

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>Clematis hexapetala</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	y	2
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	n	0
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	y	1
6.03	Hybridizes naturally		
6.04	Self-compatible or apomictic		
6.05	Requires specialist pollinators		
6.06	Reproduction by vegetative fragmentation		
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	y	1
7.05	Propagules water dispersed		
7.06	Propagules bird dispersed		
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			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	7	Yes
C	9	Yes
total	27	yes

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%20lgn d.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?64). 3. Wencai, W et al (1994) <i>Clematis hexapetala</i>. P. 362. In: Wu, Z and Raven, PH (editors). <i>Flora of China</i>. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 4. Czerepanov, SK (1995) <i>Vascular Plants of Russia and Adjacent States (the former USSR)</i>. Cambridge University Press, Cambridge and New York. 5. Toomey, M and Leeds, E (2001) <i>An illustrated encyclopedia of Clematis</i>. Timber Press in association with the British Clematis Society, Portland, Oregon. 6. Shishkin, BK (1937) <i>Flora of the U.S.S.R. Volume VII</i>. Pp. 240-241, 246. Izdatel'stvo Akademii Nauk SSSR, Moskva-Leningrad and Israel Program for Scientific Translations, Jerusalem (1970). 7. Grey-Wilson, C (1999) <i>Clematis, The Genus: A Comprehensive Guide for Gardeners, Horticulturists, and Botanists</i>. Timber Press, Portland, Oregon.</p>	<p>1. Global plant hardiness zones 1-7. 2. Siberia: Russian Federation - Buryatia, Chita; Soviet Far East: Russian Federation - Amur, Primorye; Mongolia: Mongolia [e.]; China: China - Gansu [s.], Hebei, Heilongjiang, Henan, Hubei, Jiangsu [n.], Jilin, Liaoning, Nei Monggol, Ningxia, Shaanxi, Shandong [e.], Shanxi; Eastern Asia: Japan - Hokkaido, Honshu; Korea. 3. E Gansu, Hebei, Heilongjiang, W Henan, N Hubei, N Jiangsu, Jilin, Liaoning, NeiMongol, Ningxia, Shaanxi, E Shandong, Shanxi [Korea, Mongolia, Russia (E Siberia)]. 4. Distribution listed as Eastern Siberia and the Far East. 5. "Origin: Northern China, Manchuria, Mongolia, Siberia, Korea, and Japan"; "Zones 3-9". 6. "E. Siberia: Ang. - Say. (Baikal area), Dau.; Far East: Ze. - Bu., Uss. Gen. distr.: Jap. - Ch., Mong." 7. "Distribution. NE China (Inner Mongolia, C & N Gansu, Ningxia and Shaanxi, north-eastwards to Jilin, Liaoning and Heilongjiang), Korea, Japan (Honshu, Hokkaido), C & E Mongolia, SE Russia (SE Siberia)".</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. 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-</p>	<p>1. Occurs in 3 climatic regions. 2. Siberia: Russian Federation - Buryatia, Chita; Soviet Far East: Russian Federation - Amur, Primorye; Mongolia: Mongolia [e.]; China: China - Gansu [s.], Hebei, Heilongjiang, Henan, Hubei,</p>

	<p>bin/npgs/html/taxon.pl?64). 3. Wencai, W et al (1994) <i>Clematis hexapetala</i>. P. 362. In: Wu, Z and Raven, PH (editors). <i>Flora of China</i>. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 4. Czerepanov, SK (1995) <i>Vascular Plants of Russia and Adjacent States (the former USSR)</i>. Cambridge University Press, Cambridge and New York. 5. Toomey, M and Leeds, E (2001) <i>An illustrated encyclopedia of Clematis</i>. Timber Press in association with the British Clematis Society, Portland, Oregon. 6. Shishkin, BK (1937) <i>Flora of the U.S.S.R. Volume VII</i>. Pp. 240-241, 246. Izdatel'stvo Akademii Nauk SSSR, Moskva-Leningrad and Israel Program for Scientific Translations, Jerusalem (1970). 7. Grey-Wilson, C (1999) <i>Clematis, The Genus: A Comprehensive Guide for Gardeners, Horticulturists, and Botanists</i>. Timber Press, Portland, Oregon.</p>	<p>Jiangsu [n.], Jilin, Liaoning, Nei Monggol, Ningxia, Shaanxi, Shandong [e.], Shanxi; Eastern Asia: Japan - Hokkaido, Honshu; Korea. 3. E Gansu, Hebei, Heilongjiang, W Henan, N Hubei, N Jiangsu, Jilin, Liaoning, NeiMongol, Ningxia, Shaanxi, E Shandong, Shanxi [Korea, Mongolia, Russia (E Siberia)]. 4. Distribution listed as Eastern Siberia and the Far East. 5. Origin: Northern China, Manchuria, Mongolia, Siberia, Korea, and Japan. 6. "E. Siberia: Ang. - Say. (Baikal area), Dau.; Far East: Ze. - Bu., Uss. Gen. distr.: Jap. - Ch., Mong." 7. "Distribution. NE China (Inner Mongolia, C & N Gansu, Ningxia and Shaanxi, north-eastwards to Jilin, Liaoning and Heilongjiang), Korea, Japan (Honshu, Hokkaido), C & E Mongolia, SE Russia (SE Siberia)".</p>
2.04	<p>1. Climate Source (http://www.climatesource.com/cn/fact_sheets/chinapt_xl.jpg). 2. MSN Encarta (http://encarta.msn.com/encyclopedia_761566679_4/Japan.html). 3. Atlapedia Online (http://www.atlapedia.com/online/countries/korea_n.htm). 4. Atlapedia Online (http://www.atlapedia.com/online/countries/korea_s.htm). 5. Altapedia Online (http://www.atlapedia.com/online/countries/mongolia.htm). 6. Atlapedia Online (http://www.atlapedia.com/online/countries/russia.htm). 7. Blue Planet Biomes (http://www.blueplanetbiomes.org/climate.htm).</p>	<p>1. In the provinces listed for China, average annual precipitation ranges from <2 in/yr to 78.7 in/yr. 2. Average annual precipitation in Sapporo [north] is 1,130 mm (45 in), while in Tokyo [central] it is 1,410 mm (55 in) and in Kagoshima [south] it is 2,240 mm (88 in). [Hokkaido is the north island and Honshu is mostly central Japan]. 3. For North Korea: "The wettest months are from July to September when up to 85% of rainfall occurs while average annual precipitation varies from 560 mm (22 inches) to 1,520 mm (60 inches) depending on the region." 4. For South Korea: "Average annual precipitation varies from 1,016 mm (40 inches) to 1,524 mm (60 inches) depending on each region." 5. For Mongolia: "Precipitation is sparse and averages 254 mm (10 inches) annually at Ulan Bator." 6. For the Russian Federation: rainfall is</p>

		highest in the westerly mountain regions which has an average annual precipitation of up to 2,000 mm (79 inches) while on the East European Plain it averages between 600 and 700 mm (24 to 27.5 inches) and up to 1,000 (39 inches) in the southern areas of the Far East. 7. For Siberia: Average annual precipitation ranges from 8-12 in/yr.
2.05	1. Toomey, M and Leeds, E (2001) An illustrated encyclopedia of Clematis. Timber Press in association with the British Clematis Society, Portland, Oregon. 2. Chapman, GP and Wang, Y-Z (2002) The Plant Life of China: Diversity and Distribution. Springer, Berlin.	1. This British book mentions cultivation requirements (e.g., soil, shade, hardiness zones, and suitability in the garden). 2. "Of the many species in China, the following are of some significance in temperate gardens, <i>C. hexapetala</i> ."
3.01	Global Compendium of Weeds. Hawaiian Ecosystems at Risk (http://www.hear.org/gcw/species/clematis_hexapetala/).	The data source listed on this website indicates that this species is a weed in China and Japan, however several other sources indicate that this species is native to these countries.
3.02		
3.03		
3.04	Global Compendium of Weeds. Hawaiian Ecosystems at Risk (http://www.hear.org/gcw/species/clematis_hexapetala/).	The data source listed on this website indicates that this species is a weed in China and Japan, however several other sources indicate that this species is native to these countries.
3.05	1. Weber, E (2003) Invasive Plant Species of the World. CAB International, Oxon, United Kingdom. 2. Holm, L, JV Pancho, JP Herberger, and DL Plucknett (1979) A Geographical Atlas of World Weeds. John Wiley and Sons, New York.	1. One congener is invasive in Australia and New Zealand. 2. Two congeners are common weeds in Japan and Taiwan. Four congeners are present as weeds in Brazil, Mexico, USA, and Chile [Reference #2: not enough evidence to be considered weeds].
4.01	Wencai, W <i>et al</i> (1994) <i>Clematis hexapetala</i> . P. 362. In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis).	no description of these traits

4.02		
4.03	Wencai, W <i>et al</i> (1994) <i>Clematis hexapetala</i> . P. 362. In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis).	no description of parasitism
4.04		
4.05	Wencai, W <i>et al</i> (1994) <i>Clematis hexapetala</i> . P. 362. In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis).	no evidence
4.06		
4.07	1. Shi, S-p, Dong, C-X, Jiang, D, and Tu, P-F (2007) Macrocytic glucosides from <i>Clematis mandshurica</i> and <i>Clematis hexapetala</i> . Biochemical Systematics and Ecology 35(1): 57-60. 2. Indian-Herbs-Exporters.com (http://www.indian-herbs-exporters.com/_clematis_hexapetala.html).	1. "In Chinese Pharmacopeia, the roots and rhizomes of... <i>C. hexapetala</i> Pall. are... popularly used as an anti-inflammatory, antitumor, analgesic agent." 2. "Part used: roots... Uses: rheumatic arthritis, acute tonsillitis, throat inflammation, jaundice due to acute infectious hepatitis, toothache". [no evidence of toxicity].
4.08		
4.09	1. Toomey, M and Leeds, E (2001) An illustrated encyclopedia of Clematis. Timber Press in association with the British Clematis Society, Portland, Oregon. 2. Nebraska Statewide Arboretum: Plant Data (http://arboretum.unl.edu/plantsales/).	1. "Plant in sun or partial shade". 2. "Full sun".
4.1	1. USDA, National Resources Conservation Services (NRCS), Soil Survey Division, World Soil Resources (http://soils.usda.gov/use/worldsoils/mapindex/order.html). 2. Wencai, W <i>et al</i> (1994) <i>Clematis hexapetala</i> . P. 362. In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 3. Nebraska Statewide Arboretum: Plant Data (http://arboretum.unl.edu/plantsales/). 4. Toomey, M and Leeds, E (2001) An illustrated encyclopedia of Clematis. Timber Press in association with the British Clematis Society, Portland, Oregon. 5. Walters, SM <i>et al</i> (1984) The European Garden Flora. Volume III. P. 357. Cambridge University Press, Cambridge (Cambridgeshire) and New York.	1. The provinces of China and other country boundaries are not always well-defined on the soil orders map, but it is highly likely that the following soil order types occur in the regions of origin: alfisols, aridisols, entisols, gelisols, inceptisols, mollisols, ultisols (and the andisols, histisols and rocky land soil order types also occur in these areas). 2. "slopes, grassy areas, dunes" 3. "well-drained, moderately dry soils" 4. Prefers well-drained soil. 5. "A certain amount of lime in the soil is beneficial" [genus description].
4.11	1. Wencai, W <i>et al</i> (1994) <i>Clematis hexapetala</i> . P. 362. In: Wu, Z and Raven, PH (editors). Flora of	1. "Herbs perennial, erect, 30--100 cm tall. Stems simple or branched".

	China. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. Toomey, M and Leeds, E (2001) An illustrated encyclopedia of Clematis. Timber Press in association with the British Clematis Society, Portland, Oregon. 3. Shishkin, BK (1937) Flora of the U.S.S.R. Volume VII. Pp. 240-241, 246. Izdatel'stvo Akademii Nauk SSSR, Moskva-Leningrad and Israel Program for Scientific Translations, Jerusalem (1970). 4. Grey-Wilson, C (1999) Clematis, The Genus: A Comprehensive Guide for Gardeners, Horticulturists, and Botanists. Timber Press, Portland, Oregon.	2. "Habit: Hardy, erect, deciduous, herbaceous perennial; Height: To 1 m (3.25 ft.)." 3. "Perennial - stem erect, strong, faceted, 30-70 cm high". 4. "A perennial herb with erect stems to 1 m (40 in) tall, but often 30-50 cm (12-20 in), with 8-12-furrowed simple or branched stems" [species description]; "Perennials or subshrubs with non-climbing erect stems" [genus description].
4.12	1. Wencai, W <i>et al</i> (1994) <i>Clematis hexapetala</i> . P. 362. In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. Toomey, M and Leeds, E (2001) An illustrated encyclopedia of Clematis. Timber Press in association with the British Clematis Society, Portland, Oregon. 3. Shishkin, BK (1937) Flora of the U.S.S.R. Volume VII. Pp. 240-241, 246. Izdatel'stvo Akademii Nauk SSSR, Moskva-Leningrad and Israel Program for Scientific Translations, Jerusalem (1970). 4. Grey-Wilson, C (1999) Clematis, The Genus: A Comprehensive Guide for Gardeners, Horticulturists, and Botanists. Timber Press, Portland, Oregon.	1. "Herbs perennial, erect, 30--100 cm tall. Stems simple or branched". 2. "Habit: Hardy, erect, deciduous, herbaceous perennial; Height: To 1 m (3.25 ft.)." 3. "Perennial - stem erect, strong, faceted, 30-70 cm high". 4. "A perennial herb with erect stems to 1 m (40 in) tall, but often 30-50 cm (12-20 in), with 8-12-furrowed simple or branched stems" [species description]; "Perennials or subshrubs with non-climbing erect stems" [genus description].
5.01	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?64).	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?64).	Ranunculaceae
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?64).	Ranunculaceae
5.04		
6.01		no evidence
6.02	1. Indian-Herbs-Exporters.com (http://www.indian-herbs.com)	1. "Propagation by seeds". 2.

	herbs-exporters.com/_clematis_hexapetala.html). 2. Walters, SM et al (1984) The European Garden Flora. Volume III. P. 357. Cambridge University Press, Cambridge (Cambridgeshire) and New York.	"Propagation is by seed or cuttings" [genus description].
6.03		
6.04		
6.05		
6.06		
6.07		
7.01		
7.02	1. Toomey, M and Leeds, E (2001) An illustrated encyclopedia of Clematis. Timber Press in association with the British Clematis Society, Portland, Oregon. 2. Chapman, GP and Wang, Y-Z (2002) The Plant Life of China: Diversity and Distribution. Springer, Berlin.	1. This British book mentions cultivation requirements (e.g., soil, shade, hardiness zones, and suitability in the garden). 2. "Of the many species in China, the following are of some significance in temperate gardens, <i>C. hexapetala</i> ."
7.03		no evidence
7.04	1. Wencai, W et al (1994) Clematis hexapetala. P. 362. In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. Hu, S-Y (1954) Notes on the Flora of China, III. Journal of the Arnold Arboretum 35: 189-194. 3. Nebraska Statewide Arboretum: Plant Data (http://arboretum.unl.edu/plantsales/). 4. Indian-Herbs-Exporters.com (http://www.indian-herbs-exporters.com/_clematis_hexapetala.html). 5. Grey-Wilson, C (1999) Clematis, The Genus: A Comprehensive Guide for Gardeners, Horticulturists, and Botanists. Timber Press, Portland, Oregon.	1. "Achenes obovate, 2.5--3.5 x 2--3 mm". 2. "The obovate achenes are 5 mm. long, 3.5 mm. wide, compressed, villose, and with a persistent densely villose curved style up to 3.5 cm. long." [description applies to variety <i>longiloba</i>] 3. "feathery seedheads" ["feathery likely refers to persistent styles]. 4. "Fruit a head of stalked achenes with long, usually feathery styles". 5. "Achenes obovate, 2.5-3.5 mm (0.1-0.18 in) long, hairy, with a plumose tail 15-30 mm (0.6-1.2 in) long."
7.05		
7.06		
7.07	1. Wencai, W et al (1994) Clematis hexapetala. P. 362. In: Wu, Z and Raven, PH (editors). Flora of China. Vol. 6. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. Hu, S-Y (1954) Notes on the Flora of China, III. Journal of the Arnold Arboretum 35: 189-194. 3. Nebraska Statewide Arboretum: Plant Data (http://arboretum.unl.edu/plantsales/). 4. Indian-Herbs-Exporters.com (http://www.indian-herbs-exporters.com/_clematis_hexapetala.html). 5. Grey-Wilson, C (1999) Clematis, The Genus: A	1. "Achenes obovate, 2.5--3.5 x 2--3 mm". 2. "The obovate achenes are 5mm. long, 3.5 mm. wide, compressed, villose, and with a persistent densely villose curved style up to 3.5 cm. long." [description applies to variety <i>longiloba</i>]. 3. "Feathery seedheads" ["feathery likely refers to persistent styles]. 4. "Fruit a head of stalked achenes with long,

	Comprehensive Guide for Gardeners, Horticulturists, and Botanists. Timber Press, Portland, Oregon.	usually feathery styles". 5. "Achenes obovate, 2.5-3.5 mm (0.1-0.18 in) long, hairy, with a plumose tail 15-30 mm (0.6-1.2 in) long." [no evidence of adaptations to external dispersal].
7.08		
8.01		
8.02		
8.03		
8.04		
8.05		