

# Chinese Softshell Turtle (*Pelodiscus sinensis*)

## Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, August 2016

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## 1 Native Range and Status in the United States

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### Native Range

From Turtle Taxonomy Working Group (2014):

“China (Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hong Kong, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang), Japan (Honshu, Kyoshu, Shikoku), Taiwan”

From Somma (2016):

“Distributed throughout eastern China, Korea, Taiwan, extreme southeastern Russia, Japan, and northern Vietnam (Smith, 1931; Pope, 1935; Mao, 1971; Nakamura and Uéno, 1976; Pritchard, 1979; Sengoku, 1979; [Matsui], 1985, Ernst and Barbour, 1989; Webb, 1989; Iverson, 1992; Zhao and Adler, 1993; Bonin et al., 2006).”

## Status in the United States

From Somma (2016):

“**Nonindigenous Occurrences:** Nonindigenous populations of *P. sinensis* occur in Kauai, Maui, and Oahu, Hawaii, U.S.A. (Brock, 1947; Oliver and Shaw, 1953; Ernst and Barbour, 1972; McKeown, 1978, 1996; McKeown and Webb, 1982; Iverson, 1992; Ernst et al., 1994; Iverson et al., 2000; Kraus, 2009, and personal communication 2002) [...] A single individual was found living in Windmill Pond, Queens, New York City, New York, U.S.A., and retrapped from 2009-2010 as part of study on winter survival (Rahman and Warny, 2011). Unverified reports for *P. sinensis* in Central and Prospect Parks, in New York City, New York, U.S.A. (Rahman and Warny, 2011). Other introductions include Maryland (U.S.A.) [...]”

“**Status:** The Chinese softshell is established in Kauai and Oahu, Hawaii, U.S.A. (Brock, 1947; McKeown and Webb, 1982; Iverson, 1992; Ernst et al., 1994; McKeown, 1996; Kraus, 2008, 2009; Collins and Taggart, 2009) [...] This species is not established in New York, U.S.A., but it is unclear if the individual studied by Rahman and Warny (2011) was left in Windmill Pond. It is not established in Maryland (U.S.A.) [...] (Kraus, 2009).”

## Means of Introductions in the United States

From Somma (2016):

“These turtles were brought to Hawaii, U.S.A., and cultivated by Asian immigrants as a traditional source of food from the 1800s up till [sic] World War II (Brock, 1947; McKeown and Webb, 1982; McKeown, 1996). The same seems to be true for Maryland (U.S.A.) [...]”

## Remarks

From ITIS (2016):

“Synonym(s):            *Trionyx sinensis* Wiegmann, 1835  
                              *Tyrse perocellata* Gray, 1844”

From Dong et al. (2016):

“More recently, the monotypic *P. sinensis* (Wiegmann 1835) has been shown to comprise a complex of four morphologically cryptic putative species-level lineages: *P. sinensis*, *P. maackii* (Brant 1857), *P. parviformis* (Tang 1997), and *P. axenaria* (Zhou et al. 1991; Stuckas and Fritz 2011; Yang et al. 2011). [...] The *Pelodiscus* complex occurs natively across a broad region of eastern Asia: *P. sinensis* sensu stricto occurs in central and eastern China, Taiwan, Vietnam, and Japan; *P. maackii* occurs in northern China, the Korean Peninsula, Japan, and southeastern Russia; lastly, *P. parviformis* and *P. axenaria* occur sympatrically in Guangxi, China (Turtle Taxonomy Working Group 2014).”

## 2 Biology and Ecology

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### Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2016):

“Kingdom Animalia  
Subkingdom Bilateria  
Infrakingdom Deuterostomia  
Phylum Chordata  
Subphylum Vertebrata  
Infraphylum Gnathostomata  
Superclass Tetrapoda  
Class Reptilia  
Order Testudines  
Suborder Cryptodira  
Superfamily Trionychoidea  
Family Trionychidae  
Subfamily Trionychinae  
Genus *Pelodiscus*  
Species *Pelodiscus sinensis* (Wiegmann, 1835) – Chinese Softshell,  
Chinese Softshell Turtle”

“Taxonomic Status: valid”

### Size, Weight, and Age Range

From Somma (2016):

“A small to medium-sized softshell having a carapace (upper shell) length averaging 112-250 mm (about 4.5 to 10 in) (Mao, 1971; Ernst and Barbour, 1989; Ernst et al., 1994).”

### Environment

From NIES (2016):

“Freshwater. Middle to lower rivers, ponds, lakes.”

### Climate/Range

From FAO (2017):

“The appropriate temperature range for breeding is 25-32 °C.”

## **Distribution Outside the United States**

### **Native**

From Turtle Taxonomy Working Group (2014):

“China (Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hong Kong, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang), Japan (Honshu, Kyoshu, Shikoku), Taiwan”

From Somma (2016):

“Distributed throughout eastern China, Korea, Taiwan, extreme southeastern Russia, Japan, and northern Vietnam (Smith, 1931; Pope, 1935; Mao, 1971; Nakamura and Uéno, 1976; Pritchard, 1979; Sengoku, 1979; [Matsui], 1985, Ernst and Barbour, 1989; Webb, 1989; Iverson, 1992; Zhao and Adler, 1993; Bonin et al., 2006).”

### **Introduced**

From Turtle Taxonomy Working Group (2014):

“Introduced: Brazil (Pará), Guam, Indonesia (Kalimantan, Sumatra, Timor), Japan (Bonin Islands, Ryukyu Archipelago), Malaysia (East, West), Northern Mariana Islands, Philippines (Bohol, Cebu, Latvia, Leyte, Luzon, Mindanao, Mindoro, Panay), Singapore, South Korea, Spain, Thailand, Timor-Leste, [...] Vietnam”

From Lever (2003):

“The Chinese soft-shell turtle has recently become established in the Marshes of Guadalquivir in southern Spain (Barbadillo *et al.* 1999).”

## **Means of Introduction Outside the United States**

From Somma (2016):

“*Pelodiscus sinensis* is much prized as food and as a “tonic” in China, Taiwan, and other parts of Asia where it is commonly cultivated in ponds and canals (Pope, 1935; Brock, 1947; Mao, 1971; McKeown and Webb, 1982; Cox et al., 1998; Bonin et al., 2006). It is for this reason that it has become established out of its native range.”

“Introductions of *P. sinensis* in France and Spain were from the pet trade (Kraus, 2009).”

## **Short Description**

From FAO (2017):

“Colour olive grey to greenish brown with numerous yellow-bordered black spots and yellowish dots in younger individuals; yellow spotting tends to disappear in adults; many adults show no pattern and have uniformly olive carapaces. Round to oval carapace; ridge of carapace in males slightly sunken with round-shape at posterior; longer neck and tail than females; plastron sunken

for clasping female carapace during copulation; neck can be extended to end of carapace; more active than females. Shell of females rough with oval carapace; plastron almost arched; tail and neck is thicker than male; space between two posterior legs larger than male; more timorous and meek than males. Generally, males differ from females in being shallower and having long, thick tails, with the vent near the tip. Females are more domed and the tails barely extend past the carapace rim. Females are normally larger than males, to allow for egg development.”

## **Biology**

From FAO (2017):

“Soft-shell turtles are voracious but grow slowly. They are almost wholly aquatic but come ashore when the weather is favourable to sunbathe (in order to maintain body temperature; this also controls parasites) and for egg laying. They breathe normally through their lungs but can also absorb oxygen while submerged, either through their skin or by passing water over membranes in the throat or cloaca. They remain buried at the bottom of their aquatic habitat (rivers, streams, lakes, marshes, and rice fields) for most of the day.”

“Soft-shell turtles have an aggressive disposition, as do all carnivores; however, they appear timorous and submerge themselves in hiding places under water when a noise or human/animal shadows occur. When turtles are starving, they are cannibalistic. If turtles are injured, they are savagely bitten by the other turtles.”

“In nature the soft-shell turtle *Tryonix sinensis* is predominantly carnivorous; the most common foods eaten are zooplankton, insects, crayfish, crabs, fish, molluscs and other aquatic invertebrates. Under farming conditions, turtles like spoiled (decomposed) predators; they compete against with other animals for prey; sweet potato and corn are also consumed. They eat well in summer, the food requirement being in the range of 5-10 per cent BW/day. In winter (December to March) the requirement is less (~3-5 per cent BW/day). However, turtles are very tolerant of starvation.”

“Soft-shell turtles lay their eggs in sand or mud on the banks of the rivers, streams or pools in which they live. Viable sperm may be retained in the female oviducts for about 6 months after copulation, hence the lower proportion of males compared to females. The breeding season of *T. sinensis* begins early in the spring and continues through to late autumn. Turtle females spawn simultaneously on days when there is heavy thunderous rain. When a disturbed layer of soil and footmarks are observed on egg-laying sites, these cover newly-laid eggs. Gently upturning this soil and a thin layer of sand, small holes of 4-5 cm in diameter and 10-15 cm deep can be seen. The eggs are stacked in layers from the bottom to the mouth of the nest. Newly-laid eggs stick together; the eggshells are soft and leathery to the touch. After spawning, turtle females move to a place nearby their nest for a rest and to protect their eggs. “

“After 5-7 days of spawning, *T. sinensis* females are ready to mate again. Females with a body weight of 4 000-5 000 g can produce 4-5 clutches in a single year. The diameter of large eggs is 17-20 mm, with a weight of 6.0-6.5 g.”

## Human Uses

From FAO (2017):

“*Trionyx sinensis* are used for traditional medicine and as food. The shells of turtles are usually used as a by-product in restaurants; they mainly originate from turtle farms. In the Chinese medicine, market shells are traded in whole pieces of plastron from hard shell turtles and are unlikely to be the by-product of turtle meat (usually consumed as turtle soup in Asia).”

From Diesmos et al. (2008):

“This turtle is also popular in pet shops of Manila and Cebu.”

## Diseases

From FAO (2017):

“DISEASE	AGENT	TYPE	SYNDROME
Fungal infections	<i>Saprolegnia</i> spp.	Fungi	White patches - tufts of dirty, cotton-like material on skin & whitish areas on the shell, usually secondary infections
Septicaemic cutaneous ulcerative disease	<i>Citrobacter freundii</i> <i>Serratia</i> spp.	Bacteria	Pitted scutes & sloughing with an underlying purulent discharge; anorexia; lethargy; petechial haemorrhages on the shell & skin; liver necrosis
Necrotic stomatitis	<i>Pseudomonas</i> <i>Aeromonas</i>	Bacteria	Excessive salivation & redness of the mouth lining; cheese-like pus accumulates within the mouth; petechiae in oral cavity; ulceration or granuloma formation on mouth
Swollen neck disease	<i>Hydrophyla</i> spp. <i>Pseudomonas</i> spp.	Bacteria	Swelling of neck; closed eyelids; necrosis of feet & plastron
Unnamed Viral disease	Virus pathogen	Virus	Poor appetite; red blood points on neck & back; ulcerated calipash skin; purplish red spots on scute; carapace perforations; white mucus layer adhering to limbs & neck”

From Sinmuk et al. (1996):

“*Aphanomyces* sp. was isolated from the carapaces of two juvenile soft-shelled turtles with fungal infections imported from Singapore.”

“Egusa (1970) has reported a fungal infection of cultured soft-shelled turtle, *Pelodiscus sinensis* (Wiegmann), caused by *Mucor* sp.”

From Liu et al. (2011):

“An outbreak of a poxvirus-like infection in a population of 20,500 50-day-old soft shell turtles (*Pelodiscus sinensis*) at a culture farm in Pingtung County, southern Taiwan, occurred from late November to early December 2008. A mortality rate of approximately 44 % was recorded and the clinical findings included anorexia, lethargy, swollen necks and several unusual vesicles and bullas were present on the legs and shell skin. [...] According to its morphology and size, the virus was very similar to a poxvirus. Therefore, we provisionally named this agent, ‘soft shell turtle poxvirus-like virus’.”

## **Threat to Humans**

No information available.

## **3 Impacts of Introductions**

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From Somma (2016):

“Impact of Introduction: Unknown; but the potential for this highly carnivorous turtle to have a negative impact on indigenous aquatic fauna in various region of introduction seems likely, if it has not occurred already. There are no freshwater turtles native to Hawaii (McKeown, 1996).”

From Dong et al. (2016):

“[...] the extent of habitat overlap between introduced softshells and native aquatic species [in Hawaii] may be minimal, which suggests that strong impacts through predation may be unlikely. The native freshwater species of conservation concern in Hawaii comprise five amphidromous fishes (four of which are endemic), two amphidromous crustaceans, two endemic amphidromous neritid snails, and four endemic freshwater lymnaeid snails (one occurs in Kauai and is listed as ‘endangered’; IUCN 2014). These species prefer the biotic and hydrologic characteristics of undeveloped waterways (Brasher et al. 2006), whereas the turtles inhabit highly disturbed lowland waterways dominated by the presence of other introduced species. The amphidromous life cycle of some native species necessitates migration through lower elevation freshwater habitat to access the coastal ocean, and as pristine sites become increasingly rare due to development pressures, interactions with among native taxa and softshell turtles, as well as other non-native aquatic taxa, may increase.”

From Diesmos et al. (2008):

“Its ecological impact on native fauna [in the Philippines] is unknown and needs to be investigated.”

## 4 Global Distribution

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**Figure 1.** Known global distribution of *Pelodiscus sinensis*. Map from GBIF (2016). Points on the eastern coast of the U.S., northern Spain, and in the Pacific Ocean off South America were excluded from climate matching because they do not represent established populations. Points in northern China and on the Korean Peninsula were also excluded from climate matching based on recent taxonomic work (see Remarks, above).



## 5 Distribution within the United States

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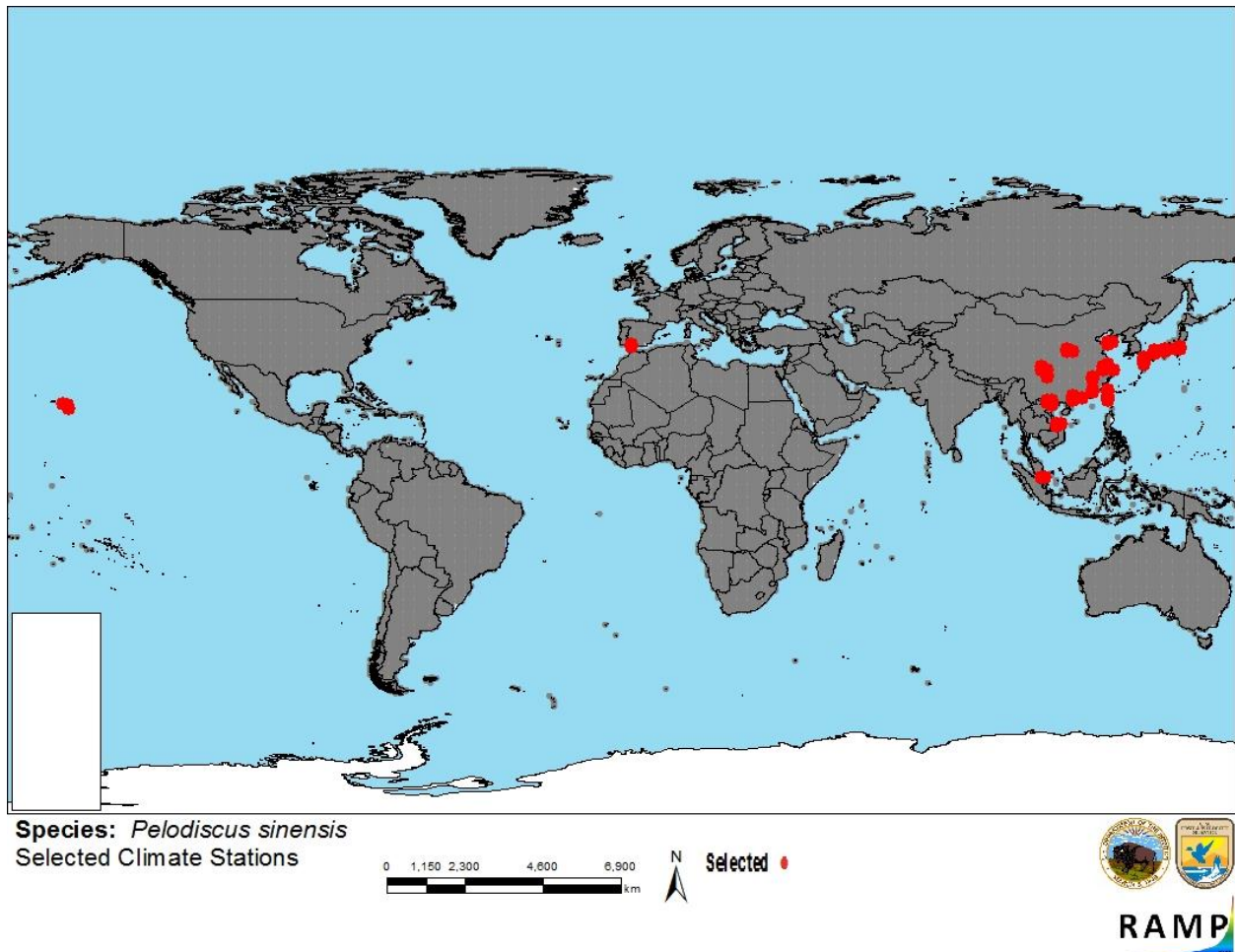
**Figure 2.** Known distribution of *Pelodiscus sinensis* in the United States. Map from Somma (2016). Only points in Hawaii represent established populations; all other points were excluded from climate matching.

## 6 Climate Matching

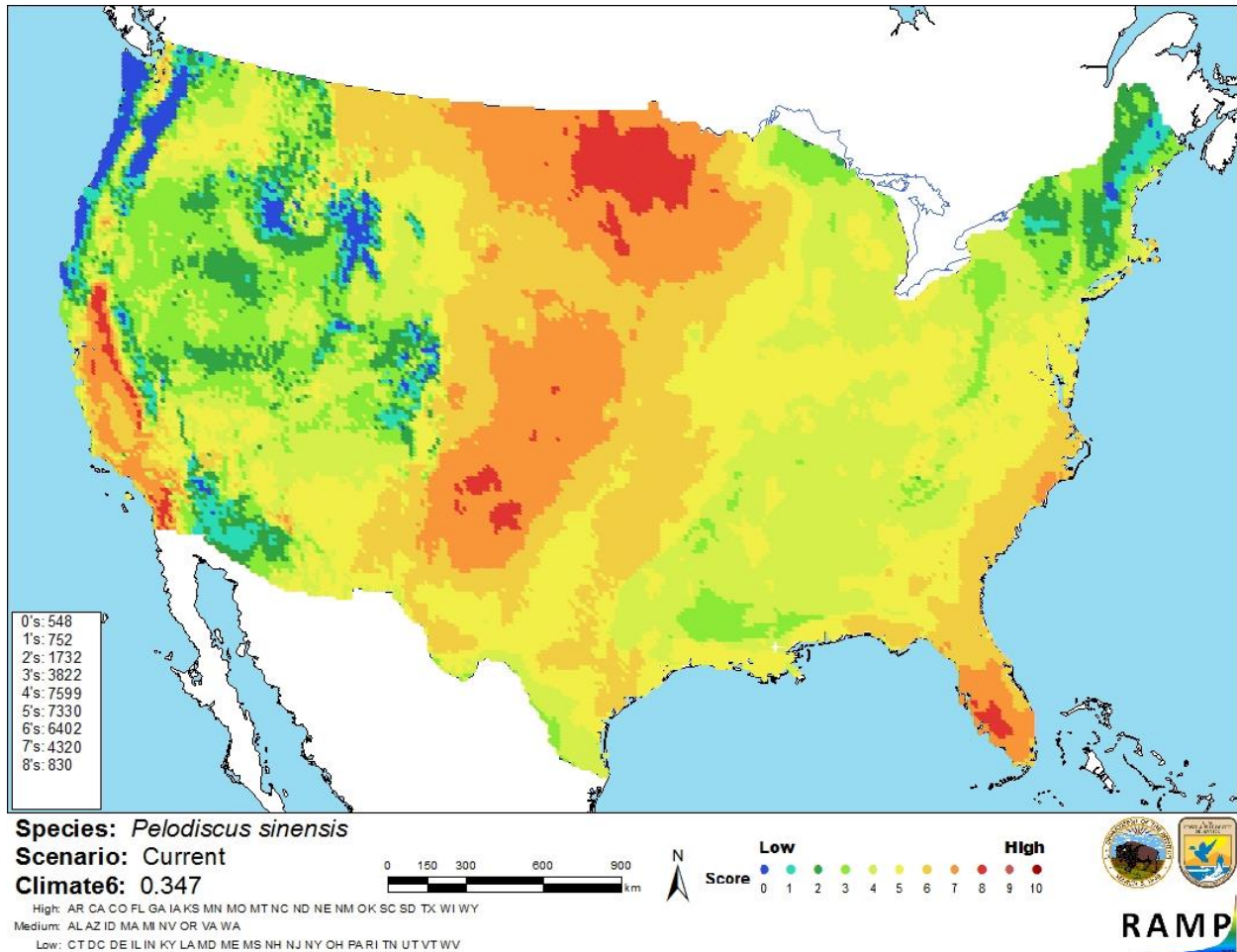
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### Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high across the Plains states, California, and southern Florida. The climate match was low in New England, the Pacific Northwest, and parts of the Rocky Mountains. Medium matches were distributed patchily elsewhere across the contiguous U.S. Climate 6 proportion indicated that the contiguous U.S. has a high climate match. Values equal to or greater than 0.103 indicate a high climate match; the Climate 6 proportion of *Pelodiscus sinensis* is 0.347.



**Figure 3.** RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *Pelodiscus sinensis* climate matching. Source locations from GBIF (2016).



**Figure 4.** Map of RAMP (Sanders et al. 2014) climate matches for *Pelodiscus sinensis* in the contiguous United States based on source locations reported by GBIF (2016). 0= Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

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
$0.000 \leq X < 0.005$	Low
$0.005 < X < 0.103$	Medium
$\geq 0.103$	High

## 7 Certainty of Assessment

The biology of *P. sinensis* is well-known. Multiple introductions of this species have been documented, although not all populations have become established. Negative impacts of this species have only been hypothesized. Further information is needed to determine if this species poses a threat to ecosystems in the United States. Certainty of this assessment is low.

## 8 Risk Assessment

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### Summary of Risk to the Contiguous United States

*Pelodiscus sinensis* is a freshwater softshell turtle native to East Asia. It is widely traded due to its culinary and medicinal value in Asian cultures; because of this, it has been introduced in multiple locations. Despite introductions of this species in the eastern U.S., it is currently only established in Hawaii. *P. sinensis* has a high climate match with the contiguous United States. The United States is at risk of further introductions of *P. sinensis* due to its economic value, but a lack of documented effects from introductions of this species results in an overall risk assessment category of uncertain.

### 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

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**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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**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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