

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>Amaranthus palmeri (Palmer amaranth)</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	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		
4.05	Toxic to animals	?	
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	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	n	0

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	y	1
6.04	Self-compatible or apomictic	n	-1
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	n	-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	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	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			11

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	20	yes
total	35	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	1. Mohlenbrock (2001) Flowering Plants: Pokeweeds, Four-o'clocks, Carpetweeds, Cacti, Purslanes, Goosefoots, Pigweeds, and Pinks. Southern Illinois University Press. 2. Flora of North America, vol. 4 (http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242415653).	1. "Native to the southwestern United States; sparingly adventive in the eastern United States." 2. "introduced Europe, Asia, and Australia"; "Originally native to the North American Southwest, from southern California to Texas and northern Mexico, <i>Amaranthus palmeri</i> at present is a successful invasive species, which is evident from its expansion both in eastern North America and overseas." [unclear whether its expansion to the midwest and eastern U.S. has been due to introduction or natural range expansion (facilitated by increased agricultural habitat)]
3.01	Flora of North America, vol. 4 (http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242415653).	"Originally native to the North American Southwest, from southern California to Texas and northern Mexico, <i>Amaranthus palmeri</i> at present is a successful invasive species, which is evident from its expansion both in eastern North America and overseas."
3.02	Sauer (1957) Recent migration and evolution of the dioecious amaranths. <i>Evolution</i> 11: 11-31.	"Of all the dioecious amaranths, <i>A. palmeri</i> has been by far the most successful as a weedy invader of artificial habitats...nearly all the peripheral colonies grow in fields or along roads, railroads, and ditches."
3.03	Sellers, Smeda, Johnson, Kendig, and Ellersieck (2003) Comparative growth of six <i>Amaranthus</i>	Palmer amaranth is a weed of soybeans in Arkansas and a weed

	species in Missouri. Weed Science 51: 329-333.	of cotton in Oklahoma.
3.04		no evidence
3.05	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	<i>A. retroflexus</i> and <i>A. viridis</i> are two of the most widely distributed weed species in the arable crops of the world.
4.01	Mohlenbrock (2001) Flowering Plants: Pokeweeds, Four-o'clocks, Carpetweeds, Cacti, Purslanes, Goosefoots, Pigweeds, and Pinks. Southern Illinois University Press.	<i>A. palmeri</i> is one of the <i>Amaranthus</i> species without spines.
4.02	Menges (1988) Allelopathic effects of Palmer amaranth (<i>Amaranthus palmeri</i>) on seedling growth. Weed Science 36: 325-328.	Residues of <i>A. palmeri</i> incorporated into the soil significantly impacted growth of sorghum. [no extracts used - just ground plants - at natural concentrations]
4.03	Mohlenbrock (2001) Flowering Plants: Pokeweeds, Four-o'clocks, Carpetweeds, Cacti, Purslanes, Goosefoots, Pigweeds, and Pinks. Southern Illinois University Press.	no description of this
4.04		
4.05		no evidence, but <i>A. spinosus</i> is toxic to animals
4.06		
4.07		no evidence
4.08		no evidence
4.09	Paredes-Lopez, ed. (1994) Amaranth Biology, Chemistry, and Technology. CRC Press, Boca Raton.	Most amaranths are pioneer species of open habitats; typically colonize disturbed sites with full sunlight.
4.1	Sauer (1957) Recent migration and evolution of the dioecious amaranths. Evolution 11: 11-31.	<i>A. palmeri</i> generally grows "in sandy floors of desert washes, canyon bottoms, and intermittent stream beds in general".
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, and is an herb
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.	Amaranthaceae
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 Amaranthaceae
5.04	Mohlenbrock (2001) Flowering Plants: Pokeweeds, Four-o'clocks, Carpetweeds, Cacti, Purslanes, Goosefoots, Pigweeds, and Pinks. Southern Illinois	"annual dioecious herb from a long taproot"

	University Press.	
6.01		
6.02	Paredes-Lopez, ed. (1994) <i>Amaranth Biology, Chemistry, and Technology</i> . CRC Press, Boca Raton.	"Amaranths are annual plants that establish every year from seeds."
6.03	Sauer (1957) Recent migration and evolution of the dioecious amaranths. <i>Evolution</i> 11: 11-31.	<i>A. palmeri</i> apparently hybridizes with several other <i>Amaranthus</i> species.
6.04	Sellers, Smeda, Johnson, Kendig, and Ellersieck (2003) Comparative growth of six <i>Amaranthus</i> species in Missouri. <i>Weed Science</i> 51: 329-333.	dioecious
6.05	Paredes-Lopez, ed. (1994) <i>Amaranth Biology, Chemistry, and Technology</i> . CRC Press, Boca Raton.	"Pollination [of the genus <i>Amaranthus</i>] is anemophilous."
6.06	1. Paredes-Lopez, ed. (1994) <i>Amaranth Biology, Chemistry, and Technology</i> . CRC Press, Boca Raton. 2. Sauer (1957) Recent migration and evolution of the dioecious amaranths. <i>Evolution</i> 11: 11-31.	1. "Amaranths are annual plants that establish every year from seeds." 2. "Being annuals with no capacity for vegetative or other apomictic reproduction..."
6.07	Mohlenbrock (2001) <i>Flowering Plants: Pokeweeds, Four-o'clocks, Carpetweeds, Cacti, Purslanes, Goosefoots, Pigweeds, and Pinks</i> . Southern Illinois University Press.	annual
7.01		
7.02		no evidence of cultivation
7.03		no evidence
7.04	Paredes-Lopez, ed. (1994) <i>Amaranth Biology, Chemistry, and Technology</i> . CRC Press, Boca Raton.	"their small [seed] size allows some dispersion by wind" [referring to the genus as a whole]
7.05		no evidence
7.06		wind dispersed
7.07		no evidence of any means of attachment
7.08		wind dispersed
8.01	Sellers, Smeda, Johnson, Kendig, and Ellersieck (2003) Comparative growth of six <i>Amaranthus</i> species in Missouri. <i>Weed Science</i> 51: 329-333.	"Palmer amaranth plants each produced over 250,000 seeds plant ⁻¹ ."
8.02	Paredes-Lopez, ed. (1994) <i>Amaranth Biology, Chemistry, and Technology</i> . CRC Press, Boca Raton.	"weedy species of amaranth usually have prolonged seed dormancy and may persist for several years in the soil"
8.03	Horak and Loughin (2000) Growth analysis of four <i>Amaranthus</i> species. <i>Weed Science</i> 48: 347-355.	"the plant exhibits tolerance to several commonly used postemergence herbicides"
8.04		
8.05		