Chilean needle grass (*Nassella neesiana*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, June 2015
Revised, April 2018
Web Version, 11/9/2020

Organism Type: Plant
Overall Risk Assessment Category: High

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1 Native Range and Status in the United States

Native Range

From GISD (2017):

"Native to South American countries of Chile, Argentina, Bolivia, Ecuador, Uruguay and Southern Brazil."

From Weeds of Australia (2016):

"Native to South America (i.e. Bolivia, Ecuador, Peru, southern Brazil, Argentina, Paraguay, Uruguay and Chile)."

Status in the United States

From USDA (2013):

"This species was detected on ballast in Mobile, Alabama on or prior to 1953 (USDA-FS, 1953). It is currently listed as established by USDA PLANTS and the BONAP databases in that county (Kartesz, 2013; NRCS, 2013), but a taxonomic evaluation of the Stipeae (Poaceae) in the United States notes that it has not been collected for some time (Barkworth, 1993). This suggests that it has not established in the United States. An online post from a master gardener program in California notes that *N. neesiana* is invasive and is being phased out of cultivation by the nursery industry, suggesting that this species has been cultivated in the United States, at least on a very minor scale (Geisel, 2011). However, we did not find any other information to support cultivation in the United States."

No records of this species in trade in the United States were found.

Means of Introductions in the United States

From USDA (2013):

"This species was detected on ballast in Mobile, Alabama on or prior to 1953 (USDA-FS, 1953)."

Remarks

From GISD (2017):

"Nassella neesiana was previously known as *Stipa neesiana*. It is difficult to distinguish from native Stipas."

From Weeds of Australia (2016):

"Common names
Chilean needlegrass, Chilean speargrass, spear grass, Uruguayan tussockgrass"

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 Lilianae
Order Poales
Family Poaceae
Genus *Nassella*
Species *Nassella neesiana* (Trin. & Rupr.) Barkworth

Size, Weight, and Age Range

From GISD (2017):

"Perennial tussock forming C3 grass of up to 1 m high. Flat leaves 1-5 mm diameter, strongly ribbed on adaxial surface with rough margins. Infloresence an open panicle; stem seeds (cleistogenes) are also produced (Gardner 1998)."

From Faithfull (2012):

"*Nassella neesiana* tussocks are "very hardy" and long-lived (Storrie and Lowien 2003) with over 70% of plants surviving over 3 years (Gardener et al. 1999) and individuals having a longevity of over 20 years (Benson and McDougall 2005)."

Environment

No information was available about specific environmental requirements for *Nassella neesiana*.

Climate

From GISD (2017):

"In Australia it invades […] temperate regions with more than 500mm rainfall (Gardner 1998)."

From Weeds of Australia (2016):

"[…] semi-arid and sometimes also drier sub-tropical regions."

Distribution Outside the United States

Native

From GISD (2017):

"Native to South American countries of Chile, Argentina, Bolivia, Ecuador, Uruguay and Southern Brazil."

Introduced
From GISD (2017):

"Naturalized populations now occur in Australia (Gardner and Sindel 1998), New Zealand (Bourdot and Hurrell 1992) and England (Stace 1977)."

From Bourdôt et al. (2010):

"*Nassella neesiana* (Trin. and Rupr.) (Chilean needle grass), native to South America, has naturalised sporadically in the UK, France, Italy and Spain, and more widely in Australia and New Zealand, where it has become a serious grassland weed."

Means of Introduction Outside the United States

From Faithfull (2012):

"The origins, mode of entry and dates of first establishment of Australian *N. neesiana* remain unknown (Grice 2004, McLaren et al. 2004)."

From USDA (2018):

"We found some evidence this species is cultivated elsewhere (Bourdôt et al., 2012) and is positively valued (Vidal et al., 2011), so it may be intentionally introduced as a plant for planting. *Nassella neesiana* may also enter as a contaminant through several other pathways, including hay, seeds for planting, machinery, clothing, wool, hides, and ship ballast (Gardener et al., 2003a; Haywood and Druce, 1919; Slay et al., 1999; Verloove, 2005; Weller et al., 2012)."

Short Description

From Weeds of Australia (2016):

"a densely tufted long-lived grass with upright or arching stems growing 30-120 cm tall."

"its linear leaves (1.5-5 mm wide) are either flat or rolled inwards."

"its seed-head is a loose, and either upright or nodding, branched panicle (5-40 cm long) with many flower spikelets that are borne singly."

"these flower spikelets are elongated in shape (10-22 mm long) and topped by a large twisted awn (45-80 mm long)."

"the mature seed has a small membranous crown-like structure (about 1 mm long) where the awn attaches to the top of the seed."

"this species also produces 'stem seeds' within the leaf sheaths."

Biology

From GISD (2017):

"Reproduces by sexual (chasmogamous) and asexual (cleistogamous) seed production. The cleistogenes are formed in the leaf sheaths and culms while the chasmogenes are found in the infloresence (Gardner 1998). Up to 22,000 chasmogamous seeds/plant/year can be produced (Bourdot and Hurrell 1992). Production of the asexual seeds is a common response following slashing, grazing or fire (Gardner 1998). Peak flowering of Chilean needle grass in Australia occurs between November and February (Gardner 1998), however it has the ability to flower all year round (Ens 2002). The seed bank has been estimated to potentially persist in the soil for up to 12 years even with annual glyphosate application (Bourdot and Hurrell 1992)!"

"agricultural areas, natural forests, range/grasslands, riparian zones, ruderal/disturbed, scrub/shrublands, water courses."

From USDA (2018):

"Seeds readily attach to animal fur (Gardener et al., 2003a); disperse on field equipment (Grech et al., 2010); contaminate hay, wool, hides, and seeds for planting (Haywood and Druce, 1919; Slay et al., 1999; Weller et al., 2012); and disperse in floodwaters (Bourdôt et al., 2012)"

Human Uses

From Gardener et al. (2005):

"It is readily grazed, produces good quality feed, is perennial and has the ability to persist during heavy grazing and drought (Fernandez et al. 1986), suggesting that it is a useful pasture plant."

Diseases

No information on pathogens or parasites of *Nassella neesiana* was found.

Threat to Humans

No information on threats to humans from *Nassella neesiana* was found.

3 Impacts of Introductions

From GISD (2017):

"Nassella neesiana has the tendency to replace native flora (Agriculture and Resource Management Council of Australia and New Zealand et al. 2000, Ens 2002), reduce ant abundance and alter the entire invertebrate community composition in conservation areas (Ens 2002). Potential distribution overlaps an array of threatened species in Australia (Thorpe and Lynch 2000). Agricultural productivity is thwarted by the replacement of palatable ground cover, injury to stock, reduction of produce quality and increased management costs (Thorpe and Lynch 2000). Some sheep grazers in eastern Australia have been forced to switch to beef production (Thorpe and Lynch 2000)."

From Faithfull et al. (2008):

"Chilean needle grass (*Nassella neesiana*) is highly invasive in temperate native grasslands of south-eastern Australia. Its impact on plant biodiversity was quantified by assessing foliar cover and species diversity of other vascular plants inside, on the margins of, and outside *N. neesiana* patches in a degraded *Themeda triandra* grassland at Yarramundi Reach, Australian Capital Territory. Early results indicate that the presence of *N. neesiana* correlates with reduced native plant diversity and increased exotic plant diversity."

From Faithfull (2012):

"*Nassella neesiana* was found to deplete soil water in spring compared to *T. triandra*, a likely mechanism of biodiversity impact. Areas occupied by *N. neesiana* in three disparate grasslands were found to have significantly reduced native vascular plant diversity (species m-2). Diversity decreased with increasing size of the *N. neesiana* patch. Forbs were the most affected group but one or more dominant grasses were absent at the smallest patch sizes. Analysis of sweep net samples determined that invertebrate populations and species richness were significantly reduced in *N. neesiana* grassland, although numerous native insect species consume the plant."

From USDA (2018):

"Furthermore, the sharp seeds wound animals and leads to the downgrading of wool, skins (hides), and carcasses (Bourdôt, 2010; Bourdôt et al., 2012; Gardener et al., 2003a; Storrie and Lowien, 2003)."

4 History of Invasiveness

Nassella neesiana has been reported outside of its native range, including the United States, but it is apparently not established in the United States. *Nassella neesiana* has invaded Australia, New Zealand, and numerous European countries where it has become a serious grassland weed. There is some indication that the plant is cultivated, but it is not clear. Other pathways may be hitch hiking or are unknown. No clear information is available on trade of this species. Impacts in its invaded range include indirectly altering agriculture practices, overlaps with imperiled species, and altering soils. The literature documents well a high history of invasiveness.

5 Global Distribution

Figure 1. Known global distribution of *Nassella neesiana*. Map from GBIF Secretariat (2018)

6 Distribution Within the United States

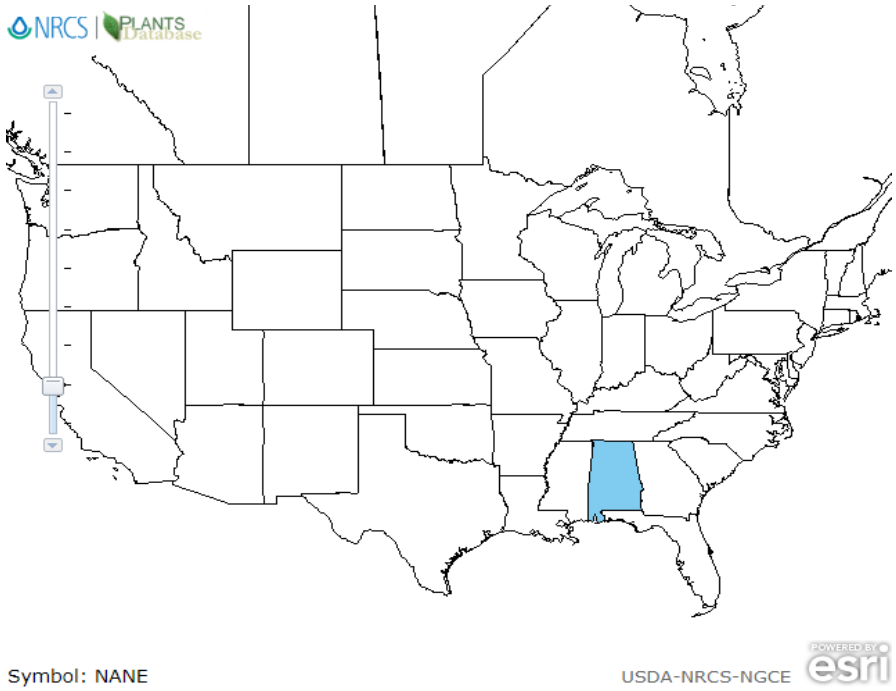

Figure 2. Known distribution of *Nassella neesiana* in the United States. Map from USDA, NRCS (2018).

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Nassella neesiana* was high in the south and along most of the Pacific Coast. There were areas of low match in northern New England, the upper Midwest, and small patches in the Great Plains. All other areas had a medium match. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous United States was 0.294 which is "High" (scores 0.103 and greater are classified as high). The following states had high individual climate scores: Alabama, Arizona, Arkansas, California, Colorado, Delaware, Florida, Georgia, Kansas, Louisiana, Maryland, Massachusetts, Mississippi, New Mexico, North Carolina, Oklahoma, Oregon, South Carolina, Texas, Utah, Virginia, Washington, and West Virginia.

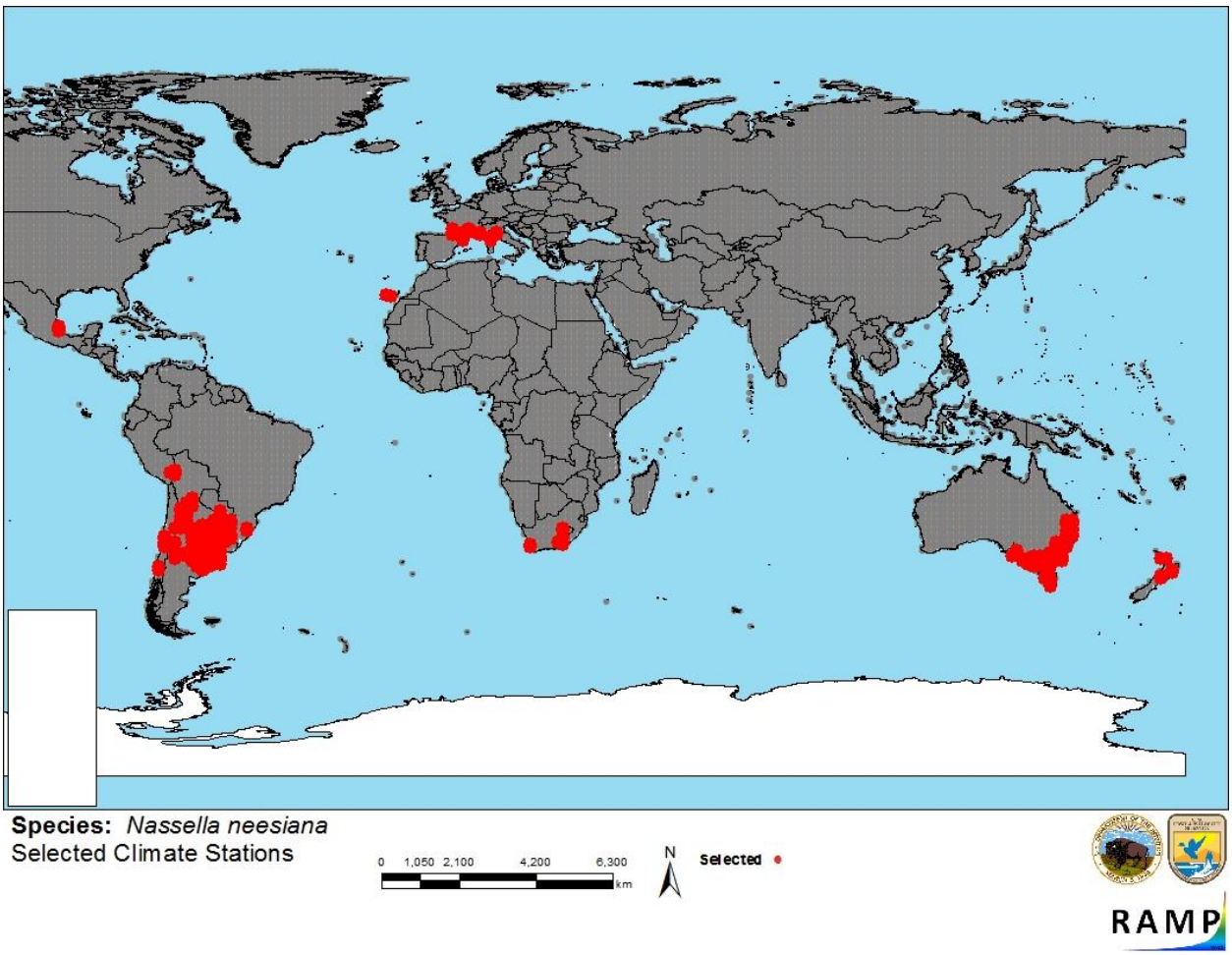

Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations in Australia, New Zealand, South Africa, Mexico, Chile, Argentian, Bolivia, Ecuador, Uraguay, France, Italy, Spain and the United Kingdom selected as source locations (red) and non-source locations (gray) for *Nassella neesiana* climate matching. Source locations from GBIF Secretariat (2018). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

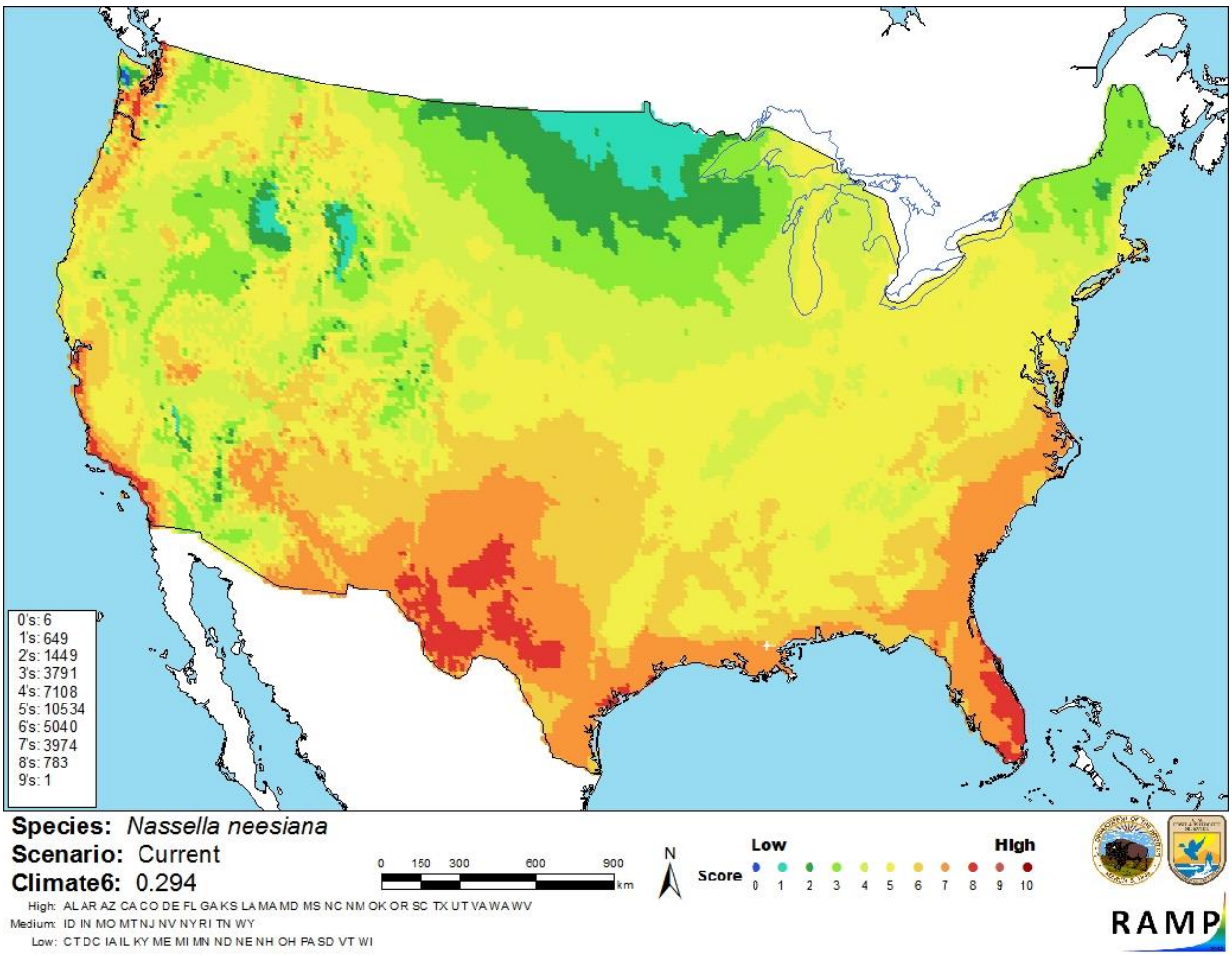

Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *Nassella neesiana* in the contiguous United States based on source locations reported by GBIF Secretariat (2018). Counts of climate match are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match

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 certainty of assessment is medium. Available peer reviewed information on the invasion history and ecological impacts of this species is not conclusive. Grey literature is available that documented actual, negative impacts of introductions of this species.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Nassella neesiana is a grass native to parts of South America. *N. neesiana* has the ability to produce seeds through both asexual and sexual mechanisms. This species is used to support livestock as it can withstand heavy grazing. Little peer reviewed information is available on *N. neesiana* despite its spread and suspected impacts in some grassland environments. However, there is enough information to classify its History of Invasiveness as "high" and the available information is scientifically credible. *N. neesiana* lowers native biodiversity and may reduce the soil water content for other species when compared to native species. Climate matching indicated the contiguous United States has a high climate match. The areas of highest match were in the south and along the Pacific Coast. The certainty of assessment is medium due to most of the impact information coming from grey literature. The overall risk assessment category is High.

Assessment Elements

- **History of Invasiveness (Sec. 4): High**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 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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