

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>Solanum viarum (tropical soda apple)</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	?	
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	y	0
3.05	Congeneric weed	y	0
4.01	Produces spines, thorns or burrs	y	1
4.02	Allelopathic	n	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	y	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		
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		
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)	y	1
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	n	-1
7.05	Propagules water dispersed	n	-1
7.06	Propagules bird dispersed	y	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	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			24

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	6	yes
B	11	yes
C	19	yes
total	36	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	Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786.	"During extended periods (greater than three weeks) of standing water plant death can occur."
2.05	Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786.	"It is native to Argentina and Brazil and has been introduced into Africa, much of India and Nepal, and can be expected to occur in other subtropical areas. Its introduction into North America probably occurred from seed adhering to people's shoes or escaped from cultivation."
3.01	Kairo, Ali, Cheesman, Haysom, and Murphy (2003) Invasive Species Threats in the Caribbean Region. Report to the Nature Conservancy.	naturalized in Puerto Rico
3.02	Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786.	"This plant is a common weed of roadsides...and disturbed areas"
3.03	Byrd, Bryson, and Westbrooks (2004) Tropical soda apple (<i>Solanum viarum</i> Dunal) identification and control. Mississippi Dept. of Agriculture and Commerce, Bureau of Plant Industry.	Tropical soda apple infests pastures and natural areas in the southeastern U.S.
3.04	1. Kairo, Ali, Cheesman, Haysom, and Murphy (2003) Invasive Species Threats in the Caribbean Region. Report to the Nature Conservancy. 2. Byrd, Bryson, and Westbrooks (2004) Tropical soda apple (<i>Solanum viarum</i> Dunal) identification and control. Mississippi Dept. of Agriculture and Commerce, Bureau of Plant Industry.	1. considered naturalized and invasive in Puerto Rico 2. infests pastures and natural areas in the southeastern U.S.

3.05	Parsons and Cuthbertson (2001) Noxious Weeds of Australia. CSIRO Publishing, Collingwood, Australia.	13 spp. of <i>Solanum</i> are considered weeds or noxious weeds in Australia.
4.01	Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786.	"Stems, leaves, flower-stalks, and calyxes have broad-based white to yellowish prickles up to 12 mm long."
4.02		no evidence
4.03		no evidence of this
4.04	Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786.	"having foliage unpalatable to livestock"
4.05		no evidence
4.06	Akanda, Mullahey, and Shilling (1996) Incidence and viability of tropical soda apple (<i>Solanum viarum</i>) seed in cow manure. Proceedings of the Weed Science Society of America, Norfolk, VA (abstract).	"Tropical soda apple serves as host for plant viruses and Colorado Potato Beetle (<i>Leptotars decemliniata</i>)"
4.07		no evidence
4.08		no evidence
4.09		
4.1	Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786.	"typically found in soils belonging to the order of Spodosols (nearly level, somewhat poorly drained 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, shrub
4.12	Weber (2003) Invasive Plant Species of the World. CABI Publishing.	"Where invasive, it forms dense stands that outcompete native species."
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.	Solanaceae
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.	Solanaceae
5.04	Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786.	no evidence of bulbs, corms, or tubers from drawing of rootstock
6.01		
6.02	Akanda, Mullahey, and Shilling (1996) Incidence and viability of tropical soda apple (<i>Solanum viarum</i>) seed	"Plants spread primarily from seed, though new plants can emerge from roots."

	in cow manure. Proceedings of the Weed Science Society of America, Norfolk, VA (abstract).	
6.03		
6.04		
6.05		
6.06	1. Weber (2003) Invasive Plant Species of the World. CABI Publishing. 2. Akanda, Mullahey, and Shilling (1996) Incidence and viability of tropical soda apple (<i>Solanum viarum</i>) seed in cow manure. Proceedings of the Weed Science Society of America, Norfolk, VA (abstract).	1. "The plant can regenerate new shoots from its extensive root system" 2. "Plants spread primarily from seed, though new plants can emerge from roots."
6.07	Akanda, Mullahey, and Shilling (1996) Environmental factors affecting germination of tropical soda apple (<i>Solanum viarum</i>). Weed Science 44: 570-574.	"It reaches full maturity and produces fruit 120 to 130 d after germination."
7.01	Byrd, Bryson, and Westbrooks (2004) Tropical soda apple (<i>Solanum viarum</i> Dunal) identification and control. Mississippi Dept. of Agriculture and Commerce, Bureau of Plant Industry.	"equipment...may also serve as a means of dispersal if contaminated with tropical soda apple seeds"
7.02		no evidence
7.03	Akanda, Mullahey, and Shilling (1996) Incidence and viability of tropical soda apple (<i>Solanum viarum</i>) seed in cow manure. Proceedings of the Weed Science Society of America, Norfolk, VA (abstract).	"Movement associated with human activities (sod, hay, grass seed) also spreads seed."
7.04	Weber (2003) Invasive Plant Species of the World. CABI Publishing.	fruits are globose berries 2-3 cm in diameter
7.05		no evidence
7.06	1. Weber (2003) Invasive Plant Species of the World. CABI Publishing. 2. Byrd, Bryson, and Westbrooks (2004) Tropical Soda Apple (<i>Solanum viarum</i> Dunal) Identification and Control. Mississippi Department of Agriculture and Commerce (http://ceris.purdue.edu/napis/pests/tsa/tsa2004-fs.pdf).	1. seeds are dispersed by birds and mammals 2. "Scarification of seeds by digestive systems of animals and birds seems to promote seed germination."
7.07		no adaptations for external attachment
7.08	1. Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786. 2. Akanda, Mullahey, and Shilling (1996) Incidence and viability of tropical soda apple (<i>Solanum viarum</i>) seed in cow manure. Proceedings of the Weed Science Society of America, Norfolk, VA (abstract).	1. "livestock and wildlife (feral hogs, deer, raccoons) will eat the fruit and disseminate the seed via feces" 2. "Seed is scarified in the animals' [cattle] stomach, increasing germination." [post-dispersal viability]
8.01	Mullahey, Nee, Wunderlin, and Delaney (1993) Tropical soda apple (<i>Solanum viarum</i>): a new weed threat in subtropical regions. Weed Technology 7: 783-786.	40,000-50,000 viable seeds per plant (and plant is only 1-2 m tall)
8.02	1. Byrd, Bryson, and Westbrooks (2004) Tropical Soda Apple (<i>Solanum viarum</i> Dunal) Identification and Control. Mississippi Department of Agriculture	1. seeds "can remain viable in the soil for two years" BUT 2. "Seed longevity studies in moist (0 MPa) soil indicated that after 3 months,

	and Commerce (http://ceris.purdue.edu/napis/pests/tsa/tsa2004-fs.pdf). 2. Mullahey, Akanda, Sherrod, and Shilling (1996) Using seed dynamics to characterize the invasiveness of tropical soda apple (<i>Solanum viarum</i>). Proceedings of the Weed Science Society of America, Norfolk, VA (abstract).	seed were not viable. However, under laboratory storage conditions (20°C), seed germination was 25% after 25 months, indicating a soil seed bank is possible."
8.03	1. Weber (2003) Invasive Plant Species of the World. CABI Publishing. 2. Byrd, Bryson, and Westbrook (2004) Tropical Soda Apple (<i>Solanum viarum</i> Dunal) Identification and Control. Mississippi Department of Agriculture and Commerce (http://ceris.purdue.edu/napis/pests/tsa/tsa2004-fs.pdf).	1. "Larger patches may be controlled by herbicides." 2. "Chemical treatments can be effective for tropical soda apple control. Triclopyr (Remedy®) is very effective for control of emerged tropical soda apple when applied at 1 quart per acre or 1 to 1.5 percent solution with 1/4 percent nonionic surfactant."
8.04	Byrd, Bryson, and Westbrook (2004) Tropical Soda Apple (<i>Solanum viarum</i> Dunal) Identification and Control. Mississippi Department of Agriculture and Commerce (http://ceris.purdue.edu/napis/pests/tsa/tsa2004-fs.pdf).	will regrow after mowing
8.05		