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

Musa sikkimensis			
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	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	y	1
6.03	Hybridizes naturally	y	1
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)	n	-1
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	?	
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			0

Outcome	**Accept**

section	# questions answered	satisfy minimum?
A	11	Yes
B	6	Yes
C	12	Yes
total	29	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%20lgnd.tif). 2. *Musa sikkimensis* (http://www.users.globalnet.co.uk/~drc/msikkimensis.htm). 3. Simmonds, NW (1956) Botanical results of the Banana Collecting Expedition, 1954-5. Kew Bulletin 11(3): 463-489. 4. Noltie, HJ (1994) Flora of Bhutan. Volume 3, Part 1, pp. 177-181. *Musaceae*. Royal Botanic Garden Edinburgh, Edinburgh. 5. Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	1. Global hardiness zones 9-11. 2. Distribution: North-east India, Bhutan; throughout Sikkim on hill slopes. 3. Collected from India and Sikkim. 4. "Bhutan: S - Phuntsholing district (below Ganglakha); C - Tongsa district (above Dakpai); Darjeeling (Sureil; waterfall below Darjeeling, Darjeeling to Peshok (Simmonds, 1957)); Sikkim (Gangtok (Simmonds, 1957)). Middle Hill Forest." 5. "Wild in Sikkim".
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. *Musa sikkimensis* (http://www.users.globalnet.co.uk/~drc/msikkimensis.htm). 3. Simmonds, NW (1956) Botanical results of the Banana Collecting Expedition, 1954-5. Kew Bulletin 11(3): 463-489. 4. Noltie, HJ (1994) Flora of Bhutan. Volume 3, Part 1, pp. 177-181. *Musaceae*. Royal Botanic Garden Edinburgh, Edinburgh. 5. Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	1. One to two climatic regions. 2. Distribution: North-east India, Bhutan; throughout Sikkim on hill slopes. 3. Collected from India and Sikkim. 4. "Bhutan: S - Phuntsholing district (below Ganglakha); C - Tongsa district (above Dakpai); Darjeeling (Sureil; waterfall below Darjeeling, Darjeeling to Peshok (Simmonds, 1957)); Sikkim (Gangtok (Simmonds, 1957)). Middle Hill Forest." 5. "Wild in Sikkim".
2.04	1. Microsoft Encarta World Precipitation and	1. For India: Average annual precipitation

	Average Rainfall (http://uk.encarta.msn.com/encnet/RefPages/RefMedia.aspx?refid=461530746&artrefid=761554737&pn=3&sec=-1). 2. Atlapedia Online (http://www.atlapedia.com/online/countries/bhutan.htm).	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. 2. For Bhutan: "Average annual precipitation varies from 1,020 to 1,520 mm (40 to 60 inches)".
2.05	1. *Musa sikkimensis* (http://www.users.globalnet.co.uk/~drc/msikkimensis.htm). 2. B & T World Seeds (http://www.b-and-t-world-seeds.com/carth.asp?species=Musa%20sikkimensis).	1. "It was introduced into general cultivation in 1998 by Toby Spanner via seed". 2. Seeds sold internationally.
3.01		no evidence
3.02		no evidence
3.03		no evidence
3.04		no evidence
3.05	Holm, L, JV Pancho, JP Herberger, and DL Plucknett (1979) A Geographical Atlas of World Weeds. John Wiley and Sons, New York.	Two congeners are present as weeds in two countries [not enough evidence to be considered weeds].
4.01	Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	no description of these traits
4.02		
4.03	Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	no description of parasitism
4.04		
4.05	Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	no evidence
4.06		
4.07	Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	no evidence
4.08		
4.09		
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	1. Baker, JG (1893). A synopsis of the genera and species of Museae. Annals of Botany 7:	1. Monocarpic shrubs with cylindrical or bottle-shaped trunks, often stoloniferous

	189 - 229. 2. Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	at the base. 2. "Stem tall cylindrical…8-12 ft".
4.12		
5.01		terrestrial
5.02		Musaceae
5.03		Musaceae
5.04	1. Baker, JG (1893). A synopsis of the genera and species of *Museae*. Annals of Botany 7: 189 - 229. 2. Cheesman, EE (1948) Classification of the Bananas: critical notes on species: *Musa nagensium*. Kew Bulletin 3(3): 325-328. 3. Noltie, HJ (1994) Flora of Bhutan. Volume 3, Part 1, pp. 177-181. Musaceae. Royal Botanic Garden Edinburgh, Edinburgh.	1. "Monocarpic shrubs with cylindrical or bottle-shaped trunks, often stoloniferous at the base". 2. "Plants stoloniferous". 3. "Plants not monocarpic, suckering from perennial corms" [genus description - note that this is different from the description of Baker (1893)].
6.01		no evidence
6.02	*Musa sikkimensis* (http://www.users.globalnet.co.uk/~drc/msikkimensis.htm).	"It was introduced into general cultivation in 1998 by Toby Spanner via seed".
6.03	Simmonds, NW and Weatherup, STC (1990) Numerical taxonomy of the wild bananas (*Musa*). New Phytologist 115: 567-571.	"*Musa balbisiana*…had frequently been recorded as crossing naturally with other species (e.g. *acuminata*, *nagensium*, *sikkimensis*, *textilis*)"
6.04		
6.05		
6.06	1. Baker, JG (1893). A synopsis of the genera and species of *Museae*. Annals of Botany 7: 189 - 229. 2. Cheesman, EE (1948) Classification of the Bananas: critical notes on species: *Musa nagensium*. Kew Bulletin 3(3): 325-328. 3. Noltie, HJ (1994) Flora of Bhutan. Volume 3, Part 1, pp. 177-181. Musaceae. Royal Botanic Garden Edinburgh, Edinburgh. 4. Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	1. "Monocarpic shrubs with cylindrical or bottle-shaped trunks, often stoloniferous at the base". 2. "Plants stoloniferous". 3. "Plants not monocarpic, suckering from perennial corms" [genus description - note that this is different from the description of Baker (1893)]. 4. "Stoloniferous".
6.07		
7.01		Large fruit/seed, no means of attachment, not growing in pastures, etc.
7.02	1. *Musa sikkimensis* (http://www.users.globalnet.co.uk/~drc/msikkimensis.htm). 2. B & T World Seeds (http://www.b-and-t-world-	1. "It was introduced into general cultivation in 1998 by Toby Spanner via seed". 2. Seeds sold internationally.

	seeds.com/carth.asp?species=Musa%20sikkimensis).	
7.03		no evidence
7.04	1. Simmonds, NW (1956) Botanical results of the Banana Collecting Expedition, 1954-5. Kew Bulletin 11(3): 463-489. 2. Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	1. "Fruits…massive, angular, 11 × 4 cm…enclosing a mass of large seeds…seeds sharply angular, smooth, 6-10 mm. wide × 5-6 mm. deep". 2. "Fruit oblong…2-3 in. in the wild form, and full of seed"; "seeds brownish-black, rugose, 1/6 in. diam." [no evidence of adaptations to wind dispersal].
7.05		
7.06	Simmonds, NW (1956) Botanical results of the Banana Collecting Expedition, 1954-5. Kew Bulletin 11(3): 463-489.	"Fruits…massive, angular, 11 × 4 cm…enclosing a mass of large seeds…seeds sharply angular, smooth, 6-10 mm. wide × 5-6 mm. deep".
7.07	1. Simmonds, NW (1956) Botanical results of the Banana Collecting Expedition, 1954-5. Kew Bulletin 11(3): 463-489. 2. Hooker JB (1875) The Flora of British India. London: L. Reeve and Co.	1. "Fruits…massive, angular, 11 x 4 cm…enclosing a mass of large seeds…seeds sharply angular, smooth, 6-10 mm. wide x 5-6 mm. deep". 2. "Fruit oblong…2-3 in. in the wild form, and full of seed"; "seeds brownish-black, rugose, 1/6 in. diam." [no evidence of adaptations to external dispersal].
7.08	Simmonds, NW (1956) Botanical results of the Banana Collecting Expedition, 1954-5. Kew Bulletin 11(3): 463-489.	"Fruits…massive, angular, 11 × 4 cm…enclosing a mass of large seeds…seeds sharply angular, smooth, 6-10 mm. wide × 5-6 mm. deep".
8.01	1. Baker, JG (1893). A synopsis of the genera and species of *Museae*. Annals of Botany 7: 189 - 229. 2. Noltie, HJ (1994) Flora of Bhutan. Volume 3, Part 1, pp. 177-181. Musaceae. Royal Botanic Garden Edinburgh, Edinburgh.	1. "Monocarpic shrubs with cylindrical or bottle-shaped trunks, often stoloniferous at the base". 2. "Plants not monocarpic, suckering from perennial corms" [genus description - note that this is different from the description of Baker (1893)] [if definitely monocarpic, seed production per year must be low, so answer "no"].
8.02		
8.03		
8.04		
8.05		