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Weed Risk Assessment for *Praxelis clematidea* R. M. King & H. Rob. (Asteraceae) – Praxelis

Top left: Small stand of *P. clematidea* in Florida (photographer: Stephen Dickman). Bottom left: Population in Queensland, Australia (photographer: Barbara Waterhouse, Australian Dept. of Agriculture). Right: Inflorescence showing open flowers and mature seeds (source: Australian National Botanic Gardens, http://www.anbg.gov.au/index.html).

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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.

***Praxelis clematidea* R. M. King & H. Rob. – Praxelis**

Species Information

Family: Asteraceae

Synonyms: *Eupatorium catarium* Veldkamp (NGRP, 2014); *E. clematideum* Griseb. (King and Robinson, 1970; NGRP, 2014); *E. urticifolium* var. *clematideum* (Gnseb.) Hieron ex Kuntze (Freire et al., 2005); *E. urticifolium* var. *nanum* Hieron. ex Kuntze (Freire et al., 2005).

Common name: Praxelis (Australian Weeds Committee, 2014).

Botanical description: *Praxelis clematidea* is an annual to short-lived perennial aster that grows up to 1-1.3 meters tall with clusters of small lilac to bluish flowers (Abbott et al., 2008; Australian Weeds Committee, 2014; Holland, 2006). Leaves are coarsely toothed and emit an odor similar to cat urine when crushed. Its appearance is very similar to *Ageratum conyzoides* and *A. houstonianum* (Holland, 2006), which are also present in the United States (Kartesz, 2014), but those species can be differentiated based on floral characteristics (Holland, 2006). See the following references for a more detailed description of the genus and species: Holland, 2006; King and Robinson, 1970; Zhengyi et al., 2014.

Initiation: A PPQ botanist from Washington state (Margaret Smither-Kopperl) reported in 2010 that identifiers in Washington state frequently intercept Praxelis from China. PERAL completed the original WRA in 2010, but revised it in this document because PPQ is considering listing this species as a Federal Noxious Weed.

Foreign distribution: This species is native to northern Argentina, southern Brazil, Bolivia, Paraguay, and Peru (NGRP, 2014; Veldkamp, 1999). It has been introduced to and naturalized in Australia, China, and Taiwan (NGRP, 2014). It is also present on Ishigaki Island (GBIF, 2014), which is near Taiwan and a part of Japan's Okinawan Islands. Praxelis was discovered on Palau but was promptly eradicated (Anonymous, 2013).

U.S. distribution and status: This species was first detected in central Florida in 2006 in an abandoned orange grove (Abbott et al., 2008). Return visits showed it was present at several localities with dozens to hundreds of individuals each and suggested that it had been spreading in the area for some years (Abbott et al., 2008). Thus far, all known occurrences in Florida appear to be disturbed areas: edges of roads and pine plantations, and the initial abandoned citrus grove. This species is present or naturalized in six central Florida counties (Wunderlin and Hansen, 2014) and reported in one additional one (Stone, 2014). In Hillsborough County, it is a weed in conservation areas that are undergoing restoration but control efforts with glyphosate seem to be working well (Dickman, 2014). This species is listed on NAPPRA as a potential pest plant, and thus is prohibited entry as a plant for planting. However, we found no evidence this species is cultivated and believe it is more likely to enter as a contaminant.

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

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1. *Praxelis clematidea* analysis

Establishment/Spread Potential

Praxelis has been a highly invasive plant in Queensland, Australia, spreading across the entire coastal region in just 20 years (CRC Weed Management, 2003; Holland, 2006; Laidlaw, 2013). It produces seeds with barbed bristles that are dispersed by wind, water, animals, and birds (CRC Weed Management, 2003). It also disperses on vehicles and clothing (Holland, 2006; Navie, 2014; Waterhouse, 2003). Praxelis moves in international trade as a contaminant (PestID, 2014; Scott et al., 1998; Waterhouse and Mitchell, 2012). It forms dense patches (Dickman, 2014; U.F. Herbarium, 2014), is self-compatible (Powell, 1985), and readily resprouts after fire (English, 2014). We had below average uncertainty for this risk element.

Risk score = 22 Uncertainty index = 0.13

Impact Potential

Praxelis is a weed of natural, anthropogenic, and production systems. Although it is a successional species that often occurs in disturbed areas, it also invades undisturbed open forests (Laidlaw, 2013; Veldkamp, 1999). It forms dense monospecific stands that exclude native species (Holland, 2006;

[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).

Pollock et al., 2004; Qin et al., 2008; Wang et al., 2006). Although it is not clear why few plants, if any, grow underneath this species (Wang et al., 2006), evidence indicates it may be allelopathic (Chen et al., 2011; Wang et al., 2006). We found very little specific information on its impacts in productions systems, but Praxelis is reported as a weed in sugarcane and pastures in Queensland (Australian Weeds Committee, 2014; Holland, 2006; Waterhouse, 2003). Two reports indicate it is not eaten by livestock (Pollock et al., 2004; Qiu et al., 2011), possibly because of the pungent, cat-spray-like odor it emits when crushed (Australian Weeds Committee, 2014; Dickman, 2014; Wunderlin and Hansen, 2014). Owners of rangelands with livestock in northern Queensland indicated that Praxelis was the most prominent weed (Shaw and Kernot, 2004). It is on the Federal Alert List for Environmental Weeds in Australia (Laidlaw, 2013) and is a quarantine species in Western Australia (DAFWA, 2012), where it is eradicated when found (Anonymous, 2008). We had a high amount of uncertainty for this risk element.
Risk score = 3.4 Uncertainty index = 0.36

Geographic Potential Based on three climatic variables, we estimate that about 23 percent of the United States is suitable for the establishment of Praxelis (Fig. 1). This predicted distribution is based on the species' known distribution elsewhere in the world and includes point-referenced localities and areas of occurrence. The map for Praxelis represents the joint distribution of Plant Hardiness Zones 7-13, areas with 10-100+ inches of annual precipitation, and the following Köppen-Geiger climate classes: tropical rainforest, tropical savanna, steppe, humid subtropical, and marine west coast. We suspect this species may also grow in wetter microhabitats of Mediterranean climates, which are not shown in Fig. 1.

The area estimated likely represents a conservative estimate, as it only uses three climatic variables. Other environmental variables, such as soil and habitat type, may further limit the areas in which this species is likely to establish. Praxelis grows along or in streambanks, roadsides, pastures, sugarcane farms, railway lines, fence lines, recently burned areas, urban wastelands, rural paths, open woods, and the borders of cultivated fields (Freire et al., 2005; Holland, 2006; Laidlaw, 2013; Veldkamp, 1999; Waterhouse, 2003).

Entry Potential This species is already present in the United States (Abbott et al., 2008; Wunderlin and Hansen, 2014) but we evaluated its entry potential because it is restricted to only a few contiguous counties in central Florida and might enter other parts of the United States. The primary regional dispersal pathway for Praxelis is as a hitchhiker on clothing and vehicles, including trains and four-wheeled drive vehicles (Australian Weeds Committee, 2014; Dickman, 2014; Holland, 2006; Navie, 2014; Waterhouse, 2003). In commercial trade, this species can be introduced as a contaminant of seeds for planting (Scott et al., 1998; Waterhouse and Mitchell, 2012), landscaping

products such as mulch and building materials (CRC Weed Management, 2003; English, 2014; Laidlaw, 2013; Waterhouse, 2003), or in hydroseed or hydromulch[2] (Space et al., 2009). It may also spread as a hitchhiker on other goods such as tiles, rubber, aluminum, and fruit (PestID, 2014). Praxelis may also be introduced intentionally for research (e.g., biochemical properties) (Falcão et al., 2013; Oliveira-Filho et al., 2013). High uncertainty was associated with this risk element.
Risk score = 0.31 Uncertainty index = 0.29

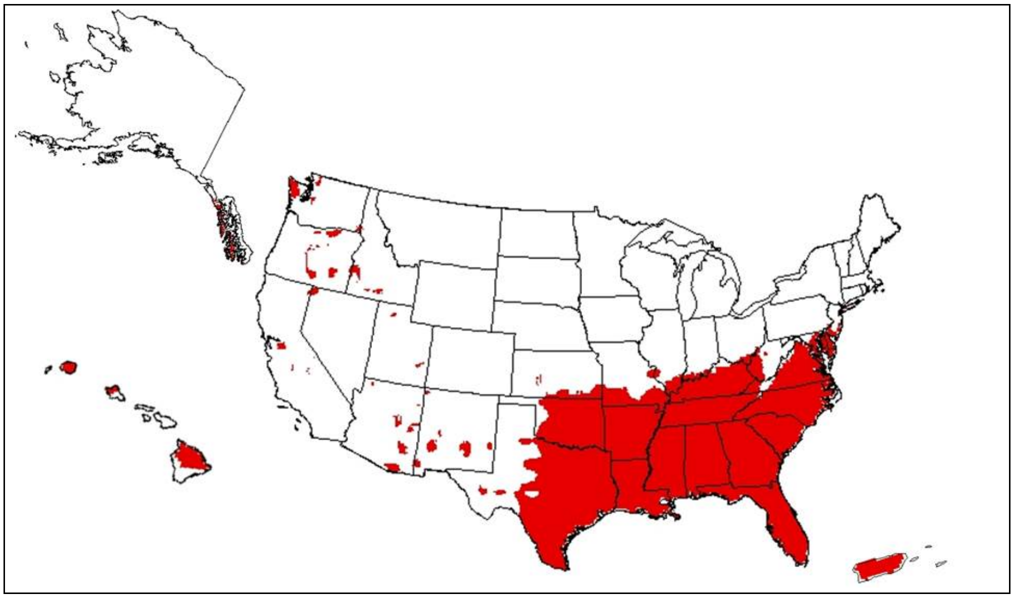

Figure 1. Predicted distribution of *Praxelis clematidea* in the United States. Map insets for Alaska, Hawaii, and Puerto Rico are not to scale.

<u>2. Results and Conclusion</u>

Model Probabilities: P(Major Invader) = 95.7%
P(Minor Invader) = 4.2%
P(Non-Invader) = 0.1%
Risk Result = High Risk
Secondary Screening = Not Applicable

[2] Hydroseed or hydromulch refers to a slurry of seeds and fine mulch that is sprayed on bare ground for the purpose of seeding an area. It is an alternative process to broadcast seeding and can be very effective for large areas.

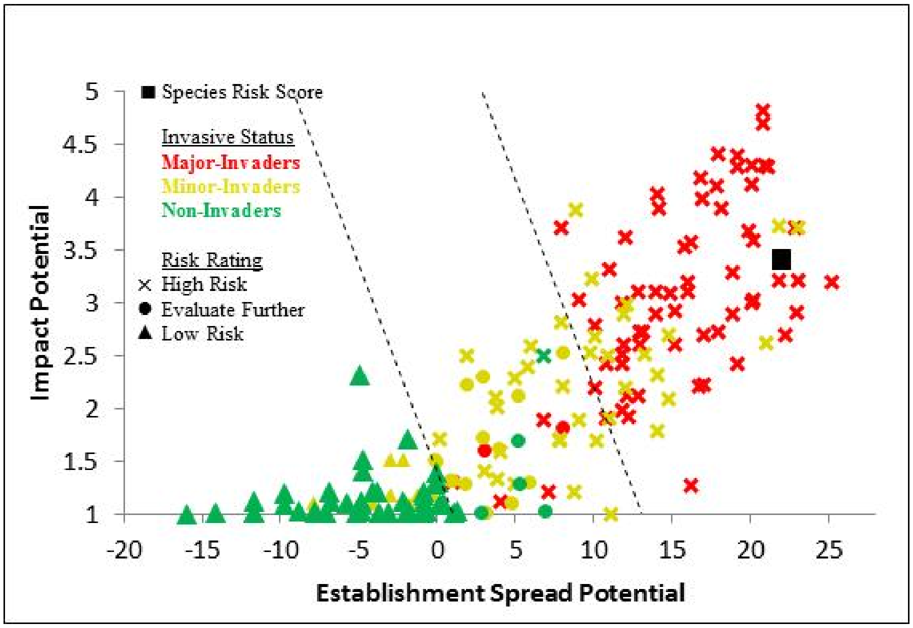

Figure 2. *Praxelis clematidea* risk score (black box) relative to the risk scores of species used to develop and validate the PPQ WRA model (other symbols). See Appendix A for the complete assessment.

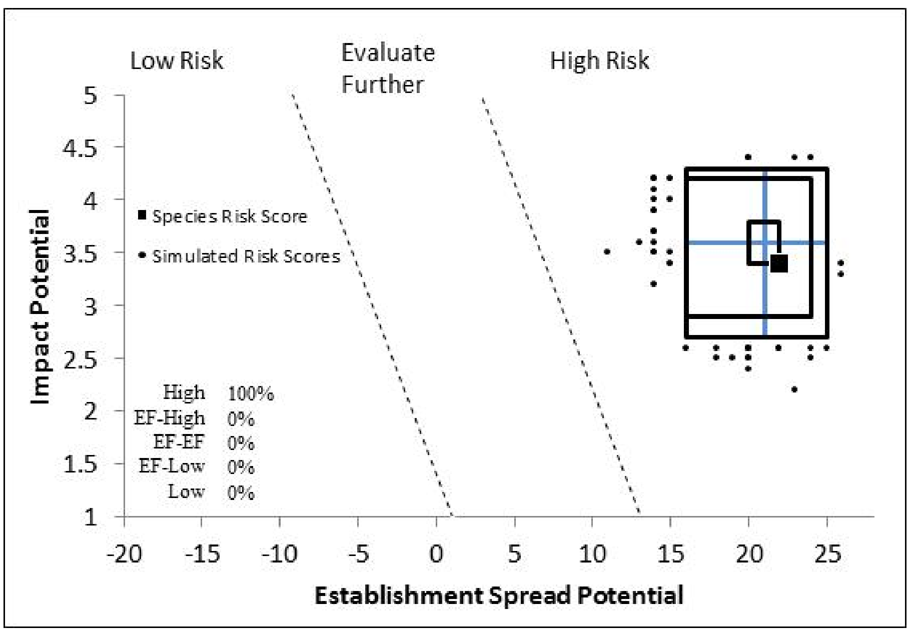

Figure 3. Model simulation results (N=5,000) for uncertainty around the risk score for *Praxelis clematidea*. The blue "+" symbol represents the medians of the simulated outcomes. The smallest box contains 50 percent of the outcomes, the second 95 percent, and the largest 99 percent.

3. Discussion

The result of the weed risk assessment for *Praxelis clematidea* is High Risk (Fig. 2). This species obtained a very high score for establishment and spread potential that is confirmed by its rapid spread along Queensland's coastal region (CRC Weed Management, 2003; Holland, 2006; Laidlaw, 2013). It also got a moderately high score for impact potential, but with higher uncertainty because its impacts have not been well characterized, particularly for production systems. It is noteworthy that Praxelis is abundant and considered a weed in its native range (Cantero et al., 2000). Overall, we are very confident in our determination of high risk based on the results of our uncertainty simulation (Fig. 3).

Praxelis is present in only six to seven counties in central Florida (Stone, 2014; Wunderlin and Hansen, 2014), but we know very little about the extent and distribution of these populations. This species could probably spread beyond this localized region into the rest of Florida and other tropical and subtropical areas in the United States. Our climate matching analysis indicated it could establish in other parts of the southeastern United States (Fig. 1). The potential for establishment in more temperate regions of the United States is supported by modeling that indicated it may invade temperate regions in China (Qiu et al., 2011). If Praxelis were not able to survive winters in these temperate regions in a vegetative state, because can also behave as a fast-growing annual (Dickman, 2014) that can produce several generations per year (Waterhouse, 2014), it may be able to persist in more temperate regions by recolonizing from a seed bank. Although its seeds tolerate cold temperatures for short periods (-30 °C for two days; Veldkamp, 1999), it is not clear if they can tolerate prolonged cold periods.

Praxelis is primarily an invader of disturbed and open habitats in both natural and production systems (Holland, 2006; Navie, 2014; Shaw and Kernot, 2004). In 2000, it was placed on the National Environmental Alert List in Australia because it was in the early stages of invasion and represented a significant threat (Grice et al., 2008). Due to its rapid spread there, however, it was already probably too late for eradication in Queensland. Given the variety of pathways and methods with which this species spreads, we think regulatory agencies and resource managers should consider Praxelis carefully for regulation or management.

4. Literature Cited

7 U.S.C. § 1581-1610. 1939. The Federal Seed Act, Title 7 United States Code § 1581-1610.

7 U.S.C. § 7701-7786. 2000. Plant Protection Act, Title 7 United States Code § 7701-7786.

Abbott, J. R., C. L. White, and S. B. Davis. 2008. *Praxelis clematidea* (Asteraceae), a genus and species new for the flora of North America. Journal of the Botanical Research Institute of Texas 2(1):621-626.

ALA. 2014. Atlas of Living Australia (ALA), Online Database. Australian Government. http://www.ala.org.au. (Archived at PERAL).

Anonymous. 2008. Praxelis weed found in WA. Queensland Country Life. Last accessed February 14, 2014, http://www.queenslandcountrylife.com.au/news/agriculture/agribusiness/general-news/praxelis-weed-found-in-wa/86336.aspx.

Anonymous. 2011. Praxelis: *Praxelis clematidea* fact sheet. Queensland Government, Queensland, Australia. 2 pp.

Anonymous. 2013. *Praxelis clematidea*. Pacific Ecosystems At Risk (HEAR). Last accessed February 14, 2014, http://www.hear.org/pier/species/praxelis_clematidea.htm.

Australian Weeds Committee. 2014. Weed identification: Praxelis. Australian Weeds Committee. Last accessed February 13, 2014, http://www.weeds.org.au/cgi-bin/weedident.cgi?tpl=plant.tpl&state=&s=0&region=all&card=H33.

Cantero, J. J., L. Petryna, and C. Nunez. 2000. The family Asteraceae in central Argentina. Compositae Newsletter 35:1-17.

Chen, Z. Y., S. F. Liang, D. W. Li, Z. S. Feng, W. H. Li, C. L. Peng, X. S. Tian, and X. Y. Zhou. 2011. Allelopathy of 12 species including *Eupatorium catarium* on *Bidens alba* seedlings [Abstract]. Journal of Tropical and Subtropical Botany 5.

Clarkson, J. 2014. Praxelis. Personal communication to B. M. Waterhouse on February 24, 2014, from John Clarkson, Principal Botanist, Queensland Parks and Wildlife Service, Australia.

CRC Weed Management. 2003. Weed management guide: Praxelis (*Praxelis clematidea*). Cooperative Research Centre (CRC) for Australian Weed Management, Australia. 6 pp.

Csurhes, S., and R. Edwards. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Queensland Department of Natural Resources, Australia. 202 pp.

DAFWA. 2012. Praxelis (*Praxelis clematidea*). Department of Agriculture and Food Western Australia (DAFWA), Perth, Australia. 2 pp.

DAFWA. 2013. Sugarcane mulch restricted entry to WA. Department of Agriculture and Food Western Australia (DAFWA), Perth, Australia. Last accessed February 19, 2014, http://archive.agric.wa.gov.au/PC_95686.html?s=1001.

Dickman, S. 2014. Looking for information on *Praxelis clematidea*. Personal communication to A. Koop on February 12, 2014, from Stephen Dickman, Environmental Specialist, Hillsborough County, Florida, Parks, Recreation and Conservation Department.

English, B. 2014. Information on *Praxelis clematidea*. Personal communication to B. Waterhouse on February 17, 2014, from Bernie English, Senior Extension Officer (Beef), Queensland Department of Agriculture, Fisheries and Forestry, Australia.

Falcão, H. D. S., G. L. D. A. Maia, F. Bonamin, H. Kushima, T. M. Moraes, C. A. Hiruma Lima, C. Takayama, A. L. Ferreira, A. R. M. Souza Brito, M.

D. F. Agra, J. M. Barbosa Filho, and L. M. Batista. 2013. Gastroprotective mechanisms of the chloroform and ethyl acetate phases of *Praxelis clematidea* (Griseb.) R.M.King & H.Robinson (Asteraceae) [Abstract]. Journal of Natural Medicines 67(3):480-491.

Falla, R. 2014. Praxelis. Personal communication to B. M. Waterhouse on February 18, 2014, from Richie Falla, Senior Field Officer with Mulgrave Mill (Queensland, Australia), specializing in weed management in sugarcane.

Freire, S. E., G. Sancho, E. Urtubey, N. D. Bayon, and K. Liliana. 2005. Catalogue of Asteraceae of Chacoan Plain, Argentina. Compositae Newsletter 43:1-126.

GBIF. 2014. GBIF, Online Database. Global Biodiversity Information Facility (GBIF). http://data.gbif.org/welcome.htm. (Archived at PERAL).

Grice, A. C., S. Campbell, R. Breaden, F. Bebawi, and W. Vogler. 2008. Habitat management guide-Rangelands: Ecological principles for the strategic management of weeds in rangeland habitats. CRC for Australian Weed Management, Adelaide, Australia.

Heap, I. 2014. The international survey of herbicide resistant weeds. Weed Science Society of America. http://www.weedscience.org/summary/home.aspx. (Archived at PERAL).

Heide-Jorgensen, H. S. 2008. Parasitic Flowering Plants. Brill, Leiden, The Netherlands. 438 pp.

Holland, A. 2006. Praxelis (*Praxelis clematidea* R.M.King & H.Rob). Weed Spotters Newsletter Autumn(3):5-6.

IPPC. 2012. International Standards for Phytosanitary Measures No. 5: Glossary of Phytosanitary Terms. Food and Agriculture Organization of the United Nations, Secretariat of the International Plant Protection Convention (IPPC), Rome, Italy.

ISSG. 2014. 100 of the World's Worst Invasive Alien Species. The World Conservation Union (IUCN), Invasive Species Specialist Group (ISSG). Last accessed February 28, 2014, http://www.issg.org/database/species/search.asp?st=100ss.

Kartesz, J. 2014. The Biota of North America Program (BONAP). North American Plant Atlas. http://bonap.net/tdc. (Archived at PERAL).

King, R. M., and H. Robinson. 1970. Studies in the Eupatorieae (Compositae). XXVIII, the genus *Praxelis*. Phytologia 20:193-195.

Koop, A., L. Fowler, L. Newton, and B. Caton. 2012. Development and validation of a weed screening tool for the United States. Biological Invasions 14(2):273-294.

Laidlaw, M. 2013. Praxelis (*Praxelis clematidea*) – 20 years down the track. Weed Spotters' Network Queensland March:2-3.

Martin, P. G., and J. M. Dowd. 1990. A protein sequence study of the dicotyledons and its relevance to the evolution of the legumes and nitrogen fixation. Australian Systematic Botany 3:91-100.

Martin, T. G., S. Campbell, and S. Grounds. 2006. Weeds of Australian rangelands. The Rangeland Journal 28(1):3-26.

Navie, S. 2014. Looking for information on *Praxelis clematidea*. Personal communication to A. Koop on February 5, 2014, from Sheldon Navie, consulting scientist with Technigro, which specializes in integrated vegetation management.

NGRP. 2014. Germplasm Resources Information Network (GRIN). United States Department of Agriculture, Agricultural Research Service, National Genetic Resources Program (NGRP). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl?language=en. (Archived at PERAL).

Nickrent, D. 2009. Parasitic plant classification. Southern Illinois University Carbondale, Carbondale, IL. Last accessed June 12, 2009, http://www.parasiticplants.siu.edu/ListParasites.html.

Oliveira-Filho, A. A., H. M. B. Fernandes, J. P. Sousa, G. L. A. Maia, D. F. Silva, J. M. Barbosa-Filho, T. L. Oliveira, E. O. Lima, and H. L. F. Pêsoa. 2013. Antibacterial and antifungal potential of the ethanolic extract of *Praxelis clematidea* R.M. King & Robinson [Abstract]. International Journal of Pharmacognosy and Phytochemical Research 5(3):183-185.

PestID. 2014. Pest Identification Database (PestID). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine. https://mokcs14.aphis.usda.gov/aqas/login.jsp. (Archived at PERAL).

Pollock, S., A. Holland, W. D. Smith, and R. Price. 2004. New alien weed for Queensland: Praxelis: Queensland Herbarium alert sheet. Queensland Government, Queensland, Australia. 1 pp.

Powell, A. M. 1985. Crossing data as generic criteria in the Asteraceae. Taxon 34(1):55-60.

Qin, W. H., Z. Wang, W. G. Xu, and M. K. Jiang. 2008. Investigation and analysis on alien invasive plants in three national nature reserves in Hainan Province [Abstract]. Journal of Plant Resources and Environment 17(2):44-49.

Qiu, C., Q. Wang, and Y. Yu. 2011. Predicted potential distribution of *Praxelis clematidea* in China. Chinese Journal of Applied and Environmental Biology 17(6):774-781.

Ramírez, N. 2004. Ecology of pollination in a tropical Venezuelan savanna. Plant Ecology 171:171-189.

Randall, J. M. 2007. The Introduced Flora of Australia and its Weed Status. CRC for Australian Weed Management, Department of Agriculture and Food, Western Australia, Australia. 528 pp.

Randall, R. P. 2012. A Global Compendium of Weeds, 2nd edition. Department of Agriculture and Food, Western Australia, Perth, Australia. 1107 pp.

Robinson, H., E. Schilling, and J. L. Panero. 2009. Eupatorieae. Pages 731-744 *in* V. A. Funk, A. Susanna, T. F. Stuessy, and R. J. Bayer, (eds.). Systematics, Evolution, and Biogeography of Compositae. International Association for Plant Taxonomy (IAPT), Vienna.

Scott, L. J., C. L. Lange, G. C. Graham, and D. K. Yeates. 1998. Genetic diversity and origin of siam weed (*Chromolaena odorata*) in Australia.

Weed Technology 12:27-31.
Shaw, K. A., and J. C. Kernot. 2004. Extent of dense native woodland and exotic weed infestation in the extensive grazing lands of the Upper Herbert and Upper Burdekin River Catchments of far north Queensland: Results of a producer survey. Tropical Grasslands 38:112-116.
Space, J. C., D. H. Lorence, and A. M. La Rosa. 2009. Report to the Republic of Palau: 2008 update on invasive plant species. United States Department of Agriculture - Forest Service, Pacific Southwest Research Station, Institute of Pacific Islands Forestry, Hilo, Hawai‘i, USA. 233 pp.
Stone, D. 2014. New pest species: Praxelis. Personal communication to Florida Exotic Pest Plant Council listserv on July 2, 2014, from Debi Stone, Restoration Steward with the Florida Nature Conservancy.
The Plant List. 2014. Version 1 [Online Database]. Kew Botanic Gardens and the Missouri Botanical Garden. http://www.theplantlist.org/. (Archived at PERAL).
U.F. Herbarium. 2014. Herbarium collections catalog: *Praxelis clematidea*. University of Florida. http://www.flmnh.ufl.edu/herbarium/cat/catsearch.htm. (Archived at PERAL).
Veldkamp, J. F. 1999. *Eupatorium catarium*, a new name for *Eupatorium clematideum* Griseb., non Sch.Bip. (Compositae), a South American species naturalised and spreading in SE Asia and Queensland, Australia. Gardens’ Bulletin Singapore 51:119-124.
Wang, Z. H., P. Christie, Q. B. Chen, X. X. Liu, L. L. Xie, C. J. Bai, and X. L. Li. 2006. Allelopathic potential and chemical constituents of volatile oil from *Praxelis clematidea*. Allelopathy Journal 18(2):225-235.
Waterhouse, B. M. 2003. Know your enemy: Recent records of potentially serious weeds in northern Australia, Papua New Guinea and Papua (Indonesia). Telopea 10(1):477-485.
Waterhouse, B. M. 2014. Do you have any pictures and information on Praxelis? Personal communication to A. Koop on February 16, 2014, from Barbara Waterhouse, Senior Botanist, Australian Department of Agriculture, Northern Australia Quarantine Strategy.
Waterhouse, B. M., and A. A. Mitchell. 2012. Weeds of tropical Australia: How do they get here? Pages 9-12 *in* V. Eldershaw, (ed.). 18th Australian Weeds Conference Proceedings: Developing Solutions to Evolving Weed Problems. Weed Science Society of Victoria, Melbourne, Victoria, Australia.
Weber, E., S. G. Sun, and B. Li. 2008. Invasive alien plants in China: Diversity and ecological insights. Biological Invasions 10:1411–1429.
White, E., N. Tucker, N. Meyers, and J. Wilson. 2004. Seed dispersal to revegetated isolated rainforest patches in North Queensland. Forest Ecology and Management 192(2-3):409-426.
Wunderlin, R. P., and P. F. Hansen. 2014. Atlas of Florida Vascular Plants. University of South Florida, Department of Biology, Institute for Systematic Botany. http://florida.plantatlas.usf.edu/Default.aspx.

(Archived at PERAL).
Zhengyi, W., P. H. Raven, and H. Deyuan. 2014. Flora of China. Missouri Botanical Garden Press. http://flora.huh.harvard.edu/china/. (Archived at PERAL).

Appendix A. Weed risk assessment for *Praxelis clematidea* R. M. King & H. Rob (Asteraceae). The following information came from the original risk assessment, which is available upon request (full responses and all guidance). We modified the information to fit on the page.

Question ID	Answer - Uncertainty	Score	Notes (and references)
ESTABLISHMENT/SPREAD POTENTIAL			
ES-1 (Status/invasiveness outside its native range)	f - negl	5	This species is native to northern Argentina, southern Brazil, Bolivia, Paraguay, and Peru (NGRP, 2014; Veldkamp, 1999). It was introduced into Hong Kong around 1980 and is now present in Taiwan, Macau, and other places in southern China (Veldkamp, 1999). It is rapidly invading new areas in China (Veldkamp, 1999; Wang et al., 2006). In Australia, it was first discovered in 1993 when specimens from Queensland were identified at Kew (Waterhouse, 2003). It is spreading in Australia and "rapidly approaching New Guinea from the south" (Waterhouse, 2003). It is considered invasive in Queensland (Pollock et al., 2004) where it rapidly spread across the state in the 20 years since its introduction, particularly in the last five years (CRC Weed Management, 2003; Holland, 2006; Laidlaw, 2013). The location and distribution of populations in central Florida suggest that it "has been in Florida for some time and has been spreading" (Abbott et al., 2008). Alternate answers for the Monte Carlo simulation were both "e."
ES-2 (Is the species highly domesticated)	n - negl	0	We found no evidence this species has been domesticated, bred, or cultivated. Because we found no evidence of cultivation, we used negligible uncertainty.
ES-3 (Weedy congeners)	n - low	0	*Praxelis* contains 13 species, which are all native to South America and have not been reported as exotics elsewhere (Abbott et al., 2008). The Global Compendium of Weeds lists *Eupatorium pauciflorum* Kunth as a weed (Randall, 2012) and states it is a synonym of *Praxelis pauciflora* (Kunth) R. M. King & H. Rob (Randall, 2012); however, The Plant List states it is a synonym of *Praxelis diffusa* (Rich.) Pruski. (The Plant List, 2014). Regardless of this taxonomic issue, we did not find any evidence that any *Praxelis* besides *P. clematidea* is a significant weed. It is noteworthy that *Praxelis* and *Chromolaena* are considered sister genera (Robinson et al., 2009) and both were at one point in the genus *Eupatorium* (NGRP, 2014). *Chromolaena odorata* is widely recognized as one of the world's worst 100 invasive alien species (ISSG, 2014).
ES-4 (Shade tolerant at some stage of its life cycle)	n - mod	0	*Praxelis clematidea* is categorized as an early successional species (White et al., 2004). It readily forms monospecific stands when there is little shading (Wang et al., 2006). It occurs in open places in woods, along roads, and in borders of cultivated fields (Freire et al., 2005). "It tolerates partial shade to full sun but does not cope well under heavy shade" (CRC Weed Management, 2003). It thrives in full sun, but is able to survive in full shade at least part of the year (i.e., winter); in shady areas plants will lean towards the light (Dickman, 2014). This species is likely to be quickly outcompeted by another species with a taller canopy (Clarkson, 2014). Based on the evidence, this species appears to prefer full sun, although it may be able to just survive in heavy shade for a short while. Because

Question ID	**Answer - Uncertainty**	**Score**	**Notes (and references)**
			the scope of this question is to identify plants that can grow in full shade as opposed to just survive or tolerate it for certain periods, we answered no, but with moderate uncertainty.
ES-5 (Climbing or smothering growth form)	n - negl	0	This species is neither a vine nor plant with a basal rosette. It is an herb with a woody base (suffrutescent) and grows to about 1.3 meters tall (Wunderlin and Hansen, 2014), although most plants are slightly less than 1 meter tall (Csurhes and Edwards, 1998).
ES-6 (Forms dense thickets)	y - negl	2	It forms dense swards (Holland, 2006; Pollock et al., 2004). "Capable of producing many fertile seeds falling in close proximity to the parent plant. Eventually producing a robust swarm of flowering plants" (Dickman, 2014). In one Florida site, it is growing in isolated dense patches (U.F. Herbarium, 2014).
ES-7 (Aquatic)	n - negl	0	*Praxelis clematidea* is not an aquatic. It is a terrestrial aster up to 1-1.3 meters tall (Abbott et al., 2008; Australian Weeds Committee, 2014; Holland, 2006).
ES-8 (Grass)	n - negl	0	This species is not a grass (NGRP, 2014). It is an annual to short-lived perennial aster (Abbott et al., 2008; Australian Weeds Committee, 2014; Holland, 2006).
ES-9 (Nitrogen-fixing woody plant)	n - negl	0	We found no specific evidence of nitrogen fixation. This species is neither woody nor in a family known to contain nitrogen-fixing species (Martin and Dowd, 1990).
ES-10 (Does it produce viable seeds or spores)	y - negl	1	Produces viable seeds (Dickman, 2014; Wunderlin and Hansen, 2014). "Spreads by seed" (Australian Weeds Committee, 2014), which indicates it produces viable seed.
ES-11 (Self-compatible or apomictic)	y - mod	1	*"Praxelis clematoidea"* was reported to be partially self-compatible (Powell, 1985); we assumed that "*P. clematoidea*" is a misspelling of *P. clematidea*, as that name does not appear to be valid.
ES-12 (Requires special pollinators)	n - low	0	*Praxelis clematidea* attracts a range of pollinators (Dickman, 2014). Given the history of this species' spread elsewhere (see evidence under ES-1), it seems unlikely that it requires specialist pollinators. The congener *Praxelis pauciflora* is pollinated by bees and butterflies in Venezuela (Ramírez, 2004).
ES-13 (Minimum generation time)	a - low	2	It is an annual or short-lived perennial herb (Holland, 2006; Waterhouse, 2003; Weber et al., 2008). An annual (Csurhes and Edwards, 1998). "It can produce large numbers of seeds in as little as three or four months after germinating" (CRC Weed Management, 2003). Newly germinated seedlings can begin producing seeds in 4-8 weeks in tropical Queensland (Waterhouse, 2014). Because of the rapid life cycle, this species is very likely producing multiple generations in one year, particularly in more tropical latitudes (Waterhouse, 2014). One reference indicated that plants can reproduce vegetatively where branches come in contact with the soil (Laidlaw, 2013); however, we found no other information indicating or suggesting this is an important form of reproduction. Alternate choices for the Monte Carlo simulation were both "b."
ES-14 (Prolific reproduction)	? - max	0	We found no direct estimates of seed production per unit area or per plant. Plants produces about 25-50 flowers in a flower head (Australian Weeds Committee, 2014), and flower heads occur in

Question ID	Answer - Uncertainty	Score	Notes (and references)
			clusters at the end of flowering stems (CRC Weed Management, 2003). Based on images, it appears that there are about 12-20 flower heads at the end of each flowering stem (Dickman, 2014). Also based on images, it seems that there could be a dozen or more flowering stems per square meter. Based on these estimates, there may be from 3,600 to 12,000 individual flowers per square meter. We found no data on seed viability or germination rates, but one Queensland botanist suspects that seed viability is high (Waterhouse, 2014). Without additional information we answered unknown, but suspect this species may produce at least 5,000 viable seeds per square meter.
ES-15 (Propagules likely to be dispersed unintentionally by people)	y - negl	1	"Seeds are readily spread as contaminants of vehicles, building and landscaping materials and garden mulch" (Australian Weeds Committee, 2014; English, 2014; Holland, 2006; Waterhouse, 2003). Distributed long distances by trains and four-wheeled drive vehicles, and appears along railway lines, pipeline, and power line corridors in Queensland, Australia (Navie, 2014). Spread by vehicles and on clothing (Dickman, 2014). It is easily spread by machinery (English, 2014), presumably in mud clinging to the machinery.
ES-16 (Propagules likely to disperse in trade as contaminants or hitchhikers)	y - negl	2	It was likely introduced to Queensland, Australia as a contaminant of pasture seeds from Brazil (Scott et al., 1998; Waterhouse and Mitchell, 2012). This species spreads in commercial sugarcane mulch in Queensland (English, 2014). The United States has intercepted this species on rubber, tiles, aluminum, *Cocos nucifera*, and *Garcinia mangostana* at U.S. ports since 2010 (PestID, 2014). Because this is a non-reportable species for APHIS, it is likely being intercepted on other commodities and more frequently, but has gone unreported.
ES-17 (Number of natural dispersal vectors)	4	4	Fruit and seed description for ES-17a through ES-17e: "The seeds (achenes) of *Praxelis* [*clematidea*] are black, 2.0–3.0 mm long, and topped with a tuft of bristles (pappus) longer than the seed" (Holland, 2006). Bristles on the achenes number 15-40 (Veldkamp, 1999).
ES-17a (Wind dispersal)	y - negl		The species is wind-dispersed (Laidlaw, 2013; Waterhouse, 2014). Seeds are wind-dispersed over short distances (Waterhouse, 2003). Species is classified as wind-dispersed (White et al., 2004).
ES-17b (Water dispersal)	y - low		Occurs along streambanks (Laidlaw, 2013; Waterhouse, 2003). Spread by flood waters (Laidlaw, 2013). Spread by water (CRC Weed Management, 2003). Although we did not find any direct or definitive evidence for water dispersal, we answered yes given these anecdotal accounts and the fact this species occurs along streambanks.
ES-17c (Bird dispersal)	y - high		The seeds possess a pappus of barbed bristles that can help them attach to feathers (CRC Weed Management, 2003). Pappus setae are coarsely barbellate (Zhengyi et al., 2014). Although we did not find any direct or definitive evidence, we answered yes because it seems likely given the barbed bristles of the seeds.
ES-17d (Animal external dispersal)	y - mod		It is spread by animals (Laidlaw, 2013). The seeds possess a pappus of barbed bristles that can help them attach to animal fur

Question ID	Answer - Uncertainty	Score	Notes (and references)
			(CRC Weed Management, 2003). Pappus setae are coarsely barbellate (Zhengyi et al., 2014). Although we did not find direct or definitive evidence that it is spread by animals, we answered yes as it seems likely given the barbed bristles of the seeds.
ES-17e (Animal internal dispersal)	n - mod		We found no evidence.
ES-18 (Evidence that a persistent (>1yr) propagule bank (seed bank) is formed)	? - max	0	Unknown.
ES-19 (Tolerates/benefits from mutilation, cultivation or fire)	y - mod	1	It "is very tolerant of fire and quickly shoots back from ground level if there is moisture" (English, 2014). Because it can reproduce vegetatively where branches come in contact with soil (CRC Weed Management, 2003; Laidlaw, 2013), it may be able to respond well to mutilation, but we are not very sure how important this is.
ES-20 (Is resistant to some herbicides or has the potential to become resistant)	n - mod	0	Neither the species nor the genus is listed by Heap (2014). "Reported to be more resistant to herbicides than *Ageratum conyzoides* L. because of its more robust rootstock and longer growing and flowering seasons" (Veldkamp, 1999); however, this is better interpreted as herbicide tolerance and not resistance. One manager in Florida reports that glyphosate works well on it (Dickman, 2014).
ES-21 (Number of cold hardiness zones suitable for its survival)	7	0	
ES-22 (Number of climate types suitable for its survival)	5	2	
ES-23 (Number of precipitation bands suitable for its survival)	10	1	
IMPACT POTENTIAL			
General Impacts			
Imp-G1 (Allelopathic)	y - high	0.1	Volatile oil extracts from leaves of *P. clematidea* that were presented to test plants as a volatile source (aerosolized in a sealed flask) had a significant inhibitory effect on the root length, shoot length, and fresh weight of germinating lettuce (*Lactuca sativa*) and mustard (*Brassica rapa*) seedlings relative to controls (Wang et al., 2006). Higher concentrations of these volatile oils had stronger inhibitory effects. Analysis of the volatile oils with gas chromatography identified a variety of compounds all of which are known to be allelopathic (Wang et al., 2006). The volatile oils extracted in this study also reduced the radial growth of fungal colonies and inhibited feeding by larvae of *Spodoptera litura* (Wang et al., 2006). Aqueous extracts from the leaves of *P. clematidea* had a significant inhibitory effect on the growth of *Bidens alba* seedlings; there was a significant correlation between the concentration of the extracts and the inhibitory effect (Chen et al., 2011). Although we usually prefer to see evidence of allelopathy from field experiments, the extent and nature of this evidence suggests that allelopathy may be operating under field conditions.
Imp-G2 (Parasitic)	n - negl	0	We found no evidence this species is parasitic. Furthermore, the Asteraceae is not a plant family known to contain parasitic

Question ID	Answer - Uncertainty	Score	Notes (and references)
			species (Heide-Jorgensen, 2008; Nickrent, 2009).
Impacts to Natural Systems			
Imp-N1 (Change ecosystem processes and parameters that affect other species)	? - max		In Australia, it "has the potential to cause significant degradation to our ecosystems and to threaten biodiversity" (Laidlaw, 2013). Without specific evidence, we answered unknown.
Imp-N2 (Change community structure)	y - high	0.2	It forms monospecific stands on stream banks (Wang et al., 2006). Forms monospecific stands (Anonymous, 2011). Although none of the literature examined stated that it alters habitat structure, it is likely affecting habitat structure as it forms dense monospecific stands (see question-specific guidance for this question). Because this is an assumption, we used high uncertainty.
Imp-N3 (Change community composition)	y - negl	0.2	It impacts biodiversity in three natural parks in southern China (Qin et al., 2008). Affects the growth of native species (cited in Qiu et al., 2011). Forms thickets that exclude other vegetation (Csurhes and Edwards, 1998; Laidlaw, 2013). Poses a threat to the biodiversity of Australian rangelands (Martin et al., 2006). "[V]irtually no other plants survive beneath *Praxelis*" (Wang et al., 2006).
Imp-N4 (Is it likely to affect federal Threatened and Endangered species)	y - high	0.1	Given the impacts to natural species described under Imp-N2 and Imp-N3, this species is likely to affect Threatened and Endangered species occurring in open habitats and habitats regularly subjected to disturbance events (e.g., stream banks).
Imp-N5 (Is it likely to affect any globally outstanding ecoregions)	? - max		It has "become an imminent threat to both disturbed and undisturbed ecosystems" (Wang et al., 2006). This species has been reported to have the potential to cause significant degradation to ecosystems and to threaten biodiversity (Laidlaw, 2013). Although our review of the literature indicated this species can and does invade undisturbed habitats, most of the evidence relates to spread in disturbed areas such as roadways and habitat edges. Reports of it forming monospecific stands along stream banks may or may not be in natural areas, but rather in anthropogenic areas. Without additional evidence, we answered unknown.
Imp-N6 (Weed status in natural systems)	c - low	0.6	An environmental weed in Australia (Australian Weeds Committee, 2014; Randall, 2007), where it is listed on the Federal Alert List for Environmental Weeds (Laidlaw, 2013). Weed of streambanks in Australia (Waterhouse, 2003). Invades the understory of relatively undisturbed woodlands (Holland, 2006; Waterhouse, 2003). In Florida, it was found growing in the native groundcover of a restoration site (U.F. Herbarium, 2014). Herbicide trials have not been conducted for this species, but some formulations are generally approved for this taxon (Anonymous, 2011). In Florida, because it is being encountered with increasing frequency in restoration areas, it is now specifically targeted for management (Dickman, 2014). Alternate answers for the Monte Carlo simulation were both "b."
Impact to Anthropogenic Systems (cities, suburbs, roadways)			
Imp-A1 (Impacts human property, processes, civilization, or safety)	n - mod	0	We found no evidence.

Question ID	Answer - Uncertainty	Score	Notes (and references)
Imp-A2 (Changes or limits recreational use of an area)	n - mod	0	This species has a strong musky, cat spray-like odor (Dickman, 2014; Wunderlin and Hansen, 2014) and is identified by its pungent smell (Australian Weeds Committee, 2014). However, we found no evidence this smell has affected human activity or behavior.
Imp-A3 (Outcompetes, replaces, or otherwise affects desirable plants and vegetation)	n - mod	0	We found no evidence.
Imp-A4 (Weed status in anthropogenic systems)	c - low	0.4	It occurs on roadsides in Queensland, Australia (Holland, 2006; Waterhouse, 2003). "Discovered in seeded area along road [on Palau]. Eradication program carried out in 2007 and apparently successful. Site will be monitored for new seedlings" (Anonymous, 2013). One homeowner in Queensland is removing germinating plants from her garden after seeds blow in from surrounding areas (Waterhouse, 2014). Alternate answers for the Monte Carlo simulation were both "b."
Impact to Production Systems (agriculture, nurseries, forest plantations, orchards, etc.)			
Imp-P1 (Reduces crop/product yield)	y - mod	0.4	*Praxelis clematidea* is very invasive in cultivated pasture and native pasture (English, 2014). It secretes an odor that affects livestock feeding (cited in Qiu et al., 2011). It is not eaten by animal stock (Pollock et al., 2004). Because it is not eaten by stock, it is likely reducing the carrying capacity and yield of rangelands and pastures; consequently, we answered yes, but used moderate uncertainty due to a lack of more direct evidence. In northern Queensland rangelands and pastures, this species has raised concern among beef cattle ranchers (Waterhouse, 2014). In one region of Queensland, it encroaches upon sugarcane and is seen at field borders, but it is doubtful it is having an impact in fields due to pre-existing control measures for broadleaved weeds (Falla, 2014; Waterhouse, 2014). Furthermore, it is unlikely to survive long underneath a full canopy of sugarcane (Clarkson, 2014). However, in another region of Queensland, it is being spread through commercial sugarcane mulch (English, 2014). This discrepancy may be due to differences in field management practices of sugarcane (Falla, 2014; Waterhouse, 2014). Regardless, our answer of yes was based on its impacts in rangelands and pastures.
Imp-P2 (Lowers commodity value)	? - max		This species appears to be poised to lower the value of land by increasing control costs, but without more specific and definitive evidence, we answered unknown. "[P]raxelis could threaten, and significantly increase the costs of managing, such crops as bananas, other fruits and sugarcane. It could infest pastoral grasslands and conservation areas, particularly open eucalypt woodlands" (CRC Weed Management, 2003). A survey of grazing land holders in northern Queensland, representing an area of 500,000 ha, revealed that *P. clematidea* was the most prominent weed, particularly on sandy-surfaced soils (Shaw and Kernot, 2004). "It is now prevalent on both grazed and ungrazed areas and appears to have the potential to become a serious weed across the entire catchment" (Shaw and Kernot, 2004). One botanist believes that it should not pose a problem if pastures are conservatively grazed (Clarkson, 2014).
Imp-P3 (Is it likely to impact trade)	y - low	0.2	This species is a declared noxious weed in Western Australia;

Question ID	Answer - Uncertainty	Score	Notes (and references)
			consequently, it is not permitted entry and must be eradicated when found (DAFWA, 2012). Because it is a contaminant of seeds moving in trade (Scott et al., 1998; Waterhouse and Mitchell, 2012) and of other commodities and conveyances (see evidence under ES-16), it may impact trade to areas restricting its movement. This species spreads in sugarcane mulch (English, 2014), which is restricted entry into Western Australia because of weed contaminants (DAFWA, 2013).
Imp-P4 (Reduces the quality or availability of irrigation, or strongly competes with plants for water)	n - mod	0	We found no evidence.
Imp-P5 (Toxic to animals, including livestock/range animals and poultry)	? - max		Unknown. "Anecdotal reports suggest that it may be poisonous to livestock and humans if ingested" (Veldkamp, 1999). The case for human toxicity in Veldkamp (1999) originated from a report of an elderly man in northern Queensland who routinely consumed herbal tea infused with *Ageratum conyzoides*. On one occasion he was hospitalized. It was suspected that he accidentally used *P. clematidea*, which is very similar to *A. conyzoides* (Waterhouse, 2014). Animal stock do not eat *P. clematidea* (Pollock et al., 2004), but this may be due to its odor and not toxicity.
Imp-P6 (Weed status in production systems)	b - high	0.2	Weed of pastures in Australia (Waterhouse, 2003). Weed of agriculture in Australia (Randall, 2007). It encroaches upon sugarcane plantations and other cultivated areas (Holland, 2006; Waterhouse, 2003). Invades plantations (Laidlaw, 2013). "A problem in sugarcane and pastures in Queensland" (Australian Weeds Committee, 2014). The Western Australia government helped industry eradicate an infestation that had been detected in Broome, Australia (Anonymous, 2008). Because *P. clematidea* is a quarantine pest in Western Australia and must be eradicated whereever it occurs, we are not considering this detection in Broome as evidence for general control in production systems; however, we are using high uncertainty. Furthermore, we selected "c" as the alternate answers for the Monte Carlo simulation.
GEOGRAPHIC POTENTIAL			Unless otherwise indicated, the following evidence represents geographically referenced points obtained from the Global Biodiversity Information Facility (GBIF, 2014).
Plant cold hardiness zones			
Geo-Z1 (Zone 1)	n - negl	N/A	We found no evidence that it occurs in this zone.
Geo-Z2 (Zone 2)	n - negl	N/A	We found no evidence that it occurs in this zone.
Geo-Z3 (Zone 3)	n - negl	N/A	We found no evidence that it occurs in this zone.
Geo-Z4 (Zone 4)	n - negl	N/A	We found no evidence that it occurs in this zone.
Geo-Z5 (Zone 5)	n - negl	N/A	We found no evidence that it occurs in this zone.
Geo-Z6 (Zone 6)	n - negl	N/A	We found no evidence that it occurs in this zone.
Geo-Z7 (Zone 7)	y - high	N/A	A few points in mountainous regions of the Andes in Argentina. We used high uncertainty due to the difficulty associated with evaluating climatic conditions in mountainous regions.
Geo-Z8 (Zone 8)	y - low	N/A	Bolivia.
Geo-Z9 (Zone 9)	y - negl	N/A	Argentina, Bolivia, and the United States (FL). Also in China (Guangxi, Guangdong) (Qiu et al., 2011). A potted plant was placed outside in Leiden, The Netherlands, where it was subject

Question ID	Answer - Uncertainty	Score	Notes (and references)
			to several frosts and light snow and survived (Veldkamp, 1999). In China it survives above the frost line as an annual (CRC Weed Management, 2003).
Geo-Z10 (Zone 10)	y - negl	N/A	Australia and Paraguay. China (Qiu et al., 2011). Australia (ALA, 2014). Occurring in areas of Australia with occasional light frosts (Veldkamp, 1999). Temperatures of 3-4 °C cause minor damage to flowers, but not leaves (cited in Veldkamp, 1999). It occurs up to 3050 meters elevation in Bolivia, suggesting frost resistance (Veldkamp, 1999). Seeds dried, then frozen at -30 °C for two days germinated right away, indicating they are drought and frost resistant (Veldkamp, 1999).
Geo-Z11 (Zone 11)	y - negl	N/A	Australia and Brazil. China (Qiu et al., 2011).
Geo-Z12 (Zone 12)	y - negl	N/A	Australia and Brazil.
Geo-Z13 (Zone 13)	y - negl	N/A	Australia.
Köppen -Geiger climate classes			
Geo-C1 (Tropical rainforest)	y - low	N/A	Australia and Bolivia.
Geo-C2 (Tropical savanna)	y - negl	N/A	Australia, Bolivia, Brazil, and Paraguay.
Geo-C3 (Steppe)	y - negl	N/A	Argentina, Australia, and Bolivia.
Geo-C4 (Desert)	n - low	N/A	We found no evidence it occurs in this climate class.
Geo-C5 (Mediterranean)	n - high	N/A	We found no evidence it occurs in this climate class.
Geo-C6 (Humid subtropical)	y - negl	N/A	Argentina, Paraguay, Taiwan, and the United States (FL).
Geo-C7 (Marine west coast)	y - low	N/A	Argentina and Bolivia.
Geo-C8 (Humid cont. warm sum.)	n - low	N/A	We found no evidence it occurs in this climate class.
Geo-C9 (Humid cont. cool sum.)	n - negl	N/A	We found no evidence it occurs in this climate class.
Geo-C10 (Subarctic)	n - negl	N/A	We found no evidence it occurs in this climate class.
Geo-C11 (Tundra)	n - negl	N/A	We found no evidence it occurs in this climate class.
Geo-C12 (Icecap)	n - negl	N/A	We found no evidence it occurs in this climate class.
10-inch precipitation bands			
Geo-R1 (0-10 inches; 0-25 cm)	n - high	N/A	We found no evidence it occurs in this precipitation band.
Geo-R2 (10-20 inches; 25-51 cm)	y - high	N/A	A few points in Argentina, Bolivia, and Peru, where it is likely restricted to wet microhabitats.
Geo-R3 (20-30 inches; 51-76 cm)	y - negl	N/A	Argentina and Paraguay. Expected to survive in areas with 500-700 mm annual precipitation, but will likely be restricted to wetter microhabitats (CRC Weed Management, 2003).
Geo-R4 (30-40 inches; 76-102 cm)	y - negl	N/A	Australia, Paraguay, and Taiwan. Occurs in areas of Australia that receive 90-400 cm of annual precipitation (Veldkamp, 1999; Waterhouse, 2003).
Geo-R5 (40-50 inches; 102-127 cm)	y - negl	N/A	Australia, Paraguay, and Taiwan. Occurs in areas of Australia that receive 90-400 cm of annual precipitation (Veldkamp, 1999; Waterhouse, 2003).
Geo-R6 (50-60 inches; 127-152 cm)	y - negl	N/A	Argentina, Australia, and Taiwan. Occurs in areas of Australia that receive 90-400 cm of annual precipitation (Veldkamp, 1999; Waterhouse, 2003).
Geo-R7 (60-70 inches; 152-178 cm)	y - negl	N/A	Argentina, Australia, and Taiwan. Occurs in areas of Australia that receive 90-400 cm of annual precipitation (Veldkamp, 1999; Waterhouse, 2003).
Geo-R8 (70-80 inches; 178-203 cm)	y - negl	N/A	Australia and Taiwan. Occurs in areas of Australia that receive 90-400 cm of annual precipitation (Veldkamp, 1999; Waterhouse, 2003).
Geo-R9 (80-90 inches; 203-229 cm)	y - negl	N/A	China and Taiwan. Occurs in areas of Australia that receive 90-

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			400 cm of annual precipitation (Veldkamp, 1999; Waterhouse, 2003).
Geo-R10 (90-100 inches; 229-254 cm)	y - negl	N/A	China and Taiwan. Occurs in areas of Australia that receive 90-400 cm of annual precipitation (Veldkamp, 1999; Waterhouse, 2003).
Geo-R11 (100+ inches; 254+ cm))	y - negl	N/A	China and Taiwan. Occurs in areas of Australia that receive 90-400 cm of annual precipitation (Veldkamp, 1999; Waterhouse, 2003).
ENTRY POTENTIAL			
Ent-1 (Plant already here)	n - negl	0	This species is already present in the United States (Abbott et al., 2008; Wunderlin and Hansen, 2014). Because it is restricted to only four contiguous counties in central Florida, we evaluated its entry potential as it may be introduced to other regions of the United States. We recorded no for this question to permit further evaluation in this risk element.
Ent-2 (Plant proposed for entry, or entry is imminent)	n - low	0	
Ent-3 (Human value & cultivation/trade status)	b - high	0.05	Researchers have examined this species' biochemical properties for potential medical applications (Falcão et al., 2013; Oliveira-Filho et al., 2013).
Ent-4 (Entry as a contaminant)			
Ent-4a (Plant present in Canada, Mexico, Central America, the Caribbean or China)	y - negl		This species is present in China, where it is spreading rapidly (Veldkamp, 1999; Zhengyi et al., 2014). APHIS has intercepted cargo contaminated with seeds from China, Thailand, and Vietnam (PestID, 2014).
Ent-4b (Contaminant of plant propagative material (except seeds)	n - high	0	We found no evidence.
Ent-4c (Contaminant of seeds for planting)	y - negl	0.08	Introduced to Palau as a contaminant in hydroseed used in a new road construction project (Space et al., 2009); hydroseed is a slurry of seeds, mulch, and other components that is sprayed on bare ground as an alternative to sodding and other seeding methods. *Praxelis clematidea* was likely introduced to Queensland, Australia as a contaminant of pasture seeds from Brazil (Scott et al., 1998; Waterhouse and Mitchell, 2012).
Ent-4d (Contaminant of ballast water)	n - mod	0	We found no evidence.
Ent-4e (Contaminant of aquarium plants or other aquarium products)	n - mod	0	We found no evidence.
Ent-4f (Contaminant of landscape products)	y - negl	0.04	"Seeds are readily spread as contaminants of ... garden mulch" (English, 2014), landscaping supplies (Laidlaw, 2013), and building materials (CRC Weed Management, 2003). Spreads in sugarcane mulch in Australia (English, 2014).
Ent-4g (Contaminant of containers, packing materials, trade goods, equipment or conveyances)	y - low	0.04	The United States has intercepted this species on rubber (in general cargo), tiles (in permit cargo), and aluminum (in general cargo) (PestID, 2014).
Ent-4h (Contaminants of fruit, vegetables, or other products for consumption or processing)	y - low	0.02	The United States has intercepted this species on *Cocos nucifera* (in permit cargo) and *Garcinia mangostana* (in baggage) (PestID, 2014).
Ent-4i (Contaminant of some other pathway)	e - negl	0.08	"Seeds are readily spread as contaminants of vehicles ..." (Australian Weeds Committee, 2014; Holland, 2006; Waterhouse, 2003). Being distributed long distances by trains and four-wheeled drive vehicles (Navie, 2014). Spread by

Question ID	Answer - Uncertainty	Score	Notes (and references)
			vehicles and on clothing (Dickman, 2014). Because this species has barbs on the bristles of the pappus, and given the number of reports for vehicle contamination, it seems likely to enter on clothing or vehicles.
Ent-5 (Likely to enter through natural dispersal)	n - low	0	This species is not known to be present in Canada, Mexico, or the Caribbean.