

Watercress (*Nasturtium officinale*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, May 2012

Revised, April 2018

Web Version, 2/4/2019



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1 Native Range and Status in the United States

Native Range

From Cao and Berent (2018):

“Eurasia & Asia”

From CABI (2018):

“It is apparently native to much of European and Asian countries, stretching from the British Isles probably as far as western China.”

Status in the United States

Cao and Berent (2018) report occurrences in all 48 contiguous states. More detailed information can be found on the USGS Nonindigenous Aquatic Species website:
<https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=229>.

USDA NRCS NPDT (2018) include all contiguous states except for North Dakota.

From Cao and Berent (2018):

“Established. Naturalized throughout North America, north to Alaska.”

This species is currently available for purchase within the United States.

Means of Introductions in the United States

From Cao and Berent (2018):

“Intentionally introduced by green industry and cultivation. Fragments are dispersed unintentionally by wind, water, and animals.”

Remarks

ITIS (2018) lists *Rorippa nasturtium-aquaticum*, *Nasturtium nasturtium-aquaticum*, *Sisymbrium nasturtium-aquaticum*, and *Nasturtium officinale* var. *siifolium* as synonyms for *Nasturtium officinale*. Information searches included checks under all reported species synonyms for *N. officinale*.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Kingdom Plantae
Subkingdom Viridaeplantae
Infrakingdom Streptophyta
Division Tracheophyta
Subdivision Spermatophytina
Infradivision Angiospermae
Class Magnoliopsida
Superorder Rosanae
Order Brassicales
Family Brassicaceae

Genus *Nasturtium*
Species *Nasturtium officinale*”

“Taxonomic status: valid”

Size, Weight, and Age Range

From Cao and Berent (2018):

“It can grow to a height of 50-200 cm, with a stem up to 20 mm in diameter and with leaves up to 27 cm in length.”

Environment

From CABI (2018):

“*N. officinale* occurs at the edges of rivers, streams, ditches and springs, but not in stagnant water (Howard and Lyon, 1952b). It grows on gravel, sand, silt or clay but not on acid or alkaline peats. It prefers to grow in slow-flowing, clean water 5-10 cm deep with an optimum pH of 7.2, favouring streams fed from springs originating from chalk or limestone substrata.”

“Going et al. (2008) investigated the effects of shading on *N. officinale* and found that total biomass and root biomass decreased with decreasing light levels, and that the species displayed considerable morphological plasticity, acclimatising to low light conditions primarily by increasing leaf area and canopy surface area.”

Climate/Range

From Cao and Berent (2018):

“A relatively high humidity is required for optimum growth (Howard and Lyon 1952).”

Distribution Outside the United States

Native

From Cao and Berent (2018):

“Eurasia & Asia”

From CABI (2018):

“It is apparently native to much of European and Asian countries, stretching from the British Isles probably as far as western China.”

Introduced

From CABI (2018):

“*N. officinale* has been introduced to east and southeast Asia, sub-Saharan Africa, the Americas and the Caribbean, Australia, New Zealand and some Pacific islands (Weeds of Australia, 2013; PIER, 2014; USDA-ARS, 2014; USDA-NRCS, 2014).”

Means of Introduction Outside the United States

From CABI (2018):

“It has been deliberately introduced as a leafy vegetable to east and southeast Asia, sub-Saharan Africa, the Americas and the Caribbean, Australia, New Zealand and Pacific islands. *N. officinale* is now found as a fast-growing environmental weed in parts of North America, Australasia and southern Africa. In some of these regions it has spread to invade waterways and swamp existing native vegetation, and it may smother native communities, altering their structure and composition.”

“*N. officinale* seeds and stem fragments are commonly spread by water, especially during floods (Weeds of Australia, 2014).”

“*N. officinale* seeds and stem fragments can become attached to the feet of animals, including birds, which could then transport these propagules both locally and, possibly, for long distances. Seeds and fragments may be dispersed in mud attached to animals (Weeds of Australia, 2014).”

“Accidental contamination of aquarium plants or animals could spread the species.”

“*N. officinale* is commonly cultivated for human consumption as a vegetable and for medicinal purposes, and could become even more widely dispersed by human agency. Although it can certainly be considered invasive, its benefits are usually thought to outweigh possible costs of its invasiveness.”

Short Description

From Cao and Berent (2018):

“Water cress is a fast-growing, aquatic or semi-aquatic, perennial herb. Floating or prostrate in mud. Stems succulent, hollow, and much branched, 1 to many, 4–25 in. long, rooting at nodes. Leaves pinnately divided; leaflets 3–7, oval to egg-shaped, entire to wavy-edged. Flowers small (6 mm, diameter) in terminal clusters, white. Sepals, erect, green, about 3 mm long; petals white, about 4 mm long and 4 long stamens attached near their bases to the filaments. Ovary about 3 mm long, style short, stigma with two lobes. Fruits borne on spreading pedicels and slightly curved upward. The double row of seeds in each half of the silique is a well marked character. The valves of the ripe silique beaded; seeds suborbicular and compressed, with 25 alveoli on each side of the testa.”

Biology

From Cao and Berent (2018):

“Well-suited to water that is slightly alkaline. Water cress grows at the edges of slow-flowing water in lakes, reservoirs, streams, rivers, either just below or above water level. The depth of water in commercial watercress beds is about 3-6 in. It is usually absent from stagnant water. Watercress appears to be intolerant of heavy shade. A relatively high humidity is required for optimum growth. It is mainly a lowland species but is said to extend up to 6500 ft. Flowering time: March to October. Grows throughout winter, continually occupying surface space in SW Wisconsin. Most abundant in summer and autumn.”

From CABI (2018):

“As a long day plant, *N. officinale* flowers as day length increases, and flowering tends to occur in mid to late summer (Bleasdale, 1964). Flowers are self- or cross-pollinated. Insects are the main pollination agents (Johnson, 1974). Seed pods shatter open and scatter seed when they are ripe, with most seeds falling close to the parent plant. A proportion of the seeds can float for 12 hours or even longer (Howard and Lyon, 1952). Seed production is high, at about 29 seeds per fruit and 20 or more fruits per inflorescence (Howard and Lyon, 1952b).”

“Seeds germinate soon after being shed, giving 92-100% germination within a week on moist filter paper in the light. Seed is viable for up to about 5 years when stored dry in packets in the laboratory, but apparently loses viability with longer storage (Howard and Lyon, 1952b).”

Human Uses

From CABI (2018):

“*N. officinale* is commonly grown as a crop for human consumption in salads or as a vegetable. In South Africa, controlled cultivation is permitted, despite the plant being classed as a Category 2: declared invader (Henderson and Cilliers, 2002). Watercress sprouts are commercially produced and harvested within a few days of germination.”

From Cao and Berent (2018):

“Rich source of potential anticarcinogen; Edible green used in salads, cooking; Homeopathic properties; Wastewater treatment.”

Diseases

From CABI (2018):

“Diseases of watercress include Cercospora leaf spot (*Cercospora nasturtii*), which largely affects older leaves in areas of high humidity, and Septoria leaf spot (*Septoria sisymbrii*) (Andrianova and Minter, 2004). Black rot (*Xanthomonas campestris*) is common in outdoor crops under prolonged rainy periods and high humidity. *Pythium ultimum*, or 'damping off' disease, is a common problem in watercress production, particularly in young or weakened

plants. Crook-root is a disease caused by a water-borne fungus (*Spongospora subterranean* f. sp. *nasturtii*) which causes the root to swell, distort and become brittle. Watercress yellows is a serious disease of watercress grown in Hawaii that causes reduced leaf size, leaf yellowing and crinkling, and witches' brooms.”

Threat to Humans

From CABI (2018):

“One of the downsides of consumption of wild-growing watercress is that it often carries the common liver fluke (*Fasciola hepatica*) if growing in places near where livestock graze. The alternate hosts of the fluke are water snails, which often live on watercress and can therefore pass the infection on to humans, where it can cause fasciolosis. The disease is rare in some countries, but more prevalent in others. It is a major health problem in Bolivia, Ecuador and Peru, the Nile Delta in Egypt, and central Vietnam (WHO, 2007). Cooking watercress kills the parasite.”

3 Impacts of Introductions

From CABI (2018):

“*N. officinale* is now found as a fast-growing environmental weed in parts of North America, Australasia and southern Africa. In some of these regions it has spread to invade waterways and swamp existing native vegetation, and it may smother native communities, altering their structure and composition.”

“*N. officinale* is one of the worst weeds in cultivated beds of brown cress (*N. x sterile*) in the UK, since it grows taller and faster than brown cress and tends to crowd it out (Howard and Lyon, 1952b).”

“When first introduced to areas outside its native range, watercress reportedly often becomes rampant, and expensive measures have been taken to control it. In 1899 near Concord, Massachusetts, USA, watercress was so abundant that it was removed in cartloads to prevent the stream from flooding the nearby area (IPANE, 2014). Similarly in New Zealand, following its introduction in 1840, ‘by 1864 its control/eradication in the Avon River was costing more than £300 per annum, a large sum and financial burden’ (Healy 1996). Since *N. microphyllum*, *N. officinale* and *N. x sterile* were not described separately until the 1940s (Howard and Lyon, 1952a), it is impossible to know which of the present-day species was responsible for these problems. However, their effects are nowhere near so severe in modern times, and in many places watercress has been partly displaced by other species of aquatic plants.”

“According to Howard and Lyon (1952a), quoting Barkworth (1938), *N. officinale* may taint milk if eaten by cattle.”

From Cao and Berent (2018):

“Water cress may be a noxious weed or invasive. In arid regions of western states, it can alter function and block streams. It was reported to block water flow in springs in South Central Wisconsin. Extracts can attract schistosomiasis host *Biomphalaria glabrata* (snail).”

4 Global Distribution

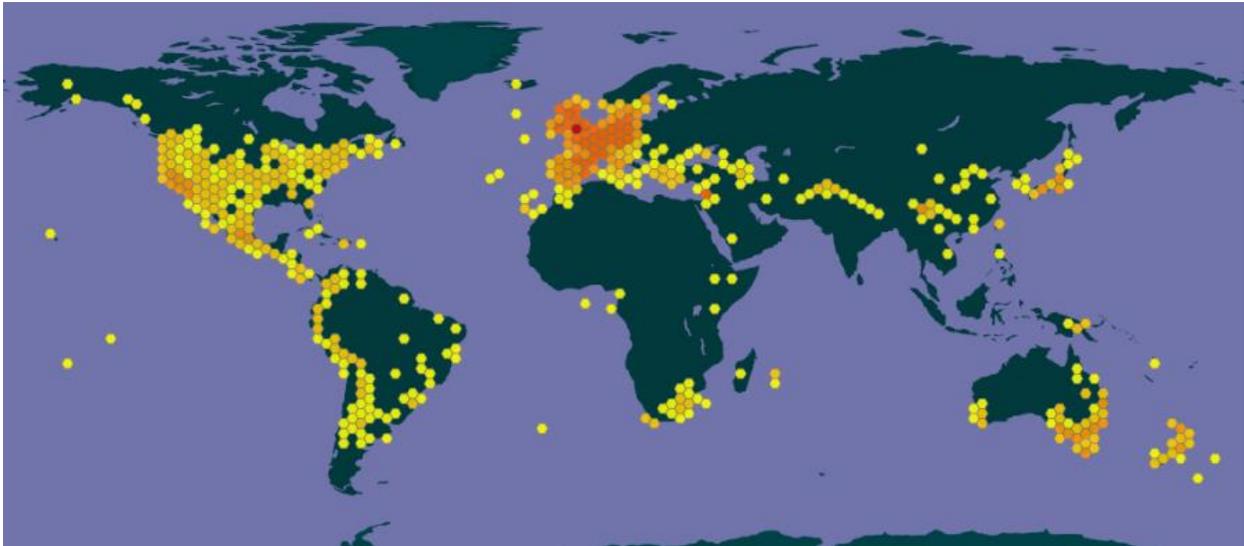


Figure 1. Known global locations of *Nasturtium officinale*. Map from GBIF Secretariat (2018). Marine occurrences were not used in the climate matching analysis as this species grows only in freshwater.

5 Distribution Within the United States

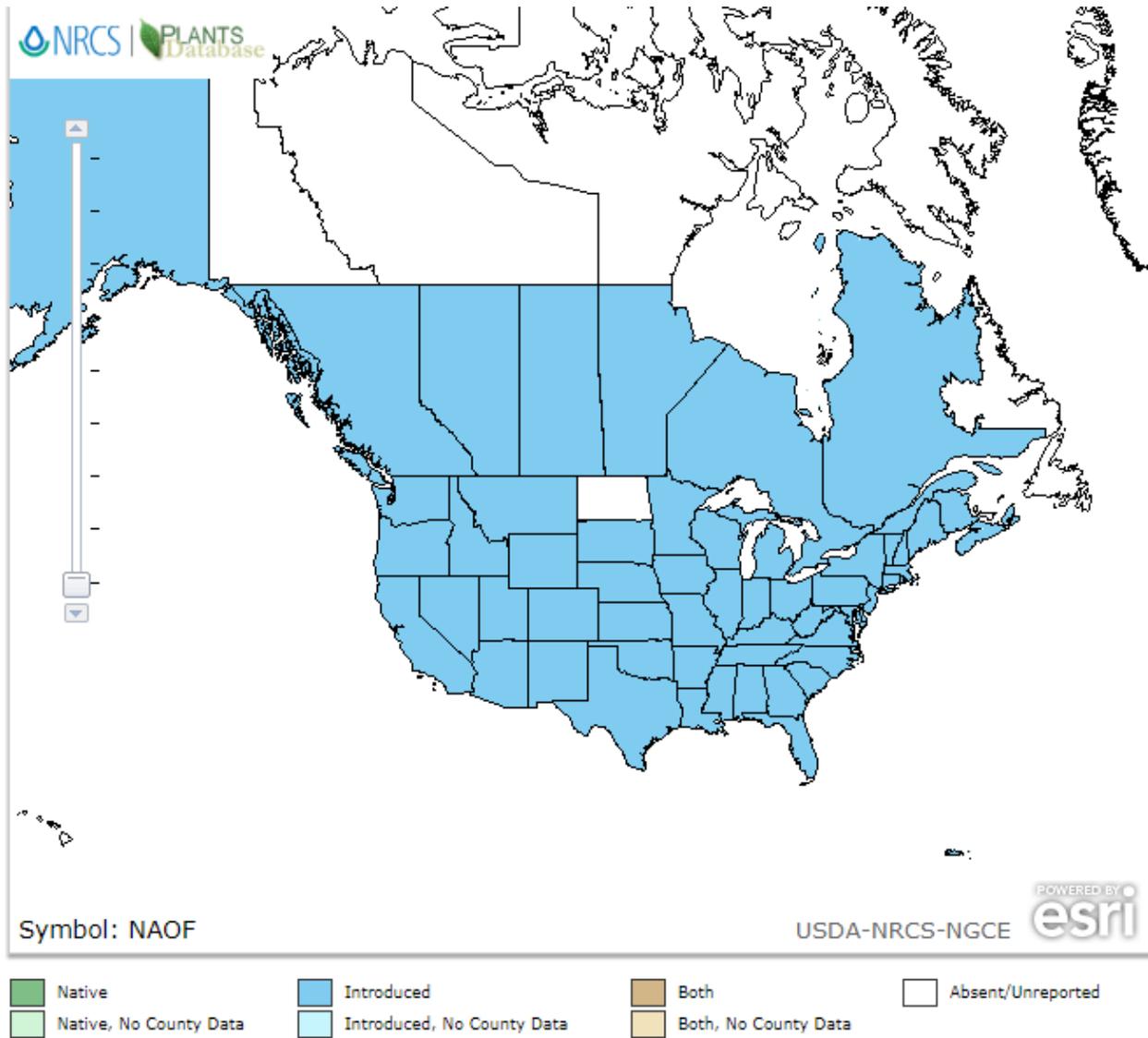


Figure 2. Distribution of *Nasturtium officinale* in the United States. Map from USDA-NRCS (2018).

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) for *Nasturtium officinale* in the contiguous United States is high overall, represented by a Climate6 score of 0.994. The range of proportions classified as high match is ≥ 0.103 . All individual states had a high Climate6 score as well. This score is not surprising given the presence of *N. officinale* in all 48 contiguous states except North Dakota (Fig. 2).

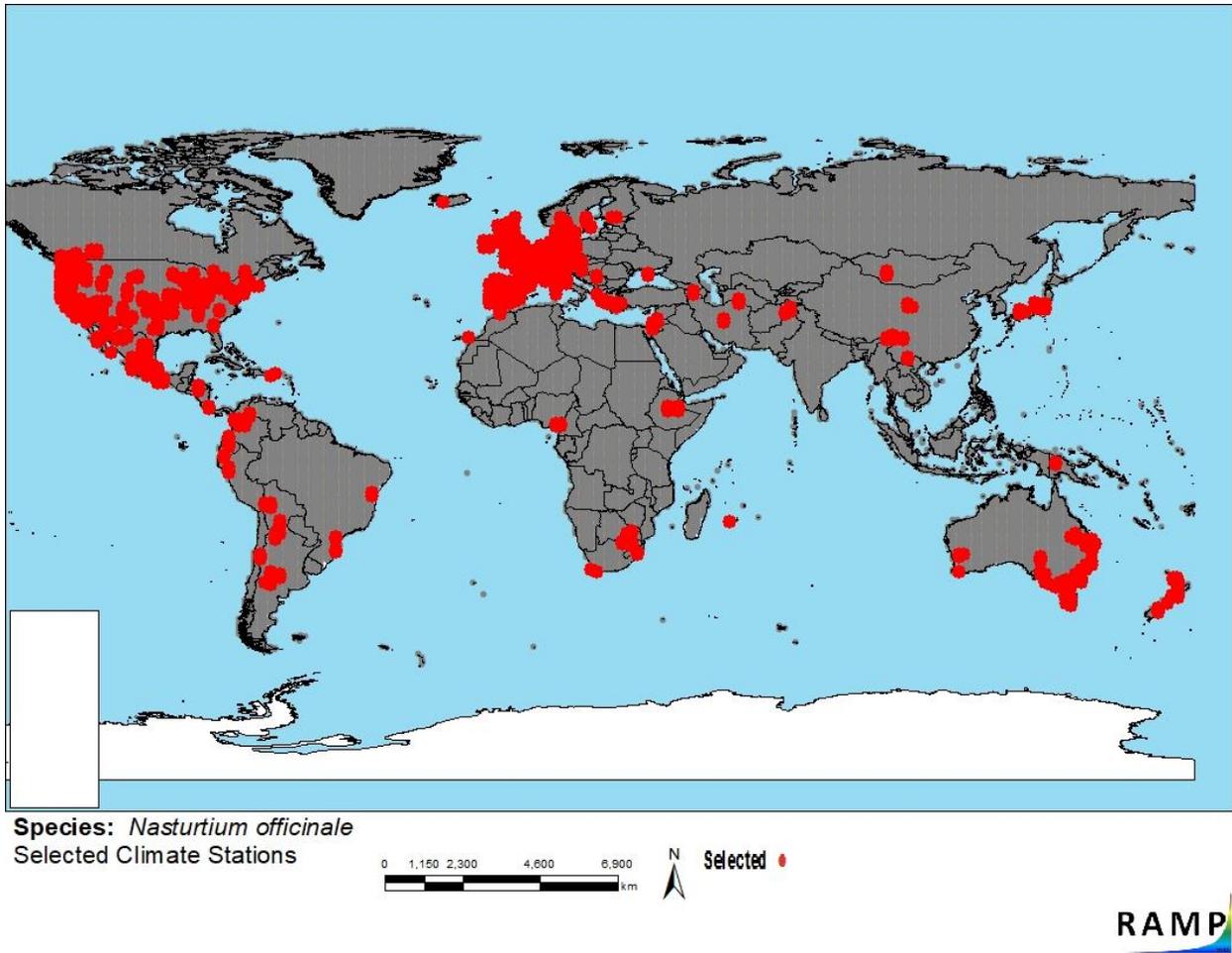


Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *Nasturtium officinale* climate matching. Source locations from GBIF Secretariat (2018).

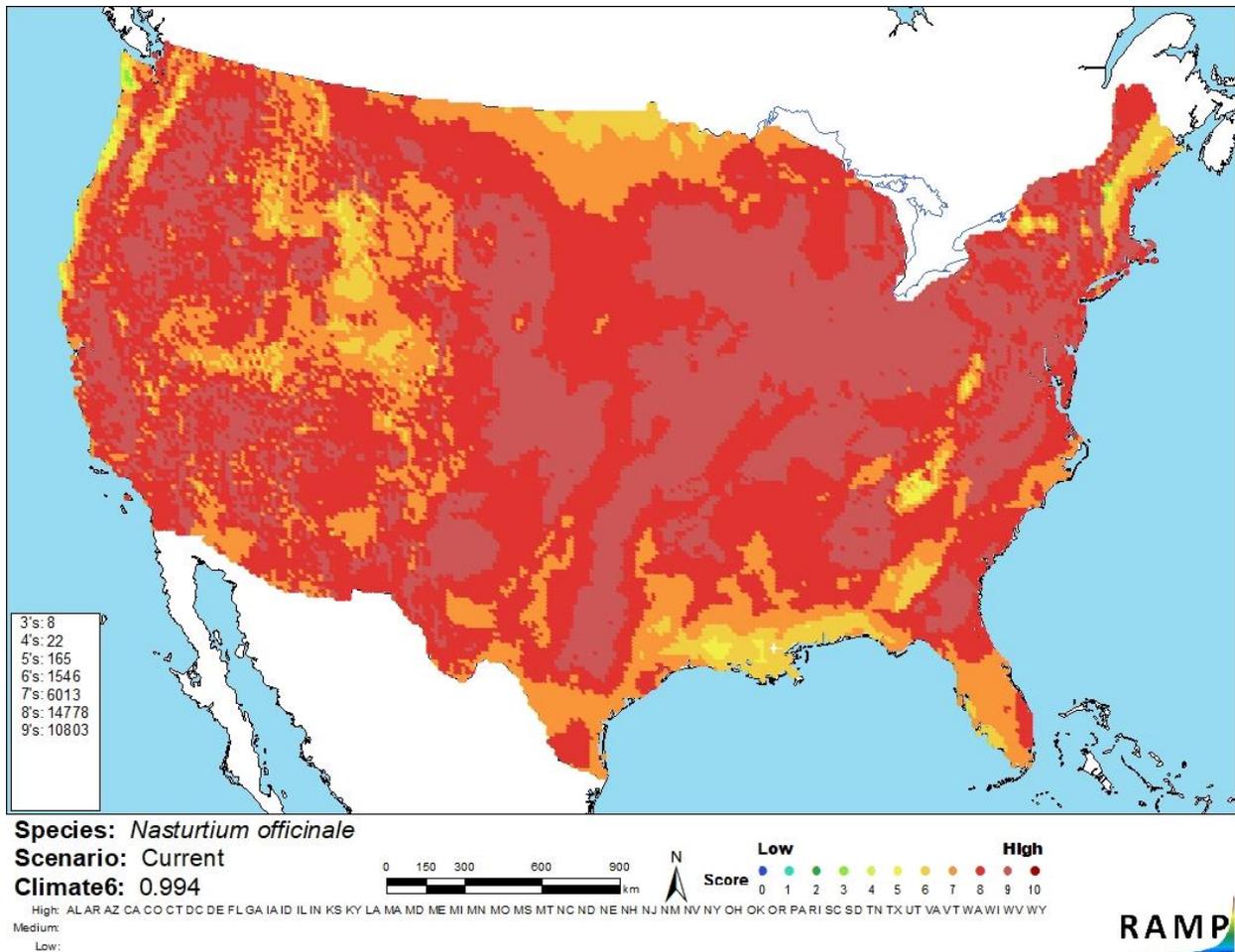


Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *Nasturtium officinale* in the contiguous United States based on source locations reported by GBIF Secretariat (2018). Counts of climate match scores are tabulated on the left. 0=Lowest match, 10=Highest match.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 < X < 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

A considerable amount of information on the biology, ecology, distribution, and impacts of *Nasturtium officinale* is available for review. However, little information is available on impacts occurring after the mid-twentieth century. According to one source, current impacts of *N. officinale* introduction are not severe relative to past impacts. Therefore, the certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Nasturtium officinale, commonly known as watercress, is an emergent freshwater plant native to much of Europe and Asia. Today, *N. officinale* can also be found in east and southeast Asia, sub-Saharan Africa, the Americas and Caribbean, Australia, New Zealand and some Pacific islands. In many cases, it was deliberately introduced as a leafy vegetable, but is now a fast-growing weed in some of these areas. Impacts include invasion of waterways, where it can crowd existing native vegetation, resulting in alterations to the structure and composition of native vegetation as well as the functionality of waterways. However, there is little evidence of such impacts occurring since the mid-twentieth century. Climate match for *N. officinale* within the contiguous United States is high. Despite the high climate match, overall risk of *N. officinale* within the contiguous United States is uncertain because of the lack of recent information on impacts.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Low**
- **Overall Risk Assessment Category: Uncertain**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

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10 References Quoted But Not Accessed

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

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