

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>Saccharum officinarum (sugarcane)</i>			
Question number	Question	Answer	Score
1.01	Is the species highly domesticated?	y	-3
1.02	Has the species become naturalised where grown?	y	1
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?	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	n	0
3.05	Congeneric weed	y	0
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	y	1
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	n	-1
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	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	y	1
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	y	1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative fragmentation	y	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	?	
7.05	Propagules water dispersed	n	-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)	n	-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			4

Outcome	Accept*
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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	12	yes
C	19	yes
total	38	yes

Data collected 2006-2007

Question number	Reference	Source data
1.01	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"The origins of <i>S. officinarum</i> are intimately associated with the activities of humans as <i>S. officinarum</i> is a purely cultivated or garden species with no members found in the wild (Sreenivasan et al. 1987)...It is believed to have become established as a domestic garden crop possibly as early as 2500 BC (Daniels and Roach 1987)."
1.02	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"Hnatiuk (1990) reported that <i>S. officinarum</i> is naturalised in Queensland and New South Wales." BUT "In sugarcane districts, transient sugarcane plants may occur along roadsides or railways where it can establish after displacement during transport, but there is no indication that these form self-perpetuating populations."
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. Holm, Plucknett, Pancho, and Herberger (1977) <i>The World's Worst Weeds: Distribution and Biology</i> . The University Press of Hawaii, Honolulu.	1. minimum temperature: 17°F 2. "growth in general is very slow below 15°C (59°F), and activity begins at 21°C (69.8°F)"
2.02		
2.03		

2.04	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm).	"Sugar cane will tolerate short floods, but, if approaching maturity, it will become lodged and the sugar content will decline."
2.05	1. FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm). 2. Holm, Plucknett, Pancho, and Herberger (1977) <i>The World's Worst Weeds: Distribution and Biology</i> . The University Press of Hawaii, Honolulu.	1. "First domesticated in India or Southeast Asia, now cultivated extensively in tropics and subtropics throughout the world." 2. "Sugarcane is considered to be native to southeast Asia, but it was grown widely throughout the tropics before recorded history."
3.01	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) <i>The biology and ecology of sugarcane (Saccharum spp. hybrids) in Australia</i> (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"Hnatiuk (1990) reported that <i>S. officinarum</i> is naturalised in Queensland and New South Wales." BUT "In sugarcane districts, transient sugarcane plants may occur along roadsides or railways where it can establish after displacement during transport, but there is no indication that these form self-perpetuating populations."
3.02		no evidence
3.03		no evidence
3.04	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) <i>The biology and ecology of sugarcane (Saccharum spp. hybrids) in Australia</i> (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"As a result of many years of cultivation, <i>S. officinarum</i> has essentially lost the capacity to invade in uncultivated habitats."
3.05	Holm, Doll, Holm, Pancho, and Herberger (1997) <i>World weeds: natural histories and distribution</i> . John Wiley & Sons, New York.	<i>S. spontaneum</i> is considered a weed in 33 countries.
4.01	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm).	no description of these traits
4.02	1. Singh, Suman, and Shrivastava (2003) Isolation and identification of allelochemicals from sugarcane leaves. <i>Allelopathy Journal</i> 12: 71-79. 2. USDA, NRCS. 2005. <i>The PLANTS Database, Version 3.5</i> (http://plants.usda.gov). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	1. Two compounds found in sugarcane leaves significantly reduced root growth of lentil seedlings; one showed effects on wheat; neither affected seed germination. BUT 2. not allelopathic
4.03	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm).	no description of this
4.04	FAO, Grassland Index	"Sugar-cane stalks are quite

	(http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm).	palatable because of the sugar content"
4.05	1. Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf). 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. "A mixture of bagasse and molasses is used as cattle feed. When fed in large quantities and incorrectly, molasses may be toxic." [but not the natural state of the plant] 2. no toxicity
4.06	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"The major pests and diseases that cause losses in sugarcane production include canegrubs, feral pigs, ratoon stunting disease (RSD), sugarcane rusts, chlorotic streak and soil-borne diseases (McLeod et al. 1999)."
4.07	1. Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf). 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. "Sugarcane is a well-established agricultural crop with a long history of safe use." Sugarcane pollen showed some allergenicity in skin tests, but "there are no reports of any major allergic responses to the commercial hybrid cultivars of sugarcane in Australia". 2. no toxicity
4.08		no evidence
4.09	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/pf000310.htm).	1. shade tolerance: intermediate 2. "Sugar cane will grow in shade"
4.1	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm).	"It has a wide range of soil tolerance, but drainage is essential."
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: graminoid
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.	Poaceae
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.	does not fix nitrogen (and Poaceae)
5.04	Australian Government, Dept. of Health and Ageing,	"the sugarcane root system is

	Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	fibrous and shallow"
6.01		
6.02	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. Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	1. propagated by seed 2. "many commercial varieties of sugarcane can produce seed"
6.03	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	lots of artificial hybrids, but no info on natural hybrids
6.04	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"Sugarcane is a cross-pollinating species although selfing occurs at low levels"
6.05	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"Sugarcane pollen is transported by wind"
6.06	1. Wagner, Herbst, and Sohmer (1999) Manual of the flowering plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press, Honolulu. 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. rhizomatous [genus <i>Saccharum</i>] 2. vegetative spread rate: moderate
6.07	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm).	"It matures in 12-14 months"
7.01		
7.02	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm).	"cultivated extensively in tropics and subtropics throughout the world...Sugar cane is one of the two main world sources of sugar for domestic and industrial use."
7.03		no evidence
7.04	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"Mature fuzz consists of the mature dry fruit (caryopsis), glumes, callus hairs, anthers and stigma."

7.05		no evidence
7.06		grass
7.07		no evidence of any means of attachment
7.08		grass
8.01	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. Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	1. fruit/seed abundance: medium 2. "The ability of sugarcane to reproduce sexually was not recognised until 1888." [suggests it is not a prolific seed producer]
8.02	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"Sugarcane fuzz [seed] is short lived, losing 90% of its viability in 80 days at 28°C if not desiccated (Rao 1980)."
8.03	Australian Government, Dept. of Health and Ageing, Office of the Gene Technology Regulator (2004) The biology and ecology of sugarcane (<i>Saccharum</i> spp. hybrids) in Australia (http://www.ogtr.gov.au/rtf/ir/biologysugarcane.rtf).	"The efficacy of glyphosate on killing sugarcane is affected by various factors such as cane varieties, soil type and stage of cane growth (Turner 1980)...Research showed that slashing of cane suppresses apical dominance and generally enhances chemical cane killing action on the regrowth (Leibrandt 1993). In addition, considerable improvement of eradication was also obtained when a mechanical under-cutter was used to shear the roots following herbicide application."
8.04	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000310.htm).	After the whole stalk is harvested at maturity, "it will then grow again from the roots and produce a succession of ratoon crops...Sugar cane is often burnt to ease harvesting. It is not killed, and will sucker from nodes or regrow from the 'stool' afterwards."
8.05		