Common Cordgrass (*Spartina anglica*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, August 2016
Revised, July 2019, August 2019
Web Version, 9/16/2021

Organism Type: Plant
Overall Risk Assessment Category: High

Photo: Jurgen Howaldt. Licensed under Creative Commons Attribution-Share Alike 2.0 Germany. Available: https://commons.wikimedia.org/wiki/File:Spartina_anglica.jpg. (July 2019).

1 Native Range and Status in the United States

Native Range

From Nehring and Adsersen (2006):

"*Spartina anglica* (2n=122-124) was the result of chromosome doubling by *Spartina x townsendii* H. and J. Groves (2n=61-62), the sterile hybrid between the 'native' small cord-grass *Spartina maritima* (Curtis) Fernald (2n=60) and the introduced North American smooth cordgrass *Spartina alterniflora* Loiselle (2n=62) (Gray et al. 1991, Hammond and Cooper 2002). It is not clear whether the small cord-grass (*Spartina maritima*) is an indigenous species in Europe. It is partly suggested that it had been introduced into Atlantic Europe from Africa by shipping (after Wolff 2005)."

Status in the United States

According to Howard (2019), *Spartina anglica* has been reported as non-native in the following States (years of reports and watersheds given after State name):

- California (1977–2011; San Pablo Bay, Tomales-Drake Bays)
- Washington (1962–1995; Puget Sound, Stillaguamish)

According to USDA, NRCS (2019), *S. anglica* is listed as an 'A' designated weed and quarantine species in Oregon, and a Class B noxious weed and wetland and aquatic weed quarantine species in Washington.

From California Department of Food and Agriculture (2015):

"It has been determined that the following species of plants are noxious weeds within the meaning of Section 5004 of the Food and Agricultural Code:
[…]
Spartina anglica (common cordgrass)"

No records of *Spartina anglica* in trade in the United States were found.

Means of Introductions in the United States

From Howard (2019):

"Means of Introduction: Introduced into Washington for bank stabilization and as possible food source for cattle (Murphy et al. 2007). Also, intentionally introduced, probably with seed, during a marsh restoration in the San Francisco Bay (Ayres et al. 2004)."

Remarks

From Howard (2019):

"*S. anglica* is the fertile F2 hybrid which arose between the European native *Spartina maritima* and *Spartina alterniflora* imported from the United States (Ayers and Strong 2001)."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to WFO (2021), *Spartina anglica* C.E.Hubb. is the accepted name for this species.

From ITIS (2019):

Kingdom Plantae
  Subkingdom Viridaeplantae
    Infrakingdom Streptophyta
      Division Tracheophyta
        Subdivision Spermatophytina
          Infradivision Angiospermae
            Class Magnoliopsida
              Superorder Lilianae
                Order Poales
                  Family Poaceae
                    Genus *Spartina*
                      Species *Spartina anglica* C.E. Hubb

Size, Weight, and Age Range

From Hubbard (1968):

"perennial, 30-130cm high"

Environment

From Howard (2019):

"Inhabits low intertidal mud flats to high salt marsh, but grows best in low salinity marshes and open mudflats (Hacker et al. 2001)."

Climate

From CABI (2019):

"*S. anglica* is distributed from 48°N to 57.5°N in Europe, from 21°N to 41°N in China and from 35°S to 46°S in Australia and New Zealand (Gray and Raybould, 1997)."

Distribution Outside the United States

Native

From Minchin (2008):

"A hybrid that developed in Britain."

From Nehring and Adsersen (2006):

"The natural distribution of this fertile hybrid is thought to be between Poole, Dorset, and Pagham, Sussex and possibly northern France (NWCB 2005)."

Introduced
From Minchin (2008):

"Introduced to Denmark, Germany, Ireland, Britain, France, The Netherlands, North America, South Africa, New Zealand, China."

From CABI (2019):

"*S. anglica* is distributed from 48°N to 57.5°N in Europe, from 21°N to 41°N in China and from 35°S to 46°S in Australia and New Zealand (Gray and Raybould, 1997). Climate change is likely to influence the future range of *S. anglica*. Climate changes should therefore be monitored in relation to the distribution of *Spartina* species."

Means of Introduction Outside the United States

From Nehring and Hesse (2008):

"The common cord-grass *Spartina anglica*, a fertile hybrid of *S. maritima* and *S. alterniflora*, was planted in the European Wadden Sea extensively during the late 1920s and 1930s to promote sediment accretion."

Short Description

From Hubbard (1968):

"A deep-rooting perennial, 30-130cm high, spreading by soft stout fleshy rhizomes, forming large clumps and extensive meadows. Culms erect, stout, many-noded, smooth. Leaves green or greyish-green; sheaths overlapping, rounded on the back, smooth; ligules densely silkily ciliate, with hairs 2-3mm long; blades with a fine hard point, 10-45cm long, 6-15mm wide, flat or inrolled upwards, firm, closely flat-ribbed above, smooth, the upper widely spreading. Panicles erect, finally contracted and dense, 12-40cm long, of 2-12 spikes, overtopping the leaves. Spikes erect or slightly spreading, stiff, up to 25cm long; axis 3-angled, smooth, terminating in a bristle up to 5cm long. Spikelets closely overlapping, in two rows on one side of and appressed to the axis, narrowly oblong, flattened, 14-21mm long, mostly 2.5-3mm wide, 1- rarely 2- flowered, falling entire at maturity, loosely to closely pubescent. Glumes keeled, pointed; lower two-thirds to four-fifths the lenght of the upper, 1-nerved; upper as long as the spikelet, lanceololate-oblong, tough except for the membranous margins, 3-6 nerved. Lemma shorter than the upper glume, lanceolate-oblong, 1-3 nerved, with broad membranous margins, shortly hairy. Palea a little longer than lemma, 2-nerved. Anthers 8-13mm long. Grain with a long green embryo, enclosed between the lemma, palea, and glumes. Ch. no. 2n = 122-124"

From Howard (2019):

"Emergent estuarine grass that colonizes within the intertidal zone, ranging between 0.3 and 1.3 meters in height. Spreads aggressively by radial growth of stout, white rhizomes.
Green to grayish-green leaves are flat when fresh, smooth on both upper and lower surfaces, accuminate and 6-15 mm wide at the leaf base and up to 10-45 mm long. Ciliate ligules are 2-3

mm long. Flowers form on numerous erect panicles, consisting of closely overlapping spikelets arranged in two rows on one side of the rachis."

Biology

From GISD (2019):

"*Spartina anglica* spread occurs in two phases, initial invasion and establishment of seedlings or vegetational fragments, and then expansion of tussocks by radial clonal growth (up to 30cm per year). Spreading tussocks fuse to form clumps that can expand into extensive meadows. Expansions may experience a lag phase. When expansions are occurring it can be very rapid."

"*Spartina anglica* is known for the unpredictable production, viability and germination of its seeds. Seed production of *S. anglica* is variable both temporally and spatially (Gray *et al*. 1991). It appears that *S. anglica* has a self-incompatibility system that requires to be broken down for seed set to occur (possibly by higher than average temperatures and humidity). Seed does not set in most years resulting in periods of spread by clonal expansion. Successful seed set has the potential to result in high seed numbers. *S. anglica* can produce up to 5 million spikelets per hectare. Less than 5% of these spikelets are likely to produce viable seed. *S. anglica* seeds do not form a seed bank. Seeds failing to germinate in their first season do not remain viable."

From NWCB (2010):

"Common cordgrass grows in the intertidal zone and can tolerate a wide range of environmental conditions. It can grow in a variety of soils including clays, fine silts, organic muds, sands and shingle. It can tolerate inundation for many hours."

"It can spread by seed, rhizomes, tillering and rhizome fragments."

Human Uses

From Minchin (2008):

"Has been widely used as a plant for stabilising mud and for land accretion to protect coastlines and prevent undue erosion."

From Nehring and Hesse (2008):

"*Spartina anglica* has also been planted for agricultural interests (Gray et al. 1991). A wide variety of livestock (e.g. domestic geese, cattle, sheep, goats, farmed fish) may use *S. anglica* as a food source (Ranwell 1967; Chung 1993). In China, 3.8 million kg of fresh *S. anglica* were cut on an area of 76 ha in 1983 for use as fish food (Chung 1993). *Spartina* biomass could also be used for biofuel production, sewage and pollution treatment, paper making, or mushroom culture (i.e. Oliver 1925; Ranwell 1967; Scott et al. 1990; Chung 2006). On the other hand, the spread of *Spartina* into areas where oysters grow threatens the economic interests of commercial oyster fisheries (Kriwoken and Hedge 2000).

Spartina anglica has also been exploited as a health product. Biomineral liquid from *S. anglica* culms has been put in sodawater, beer, milk, tea, wine and even bathing lotion (Hammond 2001). *Spartina anglica* extracts are reported to improve the immune system, to have anti-inflammatory properties and to have a tonic effect on the heart (Qin et al. 1998). Total flavonoids of *S. anglica* may significantly prevent blood coagulation and encephalon thrombus (Qin et al. 1998). However, a commercial product for all of these applications has not been achieved. In conclusion, it seems that *S. anglica* may provide some economic benefits which should be thoroughly compared with the risks of its uncontrolled propagation. A definitive assessment has not been carried out so far, especially in the case of the Wadden Sea."

"*Spartina anglica* has the potential to be used for economic benefits. Under natural conditions on tidal marshes, vigorous stands will absorb wave energy and trap and stabilise sediments, which made this alien species an interesting tool in coastal protection and land reclamation from the intertidal area (Gray et al. 1991; Chung 1993; Vestergaard 2006). However, the expected effects regarding sedimentation and stabilisation of mudflats in the Wadden Sea did not satisfy the expectations concerning coastal protection. As *S. anglica* prefers a poorly drained, soft, clayey soil and brackish conditions, it developed higher abundances only in sheltered areas and in enclosed basins where there was no existing need for better control of shore-line erosion. Also, its rapid spread in these areas could lessen the quality of the land produced because of a significant increase in silt content. By contrast, on highly erosive coastlines, which are of special interest in coastal protection management, plantations disappeared within several weeks to 2 years because plants were torn out of the soil by the water currents (König 1948; Kamps 1962). König (1948) summarised that "the common cord-grass can not protect any coast, it grows well only there where it is protected itself by the coast". In turn, the occurrence of *S. anglica* often made civil works for land reclamation more difficult and expensive, and rendered foreshores to some extent impracticable for grazing and extraction of turfs (König 1948; Pedersen 1974; Dijkema 1983). Therefore, after two decades of extensive planting of *S. anglica* in the European Wadden Sea, further planting was stopped."

"In contrast to the north European experience, in Chinese coastal waters the benefits of *S. anglica* protection was observed after typhoon events. *S. anglica* areas prevented erosion whereas unvegetated areas were severely scoured (Chung 1993). Because of its hydromorphological effects, *S. anglica* has been used to reduce the source area for silting of navigation channels (Ranwell 1967). However, increased sediment accretion may change water circulation patterns. Large, dense populations of *S. anglica* at or in river mouths may cause particular problems by decreasing flow and drainage, thereby leading to increased flooding, especially during periods of heavy precipitation and/or above normal tides (NWCB 2005). With respect to the predicted rise in sea level and increase in strong winds, the pros and cons of impacts by *S. anglica* on coastal defence have yet to be determined."

Diseases

Poelen et al. (2019) lists *Claviceps purpurea* var. *spartinae* as a pathogen to *Spartina anglica.*

From Nehring and Hesse (2008):

"There are several records of epidemic pathogens of *S. anglica*. The *Spartina* leaf mottle virus was first detected from British waters in 1980 (Jones 1980). In 1999, the virus was found at the German Wadden Sea coast. In some locations, *S. anglica* swards were completely infected (Götz et al. 2000). It is so far unknown what effects or risks have arisen from the infection. The unusual heavy infection in *S. anglica* is most obviously related to the fact that the species tends to occur as dense, monospecific swards, and thus resembles an agricultural crop in its vulnerability to epidemics. Another agent that is suspected to cause damage to *Spartina* spp. is the fungus *Claviceps purpurea*. At the beginning of the 1960s, throughout the British Isles there was a rapid and extensive colonisation of *S. anglica* swards by *C. purpurea* which was accompanied by a significant decline in *Spartina* seed numbers (Thompson 1991; Pažoutová et al. 2002). Only limited evidence is available whether the demand of the fungus on the host's resources may lead to host damage. The extent of the effect is impossible to measure in field populations because it is not possible to discriminate between individual plants (the problem with ramets) (Gray et al. 1991). However, it is as yet unknown whether *S. anglica* populations in the Wadden Sea are infected by *C. purpurea*."

Threat to Humans

From Nehring and Adsersen (2006):

"No significant human health effects have been recorded (Starfinger and Kowarik 2004). However, the leaves of *Spartina anglica* are sharp and stiff. It appears likely that the process of global warming may have a major effect on the future spread of *S. anglica* (Nehring 2003, Loebl et al. 2006). A further increase of the *Spartina* population in the Wadden Sea is expected, probably combined with an increase of cut injuries among walkers and swimmers (Nehring and Hesse 2006)."

3 Impacts of Introductions

From GISD (2019):

"*S. anglica* has been used world-wide as an agent for coastal protection / stabilization and land reclamation. Its invasion and spread leads to exclusion of native plant species such as *Zostera* and *Salicornia* species. It also leads to the loss of feeding habitat for wildfowl and waders. The spread of *S. anglica* also threatens the economic interests of commercial oyster fisheries and tourism industries (due to invasion into amenity areas)."

From Nehring and Adsersen (2006):

"Significant harmful ecological impacts of *S. anglica* are described in general as follows:
1. A loss of valuable habitat for endobenthic invertebrates and for migrating shorebirds and waterfowl;
2. A loss of rearing habitat for fish;
3. Replacement of native plants and more diverse native plant communities; and
4. Alteration the course of succession."

From Howard (2019):

"Accretion and stabilizing of loose sediments (Ranwell 1967, Gray et al. 1991, Thompson 1991); possible exclusion of native plants such as eelgrass (*Zostera marina*), pickleweed (*Salicornia* spp.) and others (Simenstad and Thom 1995); significant effects on sediment accretion, water content, redox potential, and salinity depending on the the [*sic*] type of habitat invaded (Hacker and Dethier 2006)."

From Nehring and Hesse (2008):

"*Spartina anglica* alters the course of succession in the Wadden Sea [...]. Often a dynamic patchwork develops where *S. anglica* patches may alternate with those of native plant species, but locally it may replace native vegetation zones completely by competition for light or space (Dijkema 1983). On upper tidal flats, *S. anglica* supersedes glasswort *Salicornia stricta* […], small seagrass *Zostera noltii* and associated species (König 1948; Dijkema1983; Reise 1994; Loebl 2002; Reise et al. 2005). At higher elevations, *S. anglica* invades former native saltmarsh grass-dominated vegetation and replaces communities with *Halimione portulacoides*, *Puccinellia maritima* or *Artemisia maritima* and others (Anonymous 1973; Gettner et al. 1998). Thus, the establishment of *S. anglica* is perceived as a significant threat to saltmarshes in the Wadden Sea (Gettner et al. 1998)."

"Goss-Custard and Moser (1988) showed a convincing relationship between alteration of habitat in the upper intertidal zone of British estuaries due to *S. anglica* invasion and a decline in wintering bird numbers, such as of the dunlin *Calidris alpina*. Numbers declined at the greatest rate in estuaries where *S. anglica* had changed most during the investigated period but, with some exceptions, hardly changed in those estuaries where *S. anglica* populations were static. These authors suggest that *S. anglica* both removes feeding areas and reduces the time available for adequate feeding, both of which would increase rates of emigration and mortality. The eradication of *S. anglica* using herbicides resulted in the return of waders, including the dunlin, to areas formerly vegetated by this species in Lindisfarne Bay on the British North Sea coast (Evans 1986). *Spartina anglica* invasion into areas of *Zostera* and *Enteromorpha* reduces feeding areas for wildfowl such as brent geese and wigeon (Doody 1990). Conversely, *S. anglica* provides benefits for other bird species with respect to nesting grounds and feeding areas (Zedler 1993)."

"Changes associated with *Spartina* also impact on recreational activities. Formation of large swards would change the aspect of the beach and create a belt with unattractive sedimentation […]. The leaves of *S. anglica* are sharp and stiff resulting in cut injuries among walkers and swimmers. Therefore, leisure activities in the intertidal, such as bathing, walking and fishing, could be negatively impacted by the invasion and continued spread of *S. anglica*, resulting in a potential loss of tourism (Ranwell 1967; Gray et al. 1991; NWCB 2005)."

From Sheehan and Ellison (2015):

"In Australia, *S. anglica* became considered to be an invasive species (Laegdsgaard, 2006, Boon et al., 2014), threatening the ecological integrity of estuarine wetlands of international importance (Wells, 1995, Doody, 2008). Furthermore, sediment buildup and dense vegetation impacted coastal access, brought threats to coastal infrastructure and aquaculture (Kriwoken and Hedge, 2000, Doody, 2008), and resulted in estuarine morphological transformation (Sheehan and Ellison, 2014)."

Spartina anglica is regulated in Oregon, Washington, and California.

4 History of Invasiveness

The common cord-grass *Spartina anglica*, a fertile hybrid of *S. maritima* and *S. alterniflora*, was planted in the European Wadden Sea extensively during the late 1920s and 1930s to promote sediment accretion. It has been further introduced to Denmark, Germany, Ireland, Britain, France, The Netherlands, North America, South Africa, New Zealand, and China. In the United States it was introduced into Washington for bank stabilization and as possible food source for cattle (Murphy et al. 2007). Also, intentionally introduced, probably with seed, during a marsh restoration in the San Francisco Bay (Ayres et al. 2004). Impacts include loss of valuable habitat for endobenthic invertebrates and for migrating shorebirds and waterfowl, loss of rearing habitat for fish, replacement of native plants and more diverse native plant communities, and alteration the course of succession. The history of invasiveness is classified as High.

5 Global Distribution

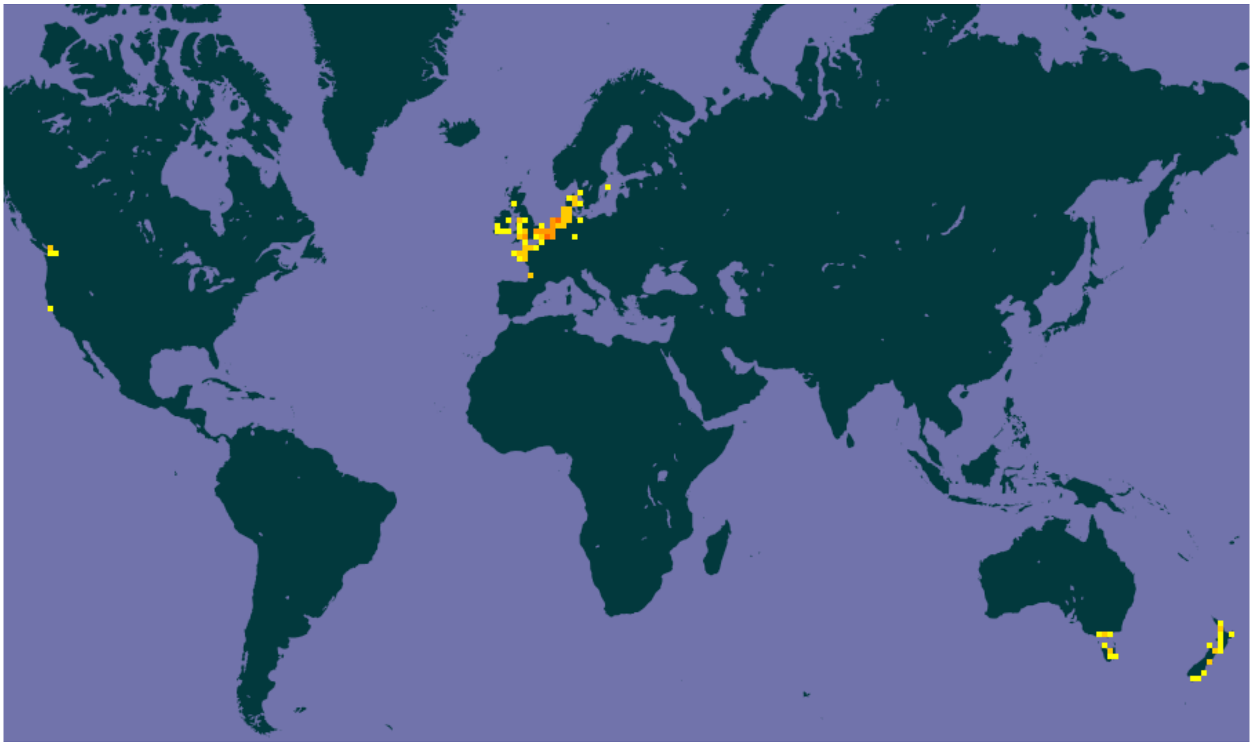

Figure 1. Known global distribution of *Spartina anglica*. Map from GBIF Secretariat (2019).

According to CABI (2019), *Spartina anglica* has been introduced into China, however, there is no additional information on the location of this introduction and resulted in an established population.

6 Distribution Within the United States

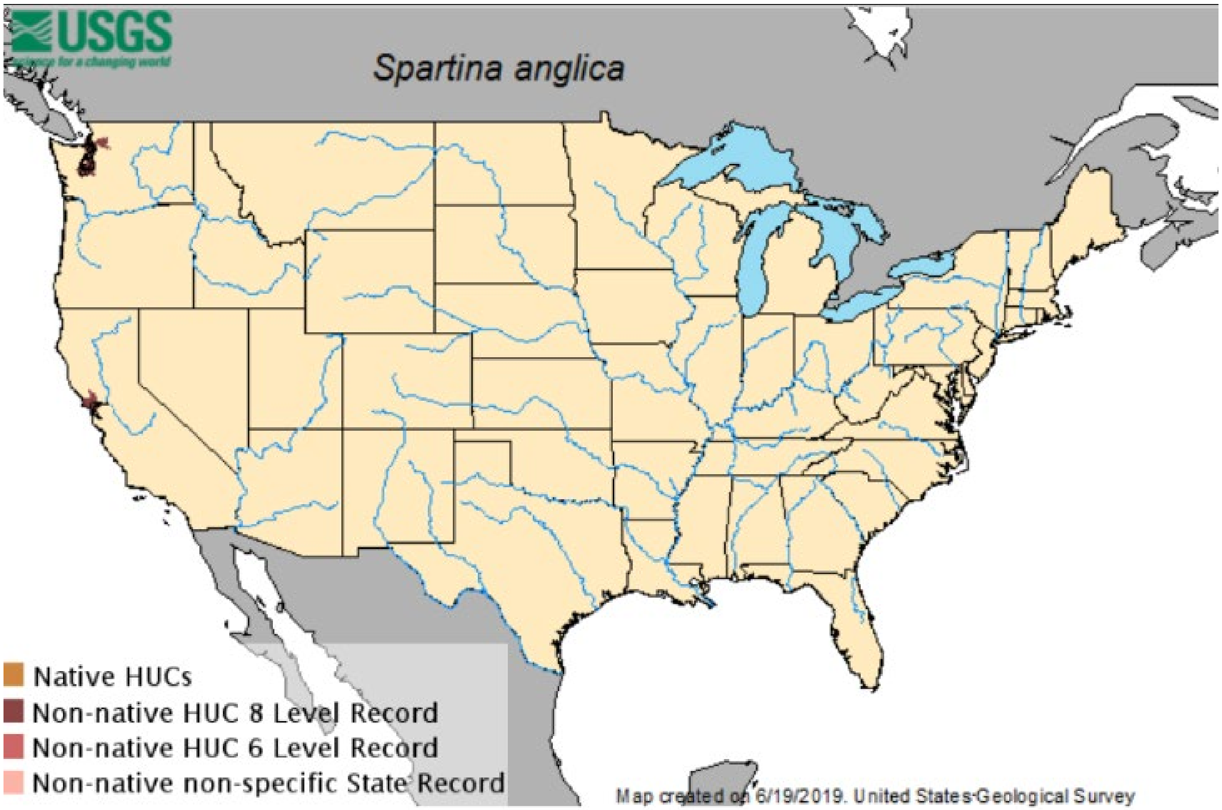

Figure 2. Known distribution of *Spartina anglica* in the United States. Map from Howard (2019).

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Spartina anglica* and the contiguous United States was medium. There were areas of high match along the West Coast, and patches of high match in the Great Lakes region. The upper Midwest, Arizona, New Mexico and Florida had very low match. The overall Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for contiguous United States was 0.042, medium (scores greater than 0.005, but less than 0.103, are classified as medium). Most States had low individual Climate 6 scores. California, Oregon, and Washington had high individual scores and Massachusetts, Michigan, New York, and Rhode Island had medium scores.

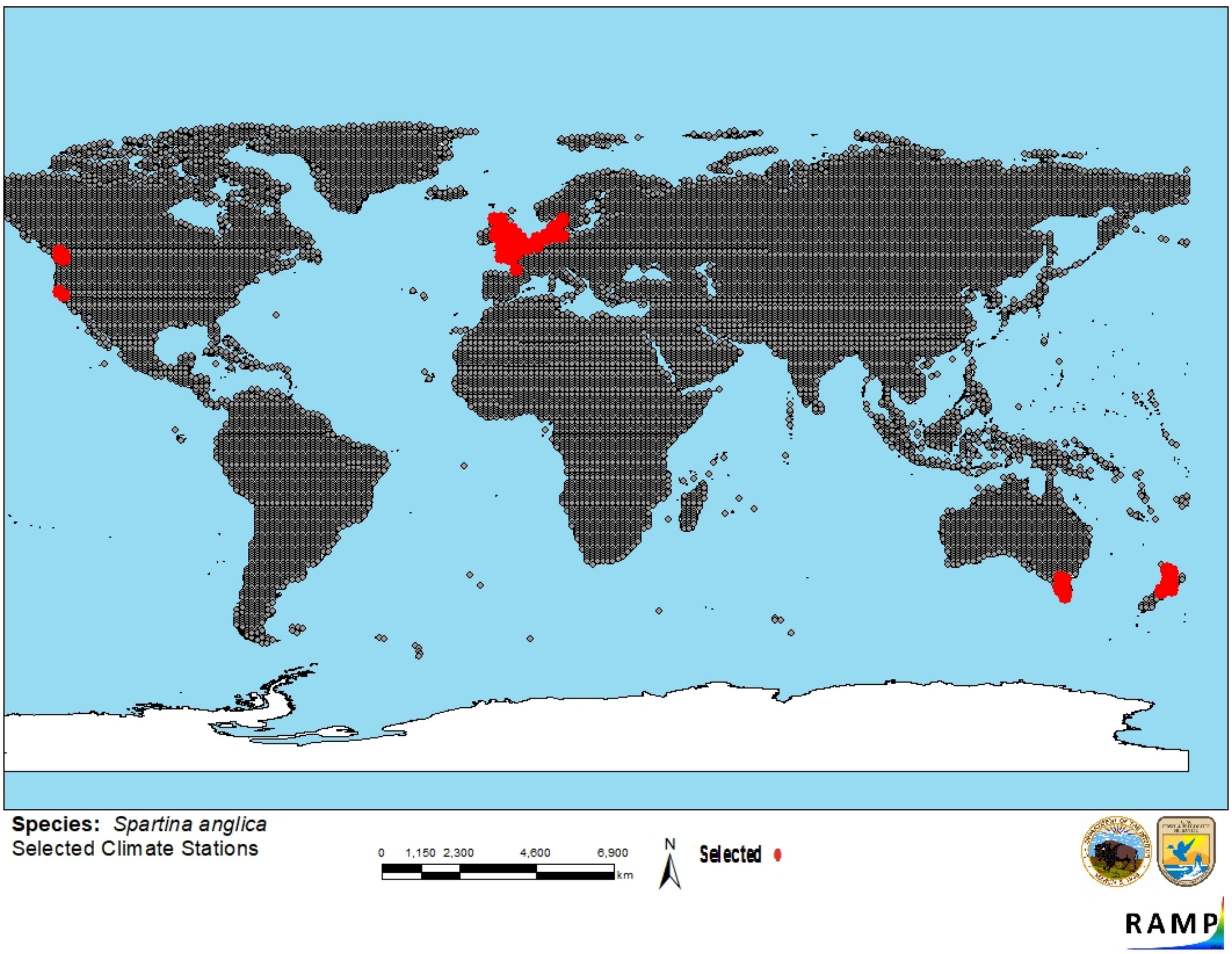

Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *Spartina anglica* climate matching. Source locations from GBIF Secretariat (2019). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

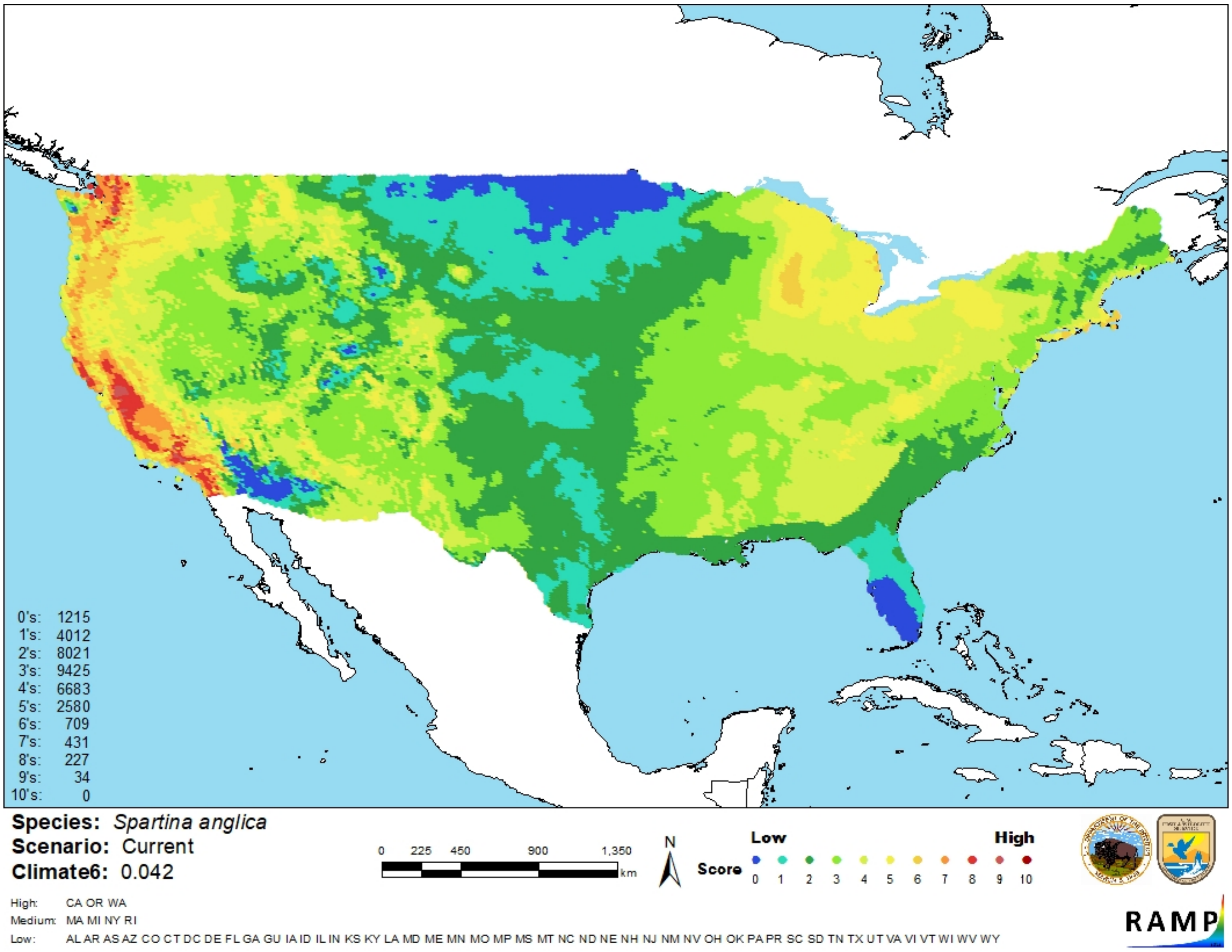

Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Spartina anglica* in the contiguous United States based on source locations reported by GBIF Secretariat (2019). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

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 biology and ecology of *Spartina anglica* are well-known. Negative impacts from introductions and spread of this species are adequately documented in the scientific literature. Certainty of this assessment is high.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Common cordgrass (*Spartina anglica*) is a fertile hybrid that was created from European native *Spartina maritima* and *Spartina alterniflora* which was imported from the United States. *Spartina anglica* is regulated in Oregon, Washington, and California. The history of invasiveness is classified as high. It has been introduced world-wide for coastal protection and stabilization. The introduction has resulted in changes in native plant communities, loss of feeding habitat for wildfowl, and has impacted oyster fisheries and tourism. The climate match for *Spartina anglica* is medium, with California, Oregon, and Washington having individually high climate scores. The certainty of assessment is high. There is a large body of peer-reviewed literature about the species and its invasion history in the United States. The overall risk assessment category is high.

Assessment Elements

- **History of Invasiveness (Sec. 3): High**
- **Overall Climate Match (Sec. 6): Medium**
- **Certainty of Assessment (Sec. 7): High**
- **Remarks/Important additional information:** No additional remarks.
- **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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