

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>Grewia flavescens</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	n	-1
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	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	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	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)	y	1
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
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section	# questions answered	satisfy minimum?
A	11	Yes
B	8	Yes
C	11	Yes
total	30	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%20lgnd.tif). 2. Hutchinson J and Dalziel JM (1927) Flora of West Tropical Africa. Volume 1, Part 1. London: The Crown Agents for the Colonies. 3. 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?101664).</p>	<p>1. Global hardiness zones 9-13. 2. "from Mauritania throughout tropical Africa to India" 3. East Tropical Africa: Kenya; Tanzania; Uganda; West-Central Tropical Africa: Burundi; Rwanda; South Tropical Africa: Malawi; Mozambique; Zambia; Southern Africa: Botswana; Namibia; South Africa - Natal, Transvaal; Swaziland; Indian Subcontinent: India [s. & c.] [tropical]</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. Hutchinson J and Dalziel JM (1927) Flora of West Tropical Africa. Volume 1, Part 1. London: The Crown Agents for the Colonies. 3. 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?101664).</p>	<p>1. 3 climatic regions. 2. "from Mauritania throughout tropical Africa to India". 3. East Tropical Africa: Kenya; Tanzania; Uganda; West-Central Tropical Africa: Burundi; Rwanda; South Tropical Africa: Malawi; Mozambique; Zambia; Southern Africa: Botswana; Namibia; South Africa - Natal, Transvaal; Swaziland; Indian Subcontinent: India [s. & c.] [at least 3 biomes]</p>
2.04	<p>1. Atlapedia Online (http://www.atlapedia.com/online/countries/). 2. 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 Kenya: "Over 70% of the country is arid receiving less than 510 mm (20 inches) of annual precipitation while rainfall is greatest in the highlands."; For Tanzania: "Around 50% of the country receives an annual precipitation of 760 mm (30 inches) with the maximum being 2,540 mm (100 inches) at Lake Nyasa and the minimum, 510 mm (20 inches) on the Central Plateau."; For Uganda: "The areas of Lake Victoria as</p>

		<p>well as the west and southwest mountains receive the highest amount of rainfall with an annual average precipitation exceeding 1,500 mm (60 inches) whereas the areas in the center or northeast receive less than 1,000 mm (39 inches) annually."; For Malawi: "Average annual precipitation is 740 mm (29 inches)."; For Mozambique: "Annual precipitation varies from 500 to 900 mm (20 to 35 inches) depending on the region with an average of 590 mm (23 inches)."; For Zambia: "Average annual precipitation varies between 1,000 mm and 1,400 mm (40 and 50 inches) in the north decreasing to 510 mm (21 inches) in the south."; For South Africa: "Average annual precipitation varies from 400 mm (16 inches) in the east to less than 50 mm (2 inches) in the northwest coastal regions. Average annual precipitation in Cape Town is 510 mm (20 inches)." 2. For Burundi: average annual precipitation is between 20 inches/year and 60 inches/year; For Rwanda: average annual precipitation is between 20 inches/year and 60 inches/year; 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; For Botswana: average annual precipitation ranges from under 10 inches/year to 40 inches/year; For Namibia: average annual precipitation ranges from under 10 inches/year to 20 inches/year.</p>
2.05	<p>1. B & T World Seeds (http://www.b-and-t-world-seeds.com/carth.asp?species=Grewia%20flavescens%20v%20flavescens&sref=21872)</p> <p>2. Tradewinds Fruit (http://www.tradewindsfruit.com/order_fruit_f_o.htm).</p>	<p>1. Seeds sold internationally. 2. Seeds sold from a California company.</p>
3.01		no evidence
3.02		no evidence
3.03		no evidence

3.04		no evidence
3.05		no evidence
4.01	Hutchinson J and Dalziel JM (1927) Flora of West Tropical Africa. Volume 1, Part 1. London: The Crown Agents for the Colonies.	no description of these traits
4.02		
4.03	Hutchinson J and Dalziel JM (1927) Flora of West Tropical Africa. Volume 1, Part 1. London: The Crown Agents for the Colonies.	no description of parasitism
4.04	<p>1. Sanon HO, Kabore-Zoungrana C, and Ledin I (2007) Behaviour of goats, sheep and cattle and their selection of browse species on natural pasture in a Sahelian area. <i>Small Ruminant Research</i> 67: 64-74.</p> <p>2. Strohbach B (2000) Vegetation Degradation trends in the northern Oshikoto Region: IV. The Broad-leafed savannas with associated pans. <i>Dinteria</i> 26: 93-112.</p> <p>3. Holdo RM (2003) Woody plant damage by African elephants in relation to leaf nutrients in western Zimbabwe. <i>Journal of Tropical Ecology</i> 19: 189-196.</p> <p>4. Arbonnier M (2004) Translation of 2nd ed. of: Arbres, arbustes et lianas des zones seches d'Afrique de l'Ouest. Montpellier : CIRAD. [passage available online at http://books.google.com/books?id=fhlo3Dfz-l0C&pg=PA498&lpq=PA498&dq=grewia+flavescens&source=web&ots=Vy8ViZz9TU&sig=TA8INseJPWuReO-FPIDsLfhnl8]</p>	<p>1. an important browse species of cattle, sheep, and goats [although research shows mostly goats] 2. listed as a browse species 3. Eaten by elephants. 4. "Leaves liked by cattle, only in the north of the distribution area".</p>
4.05	<p>1. Sanon HO, Kabore-Zoungrana C, and Ledin I (2007) Behaviour of goats, sheep and cattle and their selection of browse species on natural pasture in a Sahelian area. <i>Small Ruminant Research</i> 67: 64-74.</p> <p>2. Holdo RM (2003) Woody plant damage by African elephants in relation to leaf nutrients in western Zimbabwe. <i>Journal of Tropical Ecology</i> 19: 189-196.</p> <p>3. Arbonnier M (2004) Translation of 2nd ed. of: Arbres, arbustes et lianas des zones seches d'Afrique de l'Ouest. Montpellier : CIRAD.</p>	<p>1. An important browse species of cattle, sheep, and goats. 2. Listed as a browse species. 3. Eaten by elephants. 4. "Leaves liked by cattle, only in the north of the distribution area". [no evidence of toxicity]</p>

	[passage available online at http://books.google.com/books?id=fhlo3Dfz-l0C&pg=PA498&lpg=PA498&dq=grewia+flavescens&source=web&ots=Vy8ViZz9TU&sig=TA8lNseJPWuReO-FPIDsLfhnl8]	
4.06		
4.07	1. Leger, S (1997) The Hidden Gifts of Nature. Namibia: ded, German Development Service (http://www.sigridleger.de/book/index.html?/book/plants/pl_055.html) accessed 11/26/2007. 2. Sanon HO, Kabore-Zoungrana C, and Ledin I (2007) Behaviour of goats, sheep and cattle and their selection of browse species on natural pasture in a Sahelian area. Small Ruminant Research 67: 64-74.	1. "Fruits are eaten raw or they are mashed together with water and eaten as a porridge". 2. Listed as an edible plant for human consumption. [no evidence of toxicity].
4.08		
4.09		
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. Du Puy DJ, Labat JN, Rabevohitra R, Villiers JF, Bosser J, and Moat J (2002) The Leguminosae of Madagascar. London: Royal Botanic Gardens, Kew.	1. Kenya: mostly entisols and aridisols with some ultisols and inceptisols, and a small amount of alfisols (also with a small amount of oxisols and andisols); Tanzania: mostly ultisols with some alfisols and inceptisols and a small amount of entisols (also with a small amount of oxisols and andisols); Uganda: almost entirely oxisols and inceptisols with very small amounts of alfisols and ultisols; Burundi: almost entirely oxisols with a very small amount of ultisols; Rwanda: mostly ultisols with some oxisols; Malawi: mostly oxisols and alfisols with a small amount of inceptisols and ultisols; Mozambique: mostly alfisols with some entisols and oxisols, a small amount of inceptisols and aridisols, and a very small amount of ultisols (also a small amount of the "shifting sands" soil order type); Zambia: mostly oxisols with some alfisols, entisols, inceptisols, and ultisols (also a small amount of the shifting sands soil order type); Botswana: mostly "shifting sands" with some entisols, a small amount of alfisols, and a very small amount of inceptisols; Namibia: mostly aridisols and entisols with some alfisols, inceptisols, and ultisols (also with some of the shifting sands soil order type); South Africa (approximation

		of soil order type by state): Natal (Kwazulu-Natal): mostly alfisols with some oxisols and ultisols and a very small amount of inceptisols; Transvaal: mostly alfisols with some aridisols, entisols, and ultisols and a small amount of inceptisols (also with a very small amount of oxisols); Swaziland: mostly alfisols with some oxisols and a very small amount of aridisols, ultisols, and inceptisols; India (central): Central India is almost entirely alfisols, inceptisols, and ultisols; India (south): Southern India is mostly alfisols and ultisols with a small amount of inceptisols and entisols. 2. grows "mainly on sand but also on limestone"
4.11	1. Leger S (1997) The Hidden Gifts of Nature. Namibia: ded, German Development Service (http://www.sigridleger.de/book/index.html?book/plants/pl_055.html) accessed 11/26/2007. 2. Hutchinson, J and Dalziel, JM (1958) Flora of West Tropical Africa. Volume 1. Part 2. Crown Agents for Oversea Governments and Administrations, London.	1. Shrub up to 2m tall. 2. "A savannah shrub".
4.12	Du Puy DJ, Labat JN, Rabevohitra R, Villiers JF, Bossier J, and Moat J (2002) The Leguminosae of Madagascar. London: Royal Botanic Gardens, Kew.	"A deciduous, umbrella-shaped tree 3-10 m tall...trunk swollen, cigar-shaped, up to c. 80 cm in diameter".
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?101664).	Tiliaceae
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-	Tiliaceae

	bin/npgs/html/taxon.pl?101664).	
5.04	1. Leger S (1997) The Hidden Gifts of Nature. Namibia: ded, German Development Service (http://www.sigridleger.de/book/index.html?/book/plants/pl_055.html) accessed 11/26/2007. 2. Hutchinson, J and Dalziel, JM (1958) Flora of West Tropical Africa. Volume 1. Part 2. Crown Agents for Oversea Governments and Administrations, London.	1. Shrub up to 2m tall. 2. "A savannah shrub".
6.01		no evidence
6.02	Kew Gardens Seed Information Database (http://data.kew.org/sid/SidServlet?ID=8173&Num=1dr).	80-90% germination.
6.03		
6.04		
6.05		
6.06		
6.07		
7.01		
7.02	1. B & T World Seeds (http://www.b-and-t-world-seeds.com/carth.asp?species=Grewia%20flavescens%20v%20flavescens&sref=21872) . 2. Tradewinds Fruit (http://www.tradewindsfruit.com/order_fruit_f_o.htm).	1. Seeds sold internationally. 2. Seeds sold from a California company.
7.03		no evidence
7.04	Du Puy DJ, Labat JN, Raveohitra R, Villiers JF, Bosser J, and Moat J (2002) The Leguminosae of Madagascar. London: Royal Botanic Gardens, Kew.	Pods usually long and slender...the surface eventually cracking and falling off in small flakes, containing (14 -)18-23 seeds. Seeds ellipsoid. [no evidence of adaptations to wind dispersal]
7.05		
7.06		
7.07	Du Puy DJ, Labat JN, Raveohitra R, Villiers JF, Bosser J, and Moat J (2002) The Leguminosae of Madagascar. London: Royal Botanic Gardens, Kew.	"Pods usually long and slender...the surface eventually cracking and falling off in small flakes, containing (14 -)18-23 seeds. Seeds ellipsoid". [no evidence of adaptations to external dispersal]
7.08	Dudley J (1999) Seed dispersal by elephants in semiarid woodland habitats of	Seeds recovered from elephant dung in

	Hwange National Park, Zimbabwe. Biotropica 32(3): 556-561.	Hwange National Park, Zimbabwe.
8.01		
8.02		
8.03		
8.04		
8.05		