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Version 1

Weed Risk Assessment for *Solanum sisymbriifolium* Lam. (Solanaceae) – Sticky nightshade

Solanum sisymbriifolium leaves and fruit (source: Technische Universität Braunschweig, 2012).

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Introduction Plant Protection and Quarantine (PPQ) regulates noxious weeds under the authority of the Plant Protection Act (7 U.S.C. § 7701-7786, 2000) and the Federal Seed Act (7 U.S.C. § 1581-1610, 1939). A noxious weed is defined as "any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment" (7 U.S.C. § 7701-7786, 2000). We use weed risk assessment (WRA)—specifically, the PPQ WRA model (Koop et al., 2012)—to evaluate the risk potential of plants, including those newly detected in the United States, those proposed for import, and those emerging as weeds elsewhere in the world.

Because the PPQ WRA model is geographically and climatically neutral, it can be used to evaluate the baseline invasive/weed potential of any plant species for the entire United States or for any area within it. As part of this analysis, we use a stochastic simulation to evaluate how much the uncertainty associated with the analysis affects the model outcomes. We also use GIS overlays to evaluate those areas of the United States that may be suitable for the establishment of the plant. For more information on the PPQ WRA process, please refer to the document, *Background information on the PPQ Weed Risk Assessment*, which is available upon request.

***Solanum sisymbriifolium* Lam. – Sticky nightshade**

Species Information

Family: Solanaceae

Initiation: On January 3, 2012, Amy Ferriter, Invasive Species Coordinator for the Idaho State Department of Agriculture, contacted the PERAL Weed Team to request a weed risk assessment on *Solanum sisymbriifolium*. *Solanum sisymbriifolium* is not known to occur in Idaho, but it is under consideration there for use as a trap crop for the pale potato cyst nematode *Globodera pallida* (Koop, 2012).

Foreign distribution: Native to South America. *Solanum sisymbriifolium* is naturalized in Europe, parts of Africa, and Australia (Karaer and Kutbay, 2007).

U.S. distribution and status: This species is not widely cultivated, but it has become naturalized in Alabama, Arizona, California, Delaware, Florida, Georgia, Iowa, Louisiana, Massachusetts, Mississippi, New Jersey, New York, North Carolina, Oregon, Pennsylvania, South Carolina, and Texas (Kartesz, 2012).

WRA area[1]: Entire United States, including territories

[1] "WRA area" is the area in relation to which the weed risk assessment is conducted [definition modified from that for "PRA area" (IPPC, 2012).

<u>1. *Solanum sisymbriifolium* analysis</u>

Establishment/Spread Potential *Solanum sisymbriifolium* is a pioneer species (Byrne et al., 2002) that colonizes disturbed habitats (Karaer and Kutbay, 2007). In South Africa, *Solanum sisymbriifolium* occurs in localized dense, infestations (Hill and Hulley, 2000), some of which are eventually replaced by exotic *Acacia* species and native species (Byrne et al., 2002). *Solanum sisymbriifolium* mainly spreads by seed (Hill and Hulley, 1995); plants can produce up to 45,000 seeds each year in tomato-like, fleshy, red fruit that are dispersed by birds (Hill and Hulley, 2000) and mice (Bryson, 2011). Seed can also be spread to new areas as contaminants in hay (Bryson, 2011; Byrne et al., 2002). This element had average (moderate) uncertainty.
Risk score = 18 Uncertainty index = 0.19

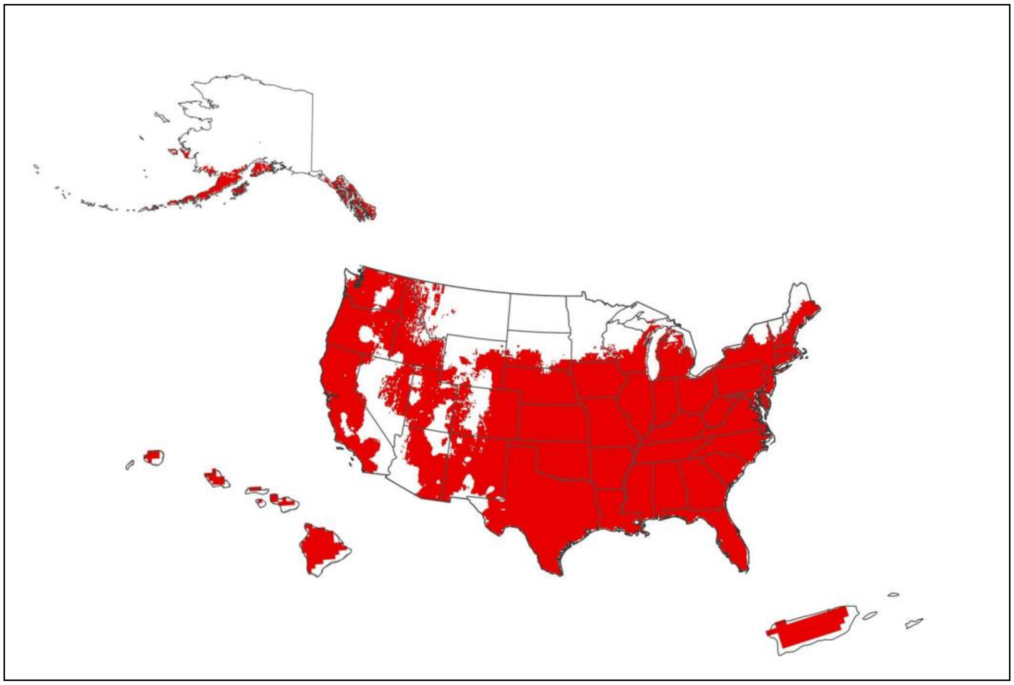
Impact Potential Although *S. sisymbriifolium* occurs in disturbed areas, such as along roadsides and fences (Karaer and Kutbay, 2007), it is primarily a weed of productions systems. In South Africa, it invades and reduces the carrying capacity and value of pastureland (Byrne et al., 2002), possibly because the stems and leaves of this species are covered in prickles and spines (Karaer and Kutbay, 2007) which make them unpalatable to cattle. Although it is not widely distributed in South Africa (Hill and Hulley, 2000), its impacts have prompted the release of biocontrol agents (King et al., 2011). In South Africa, *S. sisymbriifolium* also makes forestry management more difficult by invading forestry fire breaks (Hill and Hulley, 1995).
Risk score = 2.4 Uncertainty index = 0.15

Geographic Potential Based on three climatic variables, we estimate that about 64 percent of the United States is suitable for the establishment of *Solanum sisymbriifolium* (Fig. 1). We based this on the species' known distribution elsewhere in the world, including point-referenced localities and areas of occurrence. The map for *S. sisymbriifolium* represents the joint distribution of Plant Hardiness Zones 5-13, areas with 10-90 inches of annual precipitation, and the following Köppen-Geiger climate classes: tropical rainforest, tropical savanna, steppe, mediterranean, humid subtropical, humid continental warm summers, humid continental cool summers, and subarctic.

The area estimated likely is a conservative (i.e., overstated) estimate. Other environmental variables, such as soil and habitat type, may further limit the areas in which this species is likely to establish.

Entry Potential We did not assess the entry potential of *S. sisymbriifolium* because it is already present in the United States (see above).

Figure 1. Predicted distribution of *Solanum sisymbriifolium* in the United States. Map insets for Alaska, Hawaii, and Puerto Rico are not to scale.



2. Results and Conclusion

Model Probabilities: P(Major Invader) = 82.5%
P(Minor Invader) = 16.9%
P(Non-Invader) = 0.6%

Risk Result = High Risk

Secondary Screening = Not Applicable

Figure 2. *Solanum sisymbriifolium* risk score (black box) relative to the risk scores of species used to develop and validate the PPQ WRA model (other symbols). See Appendix A for the complete assessment.

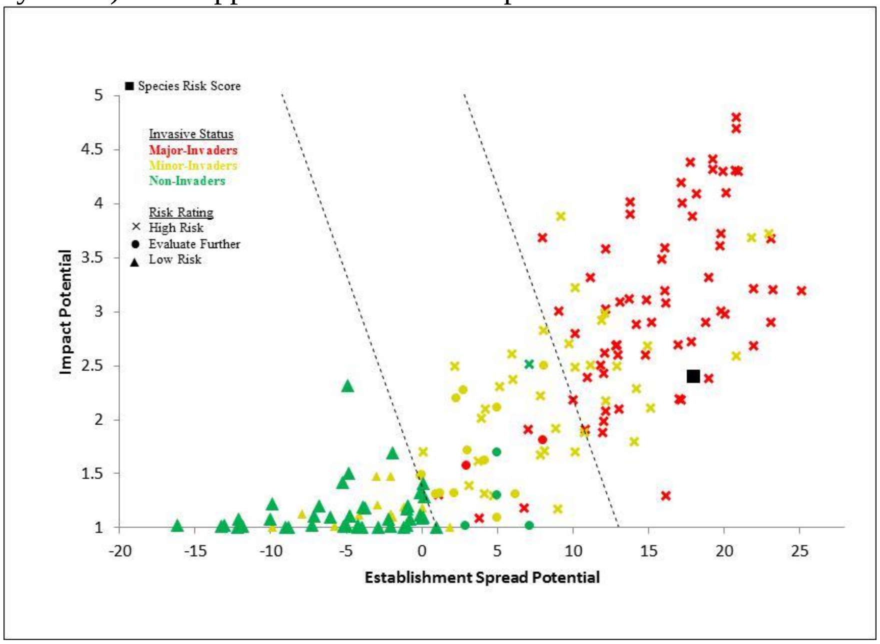
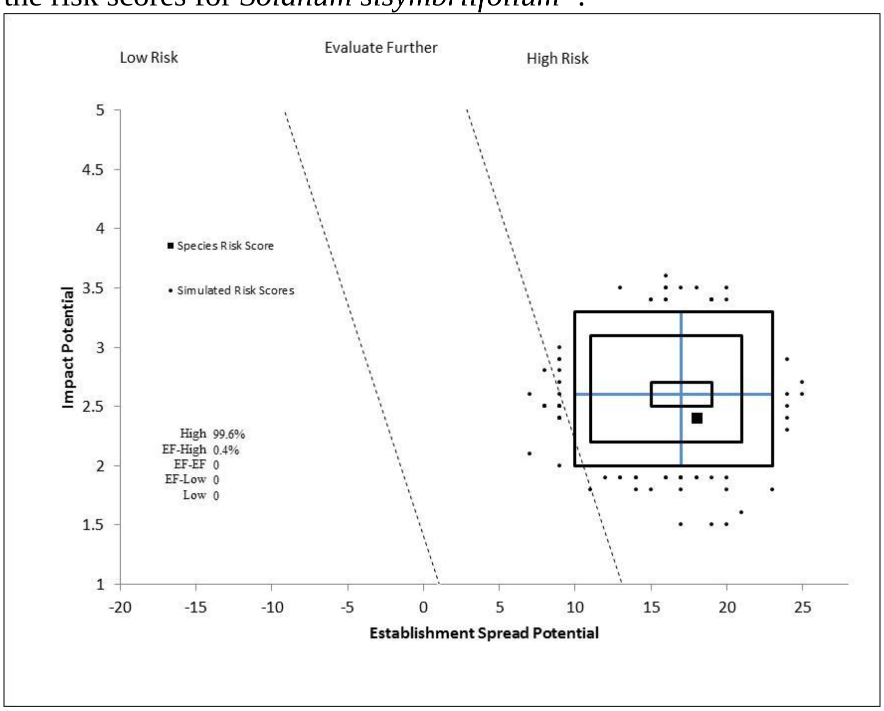


Figure 3. Monte Carlo simulation results (N=5,000) for uncertainty around the risk scores for *Solanum sisymbriifolium* [a].



[a] The blue "+" symbol represents the medians of the simulated outcomes. The smallest box contains 50 percent of the outcomes, the second 95 percent, and the largest 99 percent.

3. Discussion

The result of the weed risk assessment for *S. sisymbriifolium* is High Risk (Fig. 2). In the uncertainty analysis, 99.6 percent of the simulated risk scores resulted in a conclusion of High Risk (Fig. 3), indicating that the overall model conclusion is highly robust. This result is based on the ability of *S. sisymbriifolium* seed to spread to new locations, as well as the impacts this species has in agricultural production systems, especially pastureland. *Solanum sisymbriifolium* is not widely cultivated in the United States, but this species has become naturalized in 17 states (Kartesz, 2012), demonstrating the ability of this species to easily spread to new areas.

Because *S. sisymbriifolium* is used as a trap crop for potato cyst nematodes (Scholte, 2000), the risk of establishment is very high as entire *S. sisymbriifolium* populations are intentionally planted in fields. This plant stimulates nematode hatching, but prevents nematode development and reproduction, resulting in a reduction of the potato cyst nematode population in infested fields (Dias et al., 2012). *Solanum sisymbriifolium* has a seed bank (Byrne et al., 2002) and spreads primarily through seeds produced in fleshy, red fruits dispersed by birds (Hill and Hulley, 2000) and mice (Bryson, 2011). To reduce the risk of naturalization where they are grown as nematode trap crops, growers should harvest or till plants prior to fruit production. Ultimately, land managers will have to weigh the benefits of growing *S. sisymbriifolium* with its potential impacts and the cost of preventing this plant from becoming naturalized.

4. Literature Cited

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Appendix A. Weed risk assessment for *Solanum sisymbriifolium* Lam. (Solanaceae). The following information was obtained from the species' risk assessment, which was conducted using Microsoft Excel. The information shown in this appendix was modified to fit on the page. The original Excel file, the full questions, and the guidance to answer the questions are available upon request.

Question ID	Answer - Uncertainty	Score	Notes (and references)
Establishment/Spread Potential			
ES-1 (Status/invasiveness outside its native range)	f - high	5	Native to South America (D'Arcy, 1974), where the plant "is associated with localized, short-term disturbances" (Hill and Hulley, 1995). "[A] noxious invader" in South Africa (Hill and Hulley, 2000). Has invaded pasture lands and forestry firebreaks after being introduced to South Africa (Hill and Hulley, 1995). "Although the weed has a limited distribution in South Africa, several localised dense infestations exist" (Hill and Hulley, 2000). "Although seemingly well established in local populations, these introductions [of *S. sisymbriifolium*] have been unable to expand beyond scattered sites" in Florida (D'Arcy, 1974). Has become "established in Australia, India, the United States, and China" (Byrne et al., 2002) and Turkey (Karaer and Kutbay, 2007). Weed infestations are "ephemeral" because "*S. sisymbriifolium* often behaves as a pioneer species, persisting for relatively short periods of time before being displaced by perennial weeds (notably Australian *Acacia* species) and native plant species" (Byrne et al., 2002). *Solanum sisymbriifolium* is not widely cultivated but it has become naturalized in 17 states in the United States (Kartesz, 2012). We are answering "f" because this species has spread to new locations in South Africa and the United States but we are using high uncertainty based on the references that describe this plant being limited to localized patches. The alternate answers for the Monte Carlo simulation are both "e."
ES-2 (Is the species highly domesticated)	n - mod	0	Several different cultivars exist (Vandijke Semo, 2012), such as the cultivar 'White Star,' which appears to have been selected for its ability to control nematodes rather than reduced weed potential (Petersen, 2012). Desirable cultivars are also able to grow in a range of different soil types (Petersen, 2012). Timmermans et al. (2009) recommend breeding *S. sisymbriifolium* cultivars with cold tolerance so the plant can be grown as a nematode trap crop in northern climates. Because we were unable to find evidence that *S. sisymbriifolium* cultivars are being bred for reduced weed potential, we are answering no with moderate uncertainty.
ES-3 (Weedy congeners)	y - negl	1	Several species of *Solanum* are listed as significant weeds by Holm et al. (1979) including *S. elaeagnifolium*, *S. nigrum*, *S. nodiflorum*, *S. rostratum*, *S. torvum*, and *S. villosum* (Holm et al., 1979). Additionally, South Africa is using biological control against *S. mauritianum*, *S. seaforthianum* is invasive in the tropics, and *S. tampicense* and *Solanum viarum* are Federal Noxious Weeds in the United States (ISSG, 2012a).
ES-4 (Shade tolerant at some stage of its life cycle)	n - mod	0	"It can grow in semi-shade (light woodland) or no shade" (Plants For A Future, 2012). "[C]onditions of constant darkness inhibit germination" (Hill and Hulley, 2000). "[F]ound on railroads and along sandy, barren roadside" in Florida (D'Arcy, 1974). No evidence that this species grows in shady conditions, so we are answering "no" for this question.
ES-5 (Climbing or smothering growth form)	n - negl	0	Plant is an erect shrub that can grow to 60 cm tall (D'Arcy, 1974). No evidence of climbing or smothering growth habit.
ES-6 (Forms dense thickets)	y - mod	2	"[D]ense infestations" in South Africa (Hill and Hulley, 2000).

Question ID	Answer - Uncertainty	Score	Notes (and references)
ES-7 (Aquatic)	n - negl	0	Terrestrial herb in the family Solanaceae (D'Arcy, 1974; NGRP, 2012).
ES-8 (Grass)	n - negl	0	Not a grass. Herb in the family Solanaceae (D'Arcy, 1974; NGRP, 2012).
ES-9 (Nitrogen-fixing woody plant)	n - negl	0	No evidence that *S. sisymbriifolium* fixes nitrogen. Because no Solanaceae are known to fix nitrogen (Martin and Dowd, 1990), using “negl” uncertainty.
ES-10 (Does it produce viable seeds or spores)	y - negl	1	"Propagation is mainly through seeds" (Hill and Hulley, 1995).
ES-11 (Self-compatible or apomictic)	n - mod	-1	"A number of self-pollination trials suggest that this species is self-sterile" (D'Arcy, 1974).
ES-12 (Requires special pollinators)	n - low	0	Pollinated by several different species of solitary bees in South Africa (Hill and Hulley, 2000).
ES-13 (Minimum generation time)	b - negl	1	First flowers are produced 43 days after emergence from seed in the southern United States (Bryson et al., 2012). In many parts of the world, *S. sisymbriifolium* behaves as a short-lived annual or a biennial (Hill and Hulley, 2000). In South Africa, flowers first open in July. Green fruit appears in August (late winter/early spring) and September, turning red by November. The plants continue to produce fruit into the winter (Hill and Hulley, 2000). "[P]lant[s] persist in cold regions of the country where they die back in winter and then resprout from the previous season's rootstocks or via new recruitment from seed" (King et al., 2011). Based on this evidence, *S. sisymbriifolium* appears to have a minimum generation time of one year, with fruit and seeds being produced over a single growing season, and new plants being produced during the following season. Thus, answering "b" with low uncertainty. Alternate answers for the Monte Carlo analysis are "a" and "c."
ES-14 (Prolific reproduction)	y - low	1	Hill and Hulley (2000) studied fruit and seed set in a wild population of *S. sisymbriifolium*, observing that "[P]ropagation is enhanced by high fruit production (about 300 fruit per plant per year). Each fruit contains between 140 and 200 seeds of which around 80% are viable...This means that each plant at the site...produced around 45,000 seeds per year" (Hill and Hulley, 2000). Based on this evidence, answering "yes" with low uncertainty.
ES-15 (Propagules likely to be dispersed unintentionally by people)	? - max	0	Unknown.
ES-16 (Propagules likely to disperse in trade as contaminants or hitchhikers)	y - low	2	Thought to have been introduced into South Africa as a contaminant of horse fodder (Byrne et al., 2002). Has been observed in truck crops and contaminated hay seed is a primary means of seed dispersal (Bryson, 2011). "[G]rows near sea ports in waste places" in the southeastern United States (Karaer and Kutbay, 2007).
ES-17 (Number of natural dispersal vectors)	2	0	Berry and seed descriptions used to answer questions ES17a-ES17e: "Berry bright shiny scarlet, juicy, 8 mm across, loosely enveloped until maturity by the calyx with its enlarged spines which ruptures to expose the fruit; seeds 3 mm across, compressed-lenticular" (D'Arcy, 1974) and "1.6–2.0 cm diam., round, green [fruit], turning yellow then bright red at maturity; calyx prickly, loosely surrounds fruit until maturity, then splits to expose fruit" (Bryson et al., 2012).
ES-17a (Wind dispersal)	n - mod		No evidence for wind dispersal. Seeds are enclosed in a 1.6-2.0 cm diameter fleshy fruit (Bryson et al., 2012; D'Arcy, 1974).
ES-17b (Water dispersal)	n - mod		No evidence that water plays a major role in seed dispersal.

Question ID	Answer - Uncertainty	Score	Notes (and references)
ES-17c (Bird dispersal)	y - negl		In South Africa, *S. sisymbriifolium* is spread by indigenous birds such as bulbuls, starlings, thrushes, and barbets, which are fond of the fleshy fruits (Hill and Hulley, 1995) and the seeds remain viable after passing through the guts of birds (Hill and Hulley, 2000).
ES-17d (Animal external dispersal)	n - mod		No evidence. Seeds are enclosed in a 1.6-2.0 cm diameter fleshy fruit (Bryson et al., 2012; D'Arcy, 1974) that lacks any adaptations to adhere to the fur of animals.
ES-17e (Animal internal dispersal)	y - low		Mice are one of the primary methods of seed dispersal in the southern United States (Bryson, 2011).
ES-18 (Evidence that a persistent (>1yr) propagule bank (seed bank) is formed)	y - mod	1	Has a "resilient seed bank" (Byrne et al., 2002).
ES-19 (Tolerates/benefits from mutilation, cultivation or fire)	y - low	1	"Attempts at mechanical and chemical controls have been thwarted by the weed's ability to coppice after being cut" (Byrne et al., 2002). "[T]he weed is associated with short-term disturbance such as fire; ploughed fields; waste-, cultivated- and pastoral lands" (King et al., 2011).
ES-20 (Is resistant to some herbicides or has the potential to become resistant)	yes - high	1	Other species of *Solanum* have acquired resistance to some herbicides (WSSA, 2012) and chemical control methods in South Africa have not been effective at controlling this plant (Hill and Hulley, 1995). Answering "yes" with high uncertainty because this answer is based on congeneric information.
ES-21 (Number of cold hardiness zones suitable for its survival)	9	0	
ES-22 (Number of climate types suitable for its survival)	9	2	
ES-23 (Number of precipitation bands suitable for its survival)	8	1	
Impact Potential			
General Impacts			
Imp-G1 (Allelopathic)	n - mod	0	No evidence.
Imp-G2 (Parasitic)	n - negl	0	*Solanum sisymbriifolium* is in the family Solanaceae (D'Arcy, 1974; NGRP, 2012), a family not known to contain parasitic plants (Heide-Jørgensen, 2008; Nickrent, 2009).
Impacts to Natural Systems			
Imp-N1 (Change ecosystem processes and parameters that affect other species)	n - mod	0	No evidence. *Solanum sisymbriifolium* is an ephemeral pioneer species (Byrne et al., 2002) that is unlikely to have a long-term impact on an ecosystem.
Imp-N2 (Change community structure)	n - mod	0	No evidence.
Imp-N3 (Change community composition)	n - mod	0	No evidence. A population of *S. sisymbriifolium* being studied in South Africa was almost completely replaced by non-native *Acacia* species in just a few years (Hill and Hulley, 2000). "*S. sisymbriifolium* often behaves as a pioneer species, persisting for relatively short periods of time before being displaced by perennial weeds...and native plant species" (Byrne et al., 2002). Due to the ephemeral nature of this species, answering "no" with moderate uncertainty.

Question ID	Answer - Uncertainty	Score	Notes (and references)
Imp-N4 (Is it likely to affect federal Threatened and Endangered species)	n - mod	0	This species mainly grows in disturbed areas such as "waste areas, roadsides, fence rows, and dykes" (Karaer and Kutbay, 2007), so it seems unlikely that *S. sisymbriifolium* would affect Threatened and Endangered species in natural areas.
Imp-N5 (Is it likely to affect any globally outstanding ecoregions)	n - mod	0	This species mainly grows in disturbed areas such as "waste areas, roadsides, fence rows, and dykes" (Karaer and Kutbay, 2007), so it seems unlikely that *S. sisymbriifolium* would invade globally outstanding ecoregions.
Imp-N6 (Weed status in natural systems)	a - mod	0	In Australia, *S. sisymbriifolium* occurs in "shrubby eucalypt woodland" but no information about impact was given in this reference (Bean, 2012). Because we found no information about *S. sisymbriifolium* causing any impacts in natural areas, we are answering "a" with moderate uncertainty. The alternate answers for the Monte Carlo simulation are both "b."
Impact to Anthropogenic Systems (cities, suburbs, roadways)			
Imp-A1 (Impacts human property, processes, civilization, or safety)	n - mod	0	No evidence.
Imp-A2 (Changes or limits recreational use of an area)	n - mod	0	No evidence.
Imp-A3 (Outcompetes, replaces, or otherwise affects desirable plants and vegetation)	n - mod	0	No evidence.
Imp-A4 (Weed status in anthropogenic systems)	a - mod	0	Grows in disturbed areas such as "waste areas, roadsides, fence rows, and dykes" (Karaer and Kutbay, 2007) but no evidence that this species is perceived to be a weed in urban and suburban settings, so answering "a." The alternate answers for the Monte Carlo simulation are both "b."
Impact to Production Systems (agriculture, nurseries, forest plantations, orchards, etc.)			
Imp-P1 (Reduces crop/product yield)	y - low	0.4	Vegetative plant parts are not desirable for consumption by animals because they are covered in prickles and spines (Karaer and Kutbay, 2007), so this plant reduces the carrying capacity of pastureland in South Africa (Byrne et al., 2002; King et al., 2011).
Imp-P2 (Lowers commodity value)	y - low	0.2	Reduces value of pastureland in South Africa (Byrne et al., 2002; King et al., 2011).
Imp-P3 (Is it likely to impact trade)	y - low	0.2	Regulated by South Africa and Namibia (APHIS, 2012) and contaminates hay seed (Bryson, 2011) so *S. sisymbriifolium* could impact trade activities.
Imp-P4 (Reduces the quality or availability of irrigation, or strongly competes with plants for water)	n - mod	0	No evidence.
Imp-P5 (Toxic to animals, including livestock/range animals and poultry)	? - max		Stem and leaves of *Solanum* species contain toxic compounds (Burrows and Tyrl, 2001). Listed as toxic by Randall (2012). However, fresh fruits are non-toxic and are consumed by the Chorote Indians of Argentina (Arenas and Scarpa, 2007). "[H]igh densities of glandular trichomes on the leaves which preclude adventitious attacks from...herbivorous insect species" (King et al., 2011). While the vegetative parts of this plant are toxic, it is not clear that they would be consumed by animals, so answering "unknown."

Question ID	Answer - Uncertainty	Score	Notes (and references)
Imp-P6 (Weed status in production systems)	c - low	0.6	In South Africa, *Gratiana spadicea* tortoise beetles were released as biological control agents for *S. sisymbriifolium* (Hill and Hulley, 1995). Has "invaded good quality pasture lands and forestry firebreaks" in South Africa (Hill and Hulley, 1995). "[A] noxious invader of agricultural lands, fire breaks, and forestry plantations" in South Africa (Hill and Hulley, 2000). Listed as a weed of rice in India (Moody, 1989). Associated with cultivated crops (Hill and Hulley, 1995). Listed as a Watch List A plant (exotic plant species causing severe problems in surrounding states but not yet present in TN) by Tennessee (Bowen et al., 2002). "This species is considered as a threat for irrigated crops in Sardinia" (ISSG, 2012b). Alternate answers for the Monte Carlo simulation are both "b."
Geographic Potential			Below, p.s. refers to Point Source data (i.e., geo-referenced data points) and occ. refers to occurrence-only data (i.e., presence in a region).
Plant cold hardiness zones			
Geo-Z1 (Zone 1)	n - negl	N/A	No evidence.
Geo-Z2 (Zone 2)	n - negl	N/A	No evidence.
Geo-Z3 (Zone 3)	n - negl	N/A	No evidence.
Geo-Z4 (Zone 4)	n - low	N/A	No evidence.
Geo-Z5 (Zone 5)	y - low	N/A	New York (p.s. GBIF, 2012; Kartesz, 2012), Finland (p.s. Timmermans et al., 2009).
Geo-Z6 (Zone 6)	y - negl	N/A	South Korea (occur. ISSG, 2012b), Norway, Sweden (p.s. GBIF, 2012).
Geo-Z7 (Zone 7)	y - negl	N/A	South Korea (occur. ISSG, 2012b), Norway, Sweden (p.s. GBIF, 2012).
Geo-Z8 (Zone 8)	y - negl	N/A	South Africa, France, Ireland, Texas (p.s. GBIF, 2012).
Geo-Z9 (Zone 9)	y - negl	N/A	Chile, South Africa, Australia (p.s. GBIF, 2012).
Geo-Z10 (Zone 10)	y - negl	N/A	Argentina, South Africa, Australia (p.s. GBIF, 2012).
Geo-Z11 (Zone 11)	y - negl	N/A	Brazil (p.s. GBIF, 2012).
Geo-Z12 (Zone 12)	y - negl	N/A	Brazil (p.s. GBIF, 2012).
Geo-Z13 (Zone 13)	y - negl	N/A	Brazil (p.s. GBIF, 2012).
Köppen-Geiger climate classes			
Geo-C1 (Tropical rainforest)	y - negl	N/A	Brazil, Bolivia (p.s. GBIF, 2012).
Geo-C2 (Tropical savanna)	y - negl	N/A	Brazil, Bolivia, Benin (p.s. GBIF, 2012).
Geo-C3 (Steppe)	y - negl	N/A	Bolivia, South Africa (p.s. GBIF, 2012).
Geo-C4 (Desert)	n - low	N/A	No evidence.
Geo-C5 (Mediterranean)	y - negl	N/A	Oregon, Australia (p.s. GBIF, 2012).
Geo-C6 (Humid subtropical)	y - negl	N/A	Florida, Georgia, Argentina (p.s. GBIF, 2012).
Geo-C7 (Marine west coast)	y - negl	N/A	Bolivia, South Africa, France (p.s. GBIF, 2012).
Geo-C8 (Humid cont. warm sum.)	y - low	N/A	South Korea (occur. ISSG, 2012b).
Geo-C9 (Humid cont. cool sum.)	y - negl	N/A	Sweden, Norway (p.s. GBIF, 2012).
Geo-C10 (Subarctic)	y - mod	N/A	Grown in research plots in Finland (p.s. Timmermans et al., 2009), multiple naturalized points in Norway (p.s. GBIF, 2012). Using moderate uncertainty because Timmermans et al. (2009) say that *S. sisymbriifolium* is not well-adapted to this region.
Geo-C11 (Tundra)	n - mod	N/A	One point found in this climate type, occurring in Colombia (GBIF,

Question ID	Answer - Uncertainty	Score	Notes (and references)
			2012) but because we found no other evidence that *S. sisymbriifolium* grows in this climate type, answering "no" with moderate uncertainty.
Geo-C12 (Icecap)	n - low	N/A	No evidence.
10-inch precipitation bands			
Geo-R1 (0-10 inches; 0-25 cm)	n - mod	N/A	No evidence.
Geo-R2 (10-20 inches; 25-51 cm)	y - negl	N/A	Argentina, Bolivia (p.s. GBIF, 2012).
Geo-R3 (20-30 inches; 51-76 cm)	y - negl	N/A	Paraguay, Argentina, South Africa (p.s. GBIF, 2012).
Geo-R4 (30-40 inches; 76-102 cm)	y - negl	N/A	Brazil, Argentina, South Africa (p.s. GBIF, 2012).
Geo-R5 (40-50 inches; 102-127 cm)	y - negl	N/A	Brazil, Benin (p.s. GBIF, 2012).
Geo-R6 (50-60 inches; 127-152 cm)	y - negl	N/A	Florida, Georgia, Brazil (p.s. GBIF, 2012).
Geo-R7 (60-70 inches; 152-178 cm)	y - negl	N/A	Louisiana, Brazil (p.s. GBIF, 2012).
Geo-R8 (70-80 inches; 178-203 cm)	y - negl	N/A	Brazil (p.s. GBIF, 2012).
Geo-R9 (80-90 inches; 203-229 cm)	y - negl	N/A	Bolivia, Taiwan (p.s. GBIF, 2012).
Geo-R10 (90-100 inches; 229-254 cm)	n - high	N/A	No evidence.
Geo-R11 (100+ inches; 254+ cm))	n - high	N/A	One point in Peru (GBIF, 2012), but because we found no other evidence that this species grows in this rainfall band or in the 90-100 inches of rainfall band, answering "no" with high uncertainty.
Entry Potential			
Ent-1 (Plant already here)	y - negl	1	Present in Alabama, Arizona, California, Delaware, Florida, Georgia, Iowa, Louisiana, Massachusetts, Mississippi, New Jersey, New York, North Carolina, Oregon, Pennsylvania, South Carolina, and Texas (Kartesz, 2012).
Ent-2 (Plant proposed for entry, or entry is imminent)	-	N/A	
Ent-3 (Human value & cultivation/trade status)	-	N/A	
Ent-4 (Entry as a contaminant)			
Ent-4a (Plant present in Canada, Mexico, Central America, the Caribbean or China)	-	N/A	
Ent-4b (Contaminant of plant propagative material (except seeds))	-	N/A	
Ent-4c (Contaminant of seeds for planting)	-	N/A	
Ent-4d (Contaminant of ballast water)	-	N/A	
Ent-4e (Contaminant of	-	N/A	

Question ID	Answer - Uncertainty	Score	Notes (and references)
aquarium plants or other aquarium products)			
Ent-4f (Contaminant of landscape products)	-	N/A	
Ent-4g (Contaminant of containers, packing materials, trade goods, equipment or conveyances)	-	N/A	
Ent-4h (Contaminants of fruit, vegetables, or other products for consumption or processing)	-	N/A	
Ent-4i (Contaminant of some other pathway)	-	N/A	
Ent-5 (Likely to enter through natural dispersal)	-	N/A	