

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>Polygonatum kingianum</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)	y	1
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	n	0
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		
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	?	
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)	n	-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			1

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	10	Yes
total	27	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	1. PERAL NAPPFAST Global Plant Hardiness (http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20gnd.tif). 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland (http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?423628).	1. Global hardiness zones 5-12 (and possibly 13). 2. China - Guangxi, Guizhou, Sichuan, Yunnan; Indo-China: Myanmar; Thailand; Vietnam
2.02		
2.03	1. Köppen-Geiger climate map (http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf). 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland (http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?423628).	1. Three climatic regions [Sichuan has two climatic regions, C & D; the rest fall into A or C] 2. China - Guangxi, Guizhou, Sichuan, Yunnan; Indo-China: Myanmar; Thailand; Vietnam
2.04	1. Climate Source (http://www.climatesource.com/cn/fact_sheets/chinappt_xl.jpg). 2. Atlapedia Online (http://www.atlapedia.com/online/countries/).	1. For the regions listed, average annual precipitation ranges from 19.7 inches/year to 196.9 inches/year. 2. For Myanmar: "The coastal and high mountain precipitation varies between 2,500 to 5,000 mm (98 to 196 inches) annually with the interior receiving 1,000 mm (39 inches) or less."; For Thailand: "Average annual precipitation varies from 1,020 mm

		(40 inches) to 2,030 mm (80 inches) depending on the region."; For Vietnam: "Average annual precipitation in Hanoi is 1,830 mm (72 inches) with areas in the Annamite Mountains exceeding 4,060 mm (160 inches)."
2.05	1. University of British Columbia Botanical Garden (http://www.ubcbotanicalgarden.org/collections/data/record.php?recordid=9453). 2. Indian Herbs Exporters (http://www.indian-herbs-exporters.com/_polygonatum_kingianum.html). 3. Crug Farm (http://www.mailorder.crug-farm.co.uk/default.aspx?alpha=P).	1. Cultivated in Canada. 2. Exported from India for medicinal purposes. 3. Sold in the United Kingdom.
3.01		no evidence
3.02		no evidence
3.03		no evidence
3.04		no evidence
3.05	New Zealand Plant Conservation Network (2005) New Zealand Adventive Vascular Plant List. Wellington, New Zealand.	One congener is "fully naturalised" [not enough evidence to be considered a weed].
4.01	Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.	no description of these traits
4.02		
4.03	Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.	no description of parasitism
4.04		
4.05	Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.	no evidence
4.06		
4.07	Van Duong, N (1993) Medicinal plants of Vietnam, Cambodia, and Laos. Mekong Printing, USA.	Rhizomes used in folk medicine for backache, weakness, fatigue. [no evidence of toxicity]
4.08		
4.09		
4.1	USDA, National Resources Conservation Services (NRCS), Soil Survey Division, World Soil	Entisols are present in this region.

	Resources (http://soils.usda.gov/use/worldsoils/mapindex/order.html).	
4.11	1. Maxwell, JF (1998) Botanical notes on the flora of Northern Thailand: 6. Natural History Bulletin of the Siam Society 46(2): 149-154. 2. Collett, H and Hemsley (1890) On a collection of plants from Upper Burma and the Shan States. Journal of the Linnaean Society, Botany 28: 138 and Plate 21.	1. "A deciduous, perennial, scarce herb up to c. 3-5 m tall". 2. Refer to Plate 21. Species is an erect, herbaceous perennial.
4.12	1. Maxwell, JF (1998) Botanical notes on the flora of Northern Thailand: 6. Natural History Bulletin of the Siam Society 46(2): 149-154. 2. Collett, H and Hemsley (1890) On a collection of plants from Upper Burma and the Shan States. Journal of the Linnaean Society, Botany 28: 138 and Plate 21.	1. "A deciduous, perennial, scarce herb up to c. 3-5 m tall". 2. Refer to Plate 21. Species is an erect, herbaceous perennial.
5.01		terrestrial
5.02	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland (http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?423628).	Liliaceae (Ruscaceae)
5.03	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland (http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?423628).	Liliaceae (Ruscaceae)
5.04	Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.	"Rhizome subterete or submoniliform, 1-3 cm thick".
6.01		no evidence
6.02		
6.03		
6.04		
6.05		
6.06	Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.	"Rhizome subterete or submoniliform, 1-3 cm thick".
6.07		
7.01		
7.02	1. University of British Columbia Botanical Garden	1. Cultivated in Canada. 2. Exported

	(http://www.ubcbotanicalgarden.org/collections/data/record.php?recordid=9453). 2. Indian Herbs Exporters (http://www.indian-herbs-exporters.com/_polygonatum_kingianum.html). 3. Crug Farm (http://www.mailorder.crug-farm.co.uk/default.aspx?alpha=P).	from India for medicinal purposes. 3. Sold in the United Kingdom.
7.03		no evidence
7.04	1. Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis. 2. Maxwell, JF (1998) Botanical notes on the flora of Northern Thailand: 6. Natural History Bulletin of the Siam Society 46(2): 149-154.	1. "Berries red, 1-1.5 cm in diam., 7-12 seeded". 2. "Berries subglobose...light to medium green; 9-13 × 11-17 mm...seeds subglobose, c. 5-7 × 4-6 mm; testa smooth". [no evidence of adaptations to wind dispersal]
7.05		
7.06	1. Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis. 2. Maxwell, JF (1998) Botanical notes on the flora of Northern Thailand: 6. Natural History Bulletin of the Siam Society 46(2): 149-154.	1. "Berries red, 1-1.5 cm in diam., 7-12 seeded". 2. "Berries subglobose...light to medium green; 9-13 × 11-17 mm...seeds subglobose, c. 5-7 × 4-6 mm; testa smooth".
7.07	1. Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis. 2. Maxwell, JF (1998) Botanical notes on the flora of Northern Thailand: 6. Natural History Bulletin of the Siam Society 46(2): 149-154.	1. "Berries red, 1-1.5 cm in diam., 7-12 seeded". 2. "Berries subglobose...light to medium green; 9-13 × 11-17 mm...seeds subglobose, c. 5-7 × 4-6 mm; testa smooth". [no evidence of adaptations to external dispersal]
7.08	1. Wu, ZY and Raven, PH (editors), Flora of China, Vol. 24, p. 228. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis. 2. Maxwell, JF (1998) Botanical notes on the flora of Northern Thailand: 6. Natural History Bulletin of the Siam Society 46(2): 149-154.	1. "Berries red, 1-1.5 cm in diam., 7-12 seeded". 2. "Berries subglobose...light to medium green; 9-13 × 11-17 mm...seeds subglobose, c. 5-7 × 4-6 mm; testa smooth".
8.01		
8.02		
8.03		
8.04		
8.05		