

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.

<i>Hibiscus tiliaceus (mahoe)</i>			
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	y	1
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	n	0
3.03	Weed of agriculture	n	0
3.04	Environmental weed	y	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	y	1
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	n	0
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	y	1
5.01	Aquatic	n	0

5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
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	y	1
6.07	Minimum generative time (years)		
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	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)	n	-1
8.01	Prolific seed production	n	-1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	?	
8.03	Well controlled by herbicides	y	-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			11

Outcome	Reject*
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*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	16	yes
total	34	yes

Data collected 2006-2007

Question number	Reference	Source data
1.01		cultivated, but no evidence of selection for reduced weediness
1.02		
1.03		
2.01		
2.02		
2.03		
2.04	Allen (2003) <i>Hibiscus tiliaceus</i> L. Pp. 508-510 in Tropical Tree Seed Manual, Reforestation, Nurseries, and Genetic Resources (http://www.rngr.net/Publications/ttsm/Folder.2003-07-11.4726/PDF.2004-03-03.4433/file).	" <i>Hibiscus tiliaceus</i> is most often found in wet areas along coasts, such as at the mouths of streams or in more saline areas upstream of mangrove forests."
2.05	Whistler (2000) Tropical Ornamentals: a Guide. Timber Press, Portland.	"It is also cultivated for its yellow flowers."
3.01	New Zealand Plant Conservation Network (2005) New Zealand Adventive Vascular Plant List.	fully naturalized in New Zealand
3.02		no evidence
3.03		no evidence
3.04	Devine (1977) A programme to exterminate introduced plants on Raoul Island. Biological Conservation 11: 193-207.	<i>H. tiliaceus</i> considered one of the main pest species on Raoul Island (New Zealand).
3.05	Parsons and Cuthbertson (2001) Noxious Weeds of Australia. CSIRO Publishing.	<i>H. trionum</i> considered a weed in Australia.
4.01	Wagner, Herbst, and Sohmer (1999) Manual of the flowering plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press, Honolulu.	no description of these traits
4.02		no evidence
4.03	Wagner, Herbst, and Sohmer (1999) Manual of the flowering plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press, Honolulu.	no description of this
4.04		
4.05	Ng and Sivasothi, eds. (2001) A Guide to Mangroves of Singapore. Vol. 1: The Ecosystem and Plant Diversity. Singapore Science Centre, Raffles Museum of Biodiversity Research, The National University of Singapore	Leaves of <i>H. tiliaceus</i> are used to feed cattle in Southeast Asia. [and no evidence of toxicity]

	(http://mangrove.nus.edu.sg/guidebooks/text/1021.htm).	
4.06	McMullen (1999) Flowering Plants of the Galapagos. Cornell University Press, Ithaca.	In the Galapagos, the cottony cushion scale (<i>Icerya purchasi</i>) has been found on <i>H. tiliaceus</i> . Infested plants tend to become sickly and frequently die. This insect was a major threat to the citrus industry in California.
4.07		no evidence
4.08		no evidence
4.09	1. Hortocopia 4.0 2. Dehgan, B. (1998) Landscape Plants for Subtropical Climates. University Press of Florida.	1. full sun 2. grows in full sun
4.1	1. Dehgan, B. (1998) Landscape Plants for Subtropical Climates. University Press of Florida. 2. Allen (2003) <i>Hibiscus tiliaceus</i> L. Pp. 508-510 in Tropical Tree Seed Manual, Reforestation, Nurseries, and Genetic Resources (http://www.rngr.net/Publications/ttsm/Folder.2003-07-11.4726/PDF.2004-03-03.4433/file).	1. grows on almost any soil 2. "The tree can grow well on mud, marl, sand, and limestone."
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: tree/shrub
4.12	1. Whistler (2000) Tropical Ornamentals: a Guide. Timber Press, Portland. 2. Devine (1977) A programme to exterminate introduced plants on Raoul Island. Biological Conservation 11: 193-207.	1. "sometimes forming nearly impenetrable thickets" 2. "plants...form a dense tangle of stems" on Raoul Island (New Zealand).
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.	Malvaceae
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.	Malvaceae
5.04	Hortocopia 4.0	"This plant's roots are fibrous."
6.01		
6.02	1. Hortocopia 4.0 2. Dehgan, B. (1998) Landscape Plants for Subtropical Climates. University Press of Florida.	1. "Propagation is from cuttings and seeds." 2. "Large cuttings, air layers, or seeds all give good results."
6.03		
6.04		
6.05	McMullen (1999) Flowering Plants of the Galapagos. Cornell University Press, Ithaca.	pollinated by carpenter bees (<i>Xylocopa darwini</i>) in the Galapagos
6.06	1. Dehgan, B. (1998) Landscape Plants for Subtropical	1. "Long, snaky, drooping

	<p>Climates. University Press of Florida. 2. Devine (1977) A programme to exterminate introduced plants on Raoul Island. Biological Conservation 11: 193-207.</p>	<p>branches root where they touch the ground." 2. <i>H. tiliaceus</i> grows by layering, in the wild, on Raoul Island (New Zealand).</p>
6.07	<p>1. Dehgan, B. (1998) Landscape Plants for Subtropical Climates. University Press of Florida. 2. Hortiocopia 4.0 3. Allen (2003) <i>Hibiscus tiliaceus</i> L. Pp. 508-510 in Tropical Tree Seed Manual, Reforestation, Nurseries, and Genetic Resources (http://www.rngr.net/Publications/ttsm/Folder.2003-07-11.4726/PDF.2004-03-03.4433/file).</p>	<p>1. rapid growth rate 2. fast growth rate 3. fast-growing [but time to vegetative reproduction unknown]</p>
7.01		
7.02	<p>1. Whistler (2000) Tropical Ornamentals: a Guide. Timber Press, Portland. 2. Allen (2003) <i>Hibiscus tiliaceus</i> L. Pp. 508-510 in Tropical Tree Seed Manual, Reforestation, Nurseries, and Genetic Resources (http://www.rngr.net/Publications/ttsm/Folder.2003-07-11.4726/PDF.2004-03-03.4433/file).</p>	<p>1. "It is also cultivated for its yellow flowers." 2. "The species has also been widely planted in some locations for erosion control, dune stabilization, and as an ornamental."</p>
7.03		no evidence
7.04	<p>Wagner, Herbst, and Sohmer (1999) Manual of the flowering plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press, Honolulu.</p>	"Seeds...with minute papillae or stellate tufts."
7.05	<p>Wagner, Herbst, and Sohmer (1999) Manual of the flowering plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press, Honolulu.</p>	"it is easily dispersed by drifting in seawater"
7.06		wind dispersed
7.07		no evidence of any means of attachment
7.08		wind dispersed
8.01	<p>Allen (2003) <i>Hibiscus tiliaceus</i> L. Pp. 508-510 in Tropical Tree Seed Manual, Reforestation, Nurseries, and Genetic Resources (http://www.rngr.net/Publications/ttsm/Folder.2003-07-11.4726/PDF.2004-03-03.4433/file).</p>	<p>Fruits typically contain 5 to 15 seeds. "Seed set often appears to be very low, but no published information on seed set was located."</p>
8.02	<p>Wagner, Herbst, and Sohmer (1999) Manual of the flowering plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press, Honolulu.</p>	"the seeds are viable for several months"
8.03	<p>1. Workman (1998) Mahoe: native or exotic or both? Wildland Weeds 1: 9-11. 2. Devine (1977) A programme to exterminate introduced plants on Raoul Island. Biological Conservation 11: 193-207.</p>	<p>1. Mahoe control: cut stump, 50% Garlon 3A / water solution; basal bark, 10% Garlon 4 / oil solution. 2. Herbicidal treatment carried out on Raoul Island, but unclear how effective it was.</p>
8.04		
8.05		