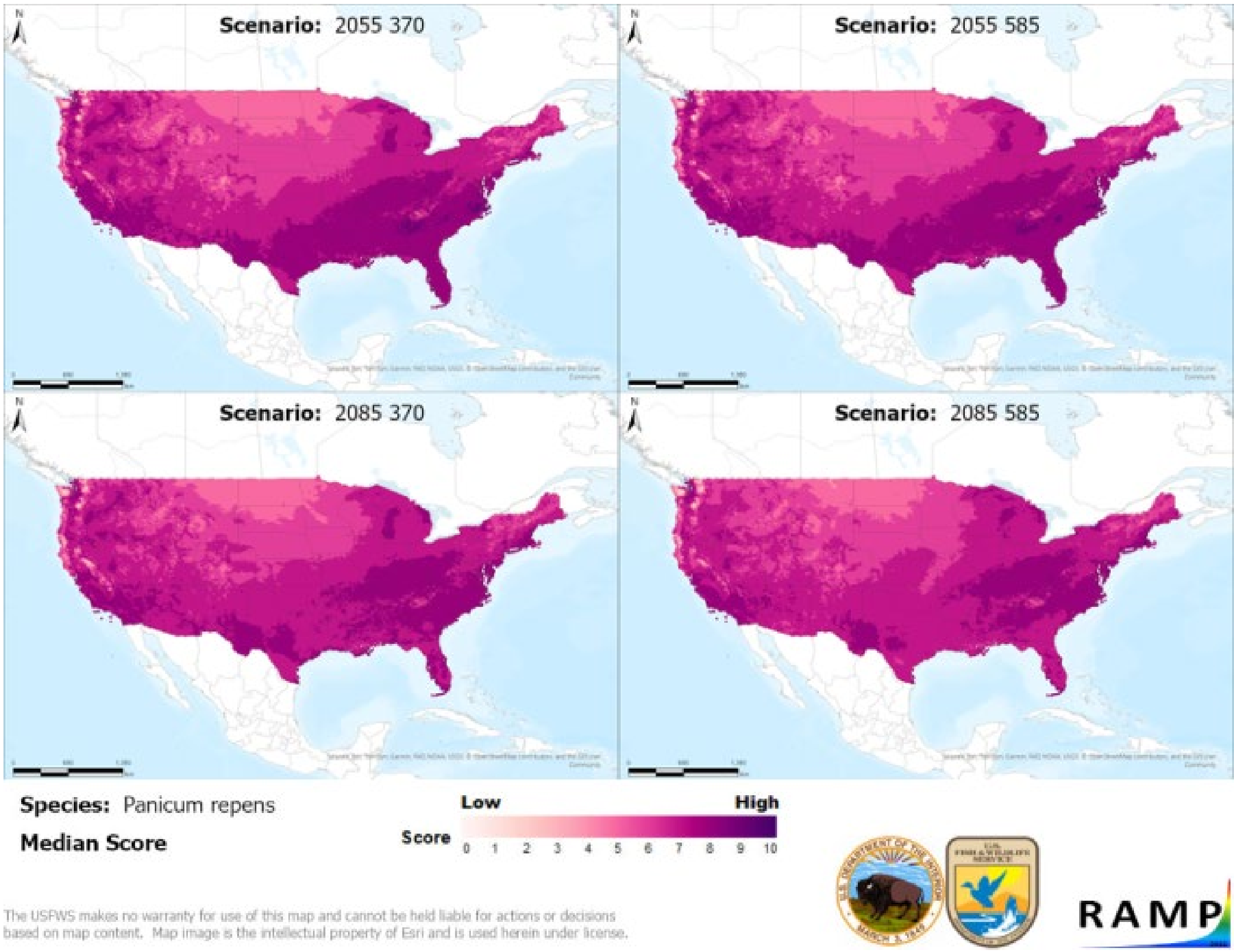


**Figure A1.** Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Panicum repens* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023). Shared 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.

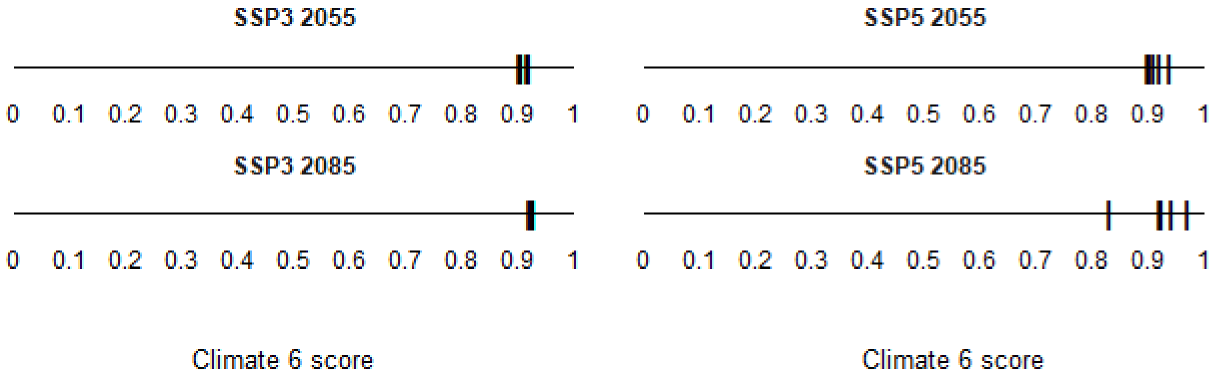


**Figure A2.** Comparison of projected future Climate 6 scores for *Panicum repens* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; 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.

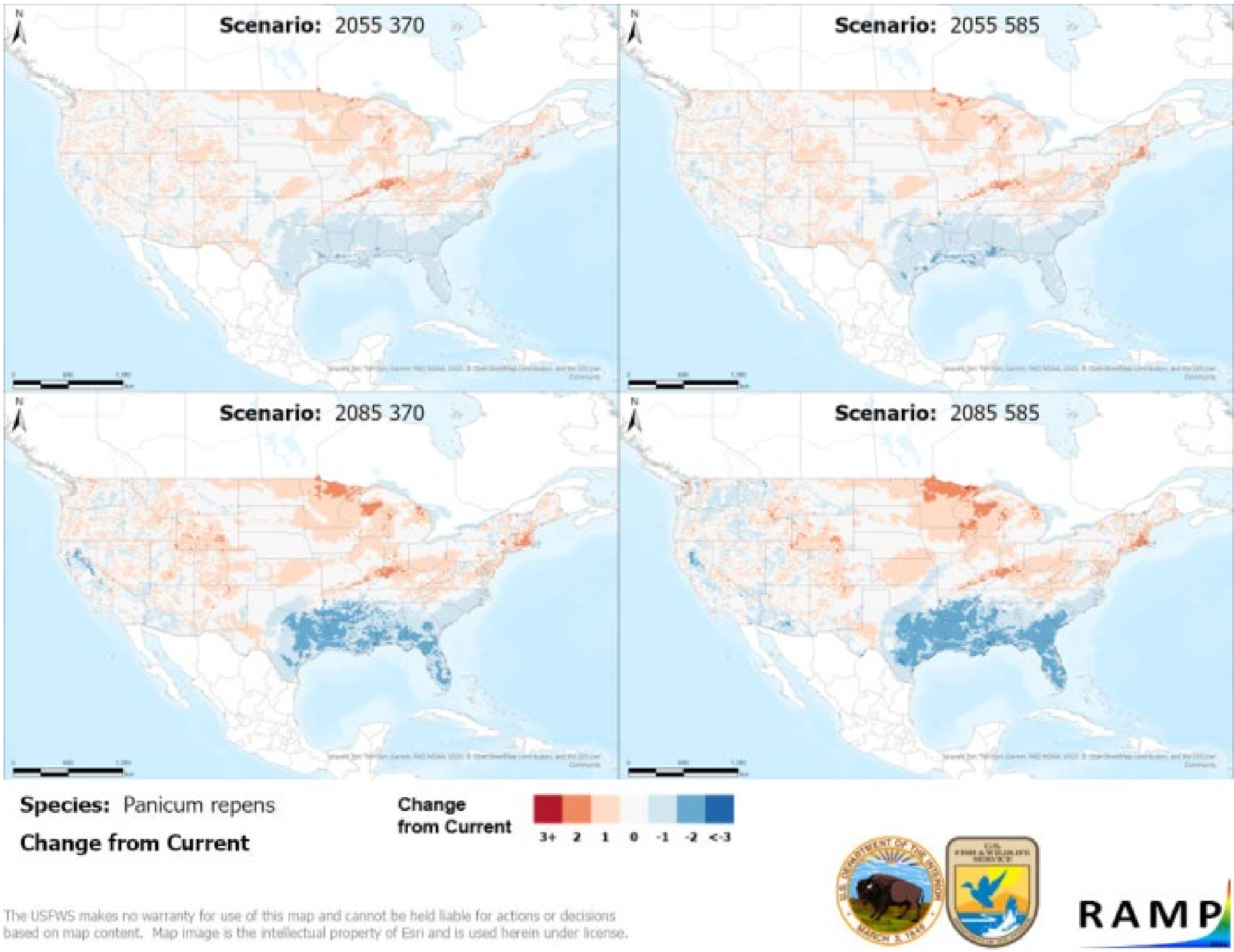


**Figure A3.** RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 5) and the median target point score for future climate scenarios (figure A1) for *Panicum repens* based on source locations reported by GBIF 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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