

Australia/New Zealand Weed Risk Assessment adapted for United States.

Data used for analysis published in: Gordon, D.R. and C.A. Gantz. 2008. Potential impacts on the horticultural industry of screening new plants for invasiveness. Conservation Letters 1: 227-235. Available at: <http://www3.interscience.wiley.com/cgi-bin/fulltext/121448369/PDFSTART>

<i>Remusatia pumila</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 U.S. climates (USDA hardiness 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)	n	0
2.04	Native or naturalized in regions with an average of 11-60 inches of annual precipitation	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	n	-2
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	n	0
4.01	Produces spines, thorns or burrs	?	
4.02	Allelopathic		
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		
4.07	Causes allergies or is otherwise toxic to humans	n	0
4.08	Creates a fire hazard in natural ecosystems		
4.09	Is a shade tolerant plant at some stage of its life cycle	y	1
4.1	Grows on one or more of the following soil types: alfisols, entisols, or mollisols	y	1
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	?	

5.01	Aquatic	n	0
5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte	y	1
6.01	Evidence of substantial reproductive failure in native habitat	n	0
6.02	Produces viable seed		
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)		
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		
7.06	Propagules bird dispersed	y	1
7.07	Propagules dispersed by other animals (externally)	y	1
7.08	Propagules dispersed by other animals (internally)	?	
8.01	Prolific seed production		
8.02	Evidence that a persistent propagule bank is formed (>1 yr)		
8.03	Well controlled by herbicides		
8.04	Tolerates, or benefits from, mutilation or cultivation		
8.05	Effective natural enemies present in U.S.		
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	11	Yes
B	6	Yes
C	11	Yes
total	28	yes

Data collected 2008

Question number	Reference	Source data
1.01		used horticulturally, but no evidence of significant modification
1.02		
1.03		
2.01	<p>1. PERAL NAPPFAST Global Plant Hardiness (http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20gnd.tif). 2. Heng, L and Guanghua, Z (1994) <i>Araceae</i>. In: Wu, Z and Raven, PH (editors). <i>Flora of China</i>. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 3. Noltie, HJ (1994) <i>Flora of Bhutan</i>. Volume 3, Part 1, pp. 133-136. Royal Botanic Garden Edinburgh, Edinburgh.</p>	<p>1. Global hardiness zones 4-10. 2. "S Xizang and Yunnan [Bhutan, India (Kunman, simla, Assam, Darjeeling), Nepal, N Thailand, Sikkim]" 3. Bhutan: S - Phuntsholing (below Ganglakha), Chukka (Chukka Colony) and Deothang (between Morong and Narfong) districts; C - Punakha (between Lobesa and Tinlegang) and Tongsa (Changkha) districts; Duars (Buxa); Darjeeling (Lebong, Sureil, Kurseong, Punkabari, Kalimpong; Birch Hill, Happy Valley); Sikkim (29 km W of Singtam, Gangtok, Namchi, Great Rangit, Yoksum".</p>
2.02		
2.03	<p>1. Köppen-Geiger climate map (http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf). 2. Heng, L and Guanghua, Z (1994) <i>Araceae</i>. In: Wu, Z and Raven, PH (editors). <i>Flora of China</i>. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 3. Noltie, HJ (1994) <i>Flora of Bhutan</i>. Volume 3, Part 1, pp. 133-136. Royal Botanic Garden Edinburgh, Edinburgh.</p>	<p>1. Two climatic regions. 2. "S Xizang and Yunnan [Bhutan, India (Kunman, simla, Assam, Darjeeling), Nepal, N Thailand, Sikkim]" 3. Bhutan: S - Phuntsholing (below Ganglakha), Chukka (Chukka Colony) and Deothang (between Morong and Narfong) districts; C - Punakha (between Lobesa and Tinlegang) and Tongsa (Changkha) districts; Duars (Buxa); Darjeeling (Lebong, Sureil, Kurseong, Punkabari, Kalimpong; Birch Hill, Happy Valley); Sikkim (29 km W of Singtam, Gangtok, Namchi,</p>

		Great Rangit, Yoksum".
2.04	<p>1. Climate Source (http://www.climatesource.com/cn/fact_sheets/chinappt_xl.jpg). 2. Atlapedia Online (http://www.atlapedia.com/online/countries/). 3. Microsoft Encarta World Precipitation and Average Rainfall (http://uk.encarta.msn.com/encnet/RefPages/RefMedia.aspx?refid=461530746&artrefid=761554737&pn=3&sec=-1).</p>	<p>1. For the regions listed, average annual precipitation ranges from 2 inches/year to greater than 196.9 inches/year. 2. For Bhutan: "Average annual precipitation varies from 1,020 to 1,520 mm (40 to 60 inches)"; For Nepal: "Average annual precipitation decreases from 1,778 mm (70 inches) in the east to 899 mm (35 inches) in the west."; For Thailand: "Average annual precipitation varies from 1,020 mm (40 inches) to 2,030 mm (80 inches) depending on the region." 3. For India: Average annual precipitation for the entire country ranges from less than 10 to greater than 80 inches, however most of the country falls into the 20-60 inch range.</p>
2.05	<p>1. Urban Jungle (http://www.urbanjungle.uk.com/product.asp?productid=297). 2. Gautam Global (http://www.gautamglobal.com/flower.htm). 3. Exotica Seeds (http://www.exoticaseeds.ru/product_info.php/cPath/74_79/products_id/742). 4. Sunshine Seeds (http://www.sunshine-seeds.de/shop/index.html?d_60312_Remusatia_pumila_42086.htm).</p>	<p>1. Sold in the United Kingdom. 2. Seeds sold in India. 3. Seeds sold in Russia. 4. Sold in Germany.</p>
3.01		no evidence
3.02		no evidence
3.03		no evidence
3.04		no evidence
3.05		no evidence
4.01	<p>1. Heng, L and Guanghua, Z (1994) <i>Araceae</i>. In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. Noltie, HJ (1994) Flora of Bhutan. Volume 3, Part 1, pp. 133-136. Royal Botanic Garden Edinburgh, Edinburgh.</p>	<p>1. "Bulbils many, covered by brown scales, bristles filiform, hooked". 2. "Stolons...bearing few to many bulbils. Bulbils c. 1 x 1 mm, bristles filiform, to over 1 cm."</p>

4.02		
4.03	Heng, L and Guanghua, Z (1994) <i>Araceae</i> . In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis).	no description of parasitism
4.04		
4.05	Heng, L and Guanghua, Z (1994) <i>Araceae</i> . In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis).	no evidence
4.06		
4.07	Bown, D (2000) <i>Aroids: plants of the Arum family</i> . Timber Press, Portland, Oregon.	"Used to treat allergic urticaria (nettle rash); the effectiveness of [<i>Remusatia pumila</i>] for allergic conditions, including asthma, is based on its ability to reduce antibody activity. It is used in Chinese herbal medicine." [no evidence of toxicity]
4.08		
4.09	Heng, L and Guanghua, Z (1994) <i>Araceae</i> . In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis).	"Dense evergreen forests"; "Petiole cylindric...15-40 cm, sheathing for lower 1/4-1/3".
4.1	USDA, National Resources Conservation Services (NRCS), Soil Survey Division, World Soil Resources (http://soils.usda.gov/use/worldsoils/mapindex/order.html).	Entisols are present in this region.
4.11	Heng, L and Guanghua, Z (1994) <i>Araceae</i> . In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis).	"Petiole cylindric...15-40 cm, sheathing for lower 1/4-1/3".
4.12	Heng, L and Guanghua, Z (1994) <i>Araceae</i> . In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis).	"Petiole cylindric...15-40 cm, sheathing for lower 1/4-1/3".
5.01		terrestrial
5.02		Araceae
5.03		Araceae
5.04	1. Heng, L and Guanghua, Z (1994) <i>Araceae</i> . In: Wu, Z and Raven, PH (editors). Flora of China. Vol.	1. "Corm globose, 1-2.5 cm in diam." 2. "Corm 1.5-2.5 cm diameter". 3.

	23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. Noltie, HJ (1994) Flora of Bhutan. Volume 3, Part 1, pp. 133-136. Royal Botanic Garden Edinburgh, Edinburgh. 3. Mayo, SJ, Bogner, J, and Boyce, PC (1997) The Genera of Araceae. Royal Botanic Gardens Kew, London.	"Tuber subglobose" [genus description].
6.01		no evidence
6.02		
6.03		
6.04		
6.05		
6.06	1. Heng, L and Guanghua, Z (1994) <i>Araceae</i> . In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 23. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. Noltie, HJ (1994) Flora of Bhutan. Volume 3, Part 1, pp. 133-136. Royal Botanic Garden Edinburgh, Edinburgh. 3. Mayo, SJ, Bogner, J, and Boyce, PC (1997) The Genera of Araceae. Royal Botanic Gardens Kew, London.	1. "Bulbiferous stolons slender, branched, spreading, creeping; bulbils many". 2. "Stolons c. 2 mm diameter, spreading...bearing few to many bulbils". 3. "Tuber subglobose, producing erect to spreading, unbranched or branching stolons from axils of scarious, deciduous cataphylls, stolons producing small, ovoid tubercles at nodes, each invested by numerous, apically revolute or flexuose scales (minute cataphylls)" [genus description].
6.07		
7.01		
7.02	1. Urban Jungle (http://www.urbanjungle.uk.com/product.asp?productid=297). 2. Gautam Global (http://www.gautamglobal.com/flower.htm). 3. Exotica Seeds (http://www.exoticaseeds.ru/product_info.php/cPath/74_79/products_id/742). 4. Sunshine Seeds (http://www.sunshine-seeds.de/shop/index.html?d_60312_Remusatia_pumila_42086.htm).	1. Sold in the United Kingdom. 2. Seeds sold in India. 3. Seeds sold in Russia. 4. Sold in Germany.
7.03		no evidence
7.04	1. Bown, D (2000) <i>Aroids: plants of the Arum family</i> . Timber Press, Portland, Oregon. 2. Mayo, SJ, Bogner, J, and Boyce, PC (1997) The Genera of Araceae. Royal Botanic Gardens Kew, London.	1. "Yellow berries"; "produce clusters of hooked tubercles or bulbils at the nodes. These burlike offsets serve as a successful method of propagation". 2. "Berry: obovoid to globose, many-seeded, infructescence ellipsoid"; "Seed: ellipsoid to subglobose...endosperm copious"

		[genus description]. [no evidence of adaptations to wind dispersal]
7.05		
7.06	1. Bown, D (2000) Aroids: plants of the Arum family. Timber Press, Portland, Oregon. 2. Mayo, SJ, Bogner, J, and Boyce, PC (1997) The Genera of Araceae. Royal Botanic Gardens Kew, London.	1. "Yellow berries"; "produce clusters of hooked tubercles or bulbils at the nodes. These burlike offsets serve as a successful method of propagation". 2. "Berry: obovoid to globose, many-seeded, infructescence ellipsoid"; "Seed: ellipsoid to subglobose...endosperm copious" [genus description].
7.07	Bown, D (2000) Aroids: plants of the Arum family. Timber Press, Portland, Oregon.	"Produce clusters of hooked tubercles or bulbils at the nodes. These burlike offsets serve as a successful method of propagation".
7.08	1. Bown, D (2000) Aroids: plants of the Arum family. Timber Press, Portland, Oregon. 2. Mayo, SJ, Bogner, J, and Boyce, PC (1997) The Genera of Araceae. Royal Botanic Gardens Kew, London.	1. "Yellow berries"; "produce clusters of hooked tubercles or bulbils at the nodes. These burlike offsets serve as a successful method of propagation". 2. "Berry: obovoid to globose, many-seeded, infructescence ellipsoid"; "Seed: ellipsoid to subglobose...endosperm copious" [genus description].
8.01		
8.02		
8.03		
8.04		
8.05		