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.

Indigofera hirsuta (hairy indigo)			
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	n	0
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	0
3.02	Garden/amenity/disturbance weed	y	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	n	0
4.04	Unpalatable to grazing animals	?	
4.05	Toxic to animals	n	0
4.06	Host for recognised pests and pathogens	n	0
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	y	1
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	y	1
5.04	Geophyte	n	0
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		
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative fragmentation	n	-1
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	y	1
7.03	Propagules likely to disperse as a produce contaminant	n	-1
7.04	Propagules adapted to wind dispersal	n	-1
7.05	Propagules water dispersed	n	-1
7.06	Propagules bird dispersed		
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)		
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	y	-1
8.04	Tolerates, or benefits from, mutilation or cultivation	y?	1
8.05	Effective natural enemies present in Florida, or east of the continental divide		
Total Score			13

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	7	yes
B	11	yes
C	17	yes
total	35	yes

Data collected 2006-2007

Question number	Reference	Source data
1.01		no evidence of selection for reduced weediness
1.02		
1.03		
2.01	1. 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. 2. Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	1. minimum temperature: 17°F 2. "It requires…an annual mean temperature of 15-28°C."
2.02		
2.03		
2.04	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"is intolerant of waterlogging"
2.05	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"*I. hirsuta* is native to Asia and Africa…It is now cultivated throughout the tropics."
3.01	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000045.htm)	"Hairy indigo occurs naturally from Senegal to the Sudan and the Congo, Zambia, Mozambique, Angola and Madagascar in Africa; also natural in southern Asia, northern Australia and Queensland, Australia. It has been naturalized in parts of tropical America." and "hairy indigo can naturalize readily in suitable habitats"
3.02	Lorenzi (2000) Plantas Daninhas do Brasil. Instituto Plantarum.	"It can be found infesting…roadsides and vacant lots."
3.03	1. Holm (1979) A Geographical Atlas of World Weeds. John Wiley and Sons. 2. Lorenzi (2000) Plantas Daninhas do Brasil. Instituto Plantarum.	1. Considered a principal weed of agriculture in Ghana, and a common weed in Colombia, Nigeria, and Taiwan. 2. "It can be found infesting orchards, annual and perennial crops"
3.04		no evidence
3.05	Holm (1979) A Geographical Atlas of World	*I. glandulosa* considered a principal

	Weeds. John Wiley and Sons.	weed of agriculture in India; *I. suffruticosa* considered a serious weed of agriculture in West Polynesia.
4.01	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	no description of these traits
4.02	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.	not allelopathic
4.03	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	no description of this
4.04	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"Cattle do not graze hairy indigo readily, but intake is good after adaptation."
4.05	1. 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. 2. FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000045.htm) 3. Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden. 4. Baltensperger, French, Prine, Ruelke, and Quesenberry (1985) Hairy Indigo: A Summer Legume for Florida. University of Florida, IFAS, Agricultural Experiment Stations, Circular S-318.	1. no toxicity 2. "Early references such as Bailey (1906) refer to suspected poisoning of stock, but these suspicions apparently have not been sustained." 3. "It is somewhat toxic and should not constitute a large proportion of the diet." [fairly minor?] 4. "nontoxic to livestock"
4.06	1. FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000045.htm) 2. Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	1. "Resistant to root knot nematode (*Meloidogyne* spp.) and most insects and diseases." 2. "*I. hirsuta* exhibits some tolerance to most diseases and pests." Some fungi have been reported as occurring on *I. hirsuta* "but without causing serious diseases".
4.07	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.	no toxicity
4.08		no evidence
4.09	1. Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden. 2. 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.	1. "Although generally fairly tolerant to shade, growth under heavy shade in an established stand of pine trees in Costa Rica was poor." BUT 2. shade intolerant

4.1	1. FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000045.htm) 2. Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden. 3. Baltensperger, French, Prine, Ruelke, and Quesenberry (1985) Hairy Indigo: A Summer Legume for Florida. University of Florida, IFAS, Agricultural Experiment Stations, Circular S-318.	1. "Being well adapted to low-fertility soils…" 2. "Hairy indigo is tolerant to poor soil conditions, growing well on moderately poor, sandy soils" 3. "It is especially well adapted to the dry, sandy soils."
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: subshrub, 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.	Fabaceae
5.03	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"Hairy indigo fixes atmospheric nitrogen symbiotically with cowpea-type rhizobium."
5.04	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.	not propagated by bulbs, corms, or tubers
6.01		
6.02	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"*I. hirsuta* is propagated by seed."
6.03		
6.04		
6.05	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"Pollination is by insects."
6.06	1. 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. 2. Lorenzi (2000) Plantas Daninhas do Brasil. Instituto Plantarum.	1. vegetative spread rate: none (and is an annual) 2. "Propagates solely by seeds."
6.07	1. 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. 2. Prohmchum and Muenkunya (1994) Preliminary studies on growth and seed production of hairy indigo (*Indigofera hirsuta* L.). Kaen Kaset/Khon Kaen Agriculture Journal 22: 26-30.	1. annual 2. "Plants sown in June started to flower in Sep., and seeds matured about 1 month after anthesis."

7.01		
7.02	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"*I. hirsuta* is a valuable green manure and cover crop, used especially in tea, coffee and rubber plantations…It is grown as an annual fodder in…Brazil and in mixtures with grasses as a forage crop."
7.03		no evidence
7.04	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"fruit is a reflexed, straight pod…1-2 cm x 1-2.5 mm"
7.05		no evidence
7.06		
7.07	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"fruit is a reflexed, straight pod…1-2 cm x 1-2.5 mm" [no evidence of any means of attachment]
7.08		
8.01	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"Seed yields average 100-300 kg/ha." 1,000 seeds weigh 1.5-2.5 g. This gives 4,000-6,667 seeds/m^2.
8.02	1. Baltensperger, French, Prine, Ruelke, and Quesenberry (1985) Hairy Indigo: A Summer Legume for Florida. University of Florida, IFAS, Agricultural Experiment Stations, Circular S-318. 2. Williams, Congdon, Grice, and Clarke (2005) Germinable soil seed banks in a tropical savanna: seasonal dynamics and effects of fire. Austral Ecology 30: 79-90.	1. "Indigo seed vary between 30 and 70 percent hard seed. These hard seed do not germinate in the same year they are produced." "a sufficient amount of hard seed usually exists in the soil to achieve a good plant stand even if the seed crop is a failure one year" 2. "Ephemeral forbs, including *I. hirsuta,* were present in the seed bank during the third year after fire, when there were very few standing plants (Williams et al. 2003a). This highlights the importance of soil seed banks for population persistence of these species."
8.03	Baltensperger, French, Prine, Ruelke, and Quesenberry (1985) Hairy Indigo: A Summer Legume for Florida. University of Florida, IFAS, Agricultural Experiment Stations, Circular S-318.	"Hairy indigo can readily be controlled in peanuts and soybeans with acifluorfen (Blazer) and in corn with atrazine and 2,4-D."
8.04	Hanum and van der Maesen, eds. (1997) Plant Resources of South-East Asia. No. 11. Auxiliary plants. Backhuys Publishers, Leiden.	"Slashing and lopping is tolerated well."
8.05		