Australia/New Zealand Weed Risk Assessment adapted for Florida.

Data used for analysis published in: Gordon, D.R., D.A. Onderdonk, A.M. Fox, R.K. Stocker, and C. Gantz. 2008. Predicting Invasive Plants in Florida using the Australian Weed Risk Assessment. Invasive Plant Science and Management 1: 178-195.

Striga gesnerioides (cowpea witchweed)			
Question number	**Question**	**Answer**	**Score**
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?		
1.03	Does the species have weedy races?		
2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high)	2	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	2	
2.03	Broad climate suitability (environmental versatility)		
2.04	Native or naturalized in habitats with periodic inundation		
2.05	Does the species have a history of repeated introductions outside its natural range?	n	
3.01	Naturalized beyond native range	n	0
3.02	Garden/amenity/disturbance weed	n	0
3.03	Weed of agriculture	y	0
3.04	Environmental weed	n	0
3.05	Congeneric weed	y	0
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	n	0
4.03	Parasitic	y	1
4.04	Unpalatable to grazing animals		
4.05	Toxic to animals	n	0
4.06	Host for recognised pests and pathogens		
4.07	Causes allergies or is otherwise toxic to humans	n	0
4.08	Creates a fire hazard in natural ecosystems	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle		
4.1	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils)	y	1
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	n	0
5.01	Aquatic	n	0

5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte		
6.01	Evidence of substantial reproductive failure in native habitat		
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally		
6.04	Self-compatible or apomictic	y	1
6.05	Requires specialist pollinators		
6.06	Reproduction by vegetative fragmentation		
6.07	Minimum generative time (years)	1	1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
7.02	Propagules dispersed intentionally by people	n	-1
7.03	Propagules likely to disperse as a produce contaminant	y	1
7.04	Propagules adapted to wind dispersal	y	1
7.05	Propagules water dispersed	y	1
7.06	Propagules bird dispersed	n	-1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	y	1
8.01	Prolific seed production	y	1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	y	1
8.03	Well controlled by herbicides	n?	1
8.04	Tolerates, or benefits from, mutilation or cultivation		
8.05	Effective natural enemies present in Florida, or east of the continental divide		
Total Score			15

Outcome **Reject***

*Used secondary screen from: Daehler, C. C., J.L. Denslow, S. Ansari, and H. Kuo. 2004. A risk assessment system for screening out harmful invasive pest plants from Hawaii's and other Pacific islands. Conserv. Biol. 18: 360-368.

section	# questions answered	satisfy minimum?
A	6	yes
B	9	yes
C	16	yes
total	31	yes

Data collected 2006-2007

Question number	Reference	Source data
1.01		no evidence of cultivation
1.02		
1.03		
2.01		
2.02		
2.03		
2.04		
2.05	Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15.	Distribution: from Cape Verde Islands through tropical and southern Africa and through the Arabian peninsula and western and southern India. [no documented introductions outside this range, not including FL]
3.01		no evidence
3.02		no evidence
3.03	1. Holm (1979) A Geographical Atlas of World Weeds. John Wiley and Sons. 2. Musselman (1987) Taxonomy of witchweeds. Pp. 4-12 in Musselman (ed.) Parasitic Weeds in Agriculture. Vol. 1. *Striga*. CRC Press, Boca Raton, Florida.	1. Considered a principal weed of agriculture in Nigeria and a common weed in Rhodesia (Zimbabwe) and South Africa. 2. "Most damaging are strains which attack cowpeas (*Vigna unguiculata*) in West Africa and tobacco in East Africa."
3.04		no evidence
3.05	1. Musselman (1987) Taxonomy of witchweeds. Pp. 4-12 in Musselman (ed.) Parasitic Weeds in Agriculture. Vol. 1. *Striga*. CRC Press, Boca Raton, Florida. 2. Holm, Plucknett, Pancho, and Herberger (1977) The World's Worst Weeds: Distribution and Biology. The University Press of Hawaii, Honolulu.	1. *S. hermonthica* "is almost certainly the most serious of all witchweeds, especially in sub-Saharan Africa where it causes tremendous losses in the subsistence grains, sorghum and millet." 2. "Other species of *Striga* may be devastating on a local level but none compare with *S. lutea* as a problem for man and his crops."
4.01	Mohamed, Musselman, and Riches (2001) The genus *Striga* (Scrophulariaceae) in Africa. Annals of the Missouri Botanical Garden 88: 60-103.	no description of these traits
4.02		no evidence

4.03	Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15.	"*S. gesnerioides* is almost completely parasitic"
4.04		
4.05		no evidence
4.06		
4.07		no evidence
4.08		no evidence
4.09		
4.1	Mohamed, Musselman, and Riches (2001) The genus *Striga* (Scrophulariaceae) in Africa. Annals of the Missouri Botanical Garden 88: 60-103.	"Witchweeds tolerate a relatively wide range of climatic and soil conditions…In general, low soil fertility, nitrogen deficiency, well-drained soils, and water stress accentuate the severity of *Striga* damage to the host."
4.11	USDA, NRCS. 2005. The PLANTS Database, Version 3.5 (http://plants.usda.gov). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	growth habit: forb/herb
4.12		no evidence
5.01		terrestrial
5.02	USDA, NRCS. 2005. The PLANTS Database, Version 3.5 (http://plants.usda.gov). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	Scrophulariaceae
5.03	USDA, NRCS. 2005. The PLANTS Database, Version 3.5 (http://plants.usda.gov). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	herbaceous Scrophulariaceae
5.04		
6.01		
6.02	Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15.	After a period of dormancy and seed conditioning, seeds germinate in response to a stimulant produced by the host root.
6.03		
6.04	Musselman (1987) Taxonomy of witchweeds. Pp. 4-12 in Musselman (ed.) Parasitic Weeds in Agriculture. Vol. 1. *Striga*. CRC Press, Boca Raton, Florida.	*S. gesnerioides* has "well-developed autogamy".
6.05		
6.06		
6.07	1. Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15. 2. Mohamed, Musselman, and Riches (2001) The genus *Striga* (Scrophulariaceae) in Africa. Annals of the Missouri Botanical Garden	1. "2-4 months are required from germination to seed-setting". 2. annual or occasionally perennial

	88: 60-103.	
7.01		
7.02		no evidence
7.03	Berner, Kling, and Singh (1995) *Striga* research and control: a perspective from Africa. Plant Disease 79: 652-660.	"The amount of *Striga*-seed contamination of cowpea, maize, millet, and sorghum seeds sold in local Nigerian markets was found to range from 62.5 to 85.4% of the samples contaminated…*Striga*-seed contamination can quickly lead to dispersal over great distances and introduction of *Striga* into previously uninfested areas."
7.04	1. Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15. 2. Berner, Kling, and Singh (1995) *Striga* research and control: a perspective from Africa. Plant Disease 79: 652-660.	1. *Striga* seeds are dispersed by wind. BUT 2. "Wind was found to be relatively ineffective in long-distance seed dispersal".
7.05	Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15.	*Striga* seeds are dispersed by water.
7.06		wind dispersed
7.07	Mohamed, Musselman, and Riches (2001) The genus *Striga* (Scrophulariaceae) in Africa. Annals of the Missouri Botanical Garden 88: 60-103.	seeds dust-like [no means of attachment]
7.08	1. Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15. 2. Berner, Kling, and Singh (1995) *Striga* research and control: a perspective from Africa. Plant Disease 79: 652-660.	1. *Striga* seeds are dispersed by cattle. BUT 2. "Only about 8% of *Striga* spp. seeds ingested by cattle remained viable, and these were not deposited far (≤0.5 km) from the site of ingestion".
8.01	1. Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) Striga Identification and Control Handbook. ICRISAT Information Bulletin No. 15. 2. Berner, Kling, and Singh (1995) *Striga* research and control: a perspective from Africa. Plant Disease 79: 652-660.	1. "*Striga* seeds are produced in enormous numbers. Each seed capsule…produces some 400-500 seeds, and each plant thus produces several thousands." 2. "Each *Striga* plant is capable of producing from 50,000 to 500,000 seeds"
8.02	1. Worsham (1987) Germination of witchweed seeds. Pp. 46-61 in Musselman (ed.) Parasitic Weeds in Agriculture. Vol. 1. *Striga*. CRC Press, Boca Raton, Florida. 2. Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15.	1. Witchweed seeds stored in pots of soil "retained a high degree of germinability during 7 years of storage. Also, witchweed-infested fields that were maintained free of host plants for 14 years had witchweed emergence when corn was planted." 2. "*Striga* seeds possess the remarkable capacity to remain viable in the soil for 15-20

		years in the absence of a suitable plant host."
8.03	1. Berner, Kling, and Singh (1995) *Striga* research and control: a perspective from Africa. Plant Disease 79: 652-660. 2. Ramaiah, Parker, Vasudeva Rao, and Musselman (1983) *Striga* Identification and Control Handbook. ICRISAT Information Bulletin No. 15.	1. "A complication of the use of herbicides is that most herbicides available for *Striga* control in Africa are applied postemergence, by which time substantial *Striga* damage to the crop has already occurred." 2. "No herbicide can provide a perfect selective control of *Striga*. But, where 2,4-D can be safely used in the cereal crops, it may at least partially prevent emergence when applied at about the time of *Striga* germination, or it may kill emerged parasites when applied later. Other herbicides such as linuron, bromoxynil, and ametryne have been suggested for directed spot-spraying in mixed crops where it would not be safe to use 2,4-D." [sounds marginally effective]
8.04		
8.05		