

Australia/New Zealand Weed Risk Assessment adapted for the U.S. (Gordon and Gantz 2008)

Data used for analysis published in: Gordon, D.R., K.J. Tancig, D.A. Onderdonk and C.A. Gantz. In press. Assessing the invasive potential of biofuel species proposed for Florida and the U.S. using the Australian weed risk assessment. *Biomass and Bioenergy*. doi:10.1016/j.biombioe.2010.08.029.

<i>Arundo donax—U.S. test</i>			
	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 Florida's USDA climate 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 habitats with mean annual precipitation 40-70 inches.	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	2
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	n	0
3.04	Environmental weed	y	4
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	n	0
4.07	Causes allergies or is otherwise toxic to humans	n	0
4.08	Creates a fire hazard in natural ecosystems	y	1
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils).	y	1
4.11	Climbing or smothering growth habit	n	0

4.12	Forms dense thickets	y	1
5.01	Aquatic	n	0
5.02	Grass	y	1
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	n	-1
6.03	Hybridizes naturally	n	-1
6.04	Self-compatible or apomictic	n	-1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	1
6.07	Minimum generative time (years)	1	1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y	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	y	1
7.06	Propagules bird dispersed	n	-1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	n	-1
8.01	Prolific seed production	n	-1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	n	-1
8.03	Well controlled by herbicides	n	1
8.04	Tolerates, or benefits from, mutilation or cultivation	y	1
8.05	Effective natural enemies present in Florida, or east of the continental divide		
Total Score			11

Outcome	Reject
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section	# questions answered	satisfy minimum?
A	11	yes
B	10	yes
C	23	yes
total	44	yes

Data collected 2008

Question number	Reference	Source data
1.01		Cultivated, but no evidence of selection for reduced weediness.
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%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?4439). 3. Bell, G.P. 1997. Ecology and Management of <i>Arundo donax</i> , and approaches to riparian habitat restoration in southern California. In: Brock, J.H., Wade, M., Pysek, P. and Green, D. (Editors). Plant Invasions: studies from North America and Europe. Backhuys Publishers, Leiden, pp. 103-113. 4. Tsvelev, N.N. 1976. Grasses of the Soviet Union [Zlaki SSSR]. Part II. Fedorov, A.A. (Editor-in-Chief). Translated from Russian. Published for the Smithsonian Institution Libraries, and the National Science Foundation, Washington, D.C., by Amerind Publishing Co. Pvt. Ltd., New Delhi, 1983. 5. Weber, E. 2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K. 6. Dudley, T.,	1. Global plant hardiness zones 6-12 are represented in the distribution range of the species. 2. "Native: Africa: Northern Africa: Algeria; Egypt; Libya; Tunisia; Asia-Temperate: Arabian Peninsula: Saudi Arabia; Western Asia: Afghanistan; Cyprus; Iran; Iraq; Israel; Jordan; Lebanon; Syria; Turkey; Caucasus: Azerbaijan; Georgia; Middle Asia: Turkmenistan; Uzbekistan; China; Eastern Asia: Japan; Taiwan; Asia-Tropical: Indian Subcontinent: India; Nepal; Pakistan; Indo-China: Indochina; Myanmar; Europe: East Europe: Ukraine - Krym [s.]; Other: cultivated elsewhere, naturalized in s. Europe, British Isles, Africa, Australia, New Zealand, w. United States & Hawaii, Mexico, West Indies, s. South America, & Macaronesia". 3. "This species is believed to be native to freshwaters of eastern Asia (Polunin and Huxley 1987)...". 4. "European part: Crimea (southern); Caucasus: western and eastern Transcaucasia, Talysh; Central Asia: Aral-Caspian (southern), Kyzylkum, Syr Darya, Amu Darya,

	<p>Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>Gissar-Darvaz, Turkmenia (mountains). Outside the USSR: Mediterranean, Asia Minor, Iran, Himalayas, Japan, China (southern part), South Asia, Africa (northern part), introduced or adventive in many other tropical and subtropical countries." 5. Listed as "Introduced, e.g. not native to the area, but not invasive in natural areas" in the British Isles, North Africa, Mexico, the Caribbean, Chile, Argentina, Cape Verde, the Canary and Madeira Islands, and Hawaii. Listed as "invasive in natural areas and not native to the area" in southern Europe, southern Africa, Australia, New Zealand, the western U.S., and the Azores. 6. "Native range: Considered native to the Indian sub-continent. Known introduced range: <i>Arundo donax</i> now occurs worldwide in tropical to warm-temperate regions, including tropical islands. It is present in the Federated States of Micronesia (Pohnpei), Guam (rare per Stone, 1970), Republic of Palau (Koror), Fiji, Hawaii, Nauru, New Caledonia, Norfolk Island and Samoa, as well as Christmas Island in the Indian Ocean."; "Alien Range: Australia; Bermuda; Cayman Islands; Cook Islands; Dominican Republic; Fiji; Gibraltar; Guam; Haiti; Kiribati; Mexico; Micronesia; Nauru; New Caledonia (Nouvelle Calédonie); New Zealand; Norfolk Island; Palau; Samoa; South Africa: Swaziland; Tonga; United States (USA); Venezuela; Native Range: India".</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-bin/npgs/html/taxon.pl?4439). 3. Bell, G.P. 1997. Ecology and Management of <i>Arundo donax</i>, and approaches to riparian habitat</p>	<p>1. At least 3 climate groups (B-D) are represented in the distribution range of the species. 2. "Native: Africa: Northern Africa: Algeria; Egypt; Libya; Tunisia; Asia-Temperate: Arabian Peninsula: Saudi Arabia; Western Asia: Afghanistan; Cyprus; Iran; Iraq; Israel; Jordan; Lebanon; Syria; Turkey; Caucasus: Azerbaijan; Georgia; Middle Asia: Turkmenistan; Uzbekistan; China; Eastern Asia: Japan; Taiwan; Asia-</p>

<p>restoration in southern California. In: Brock, J.H., Wade, M., Pysek, P. and Green, D. (Editors). <i>Plant Invasions: studies from North America and Europe</i>. Backhuys Publishers, Leiden, pp. 103-113. 4. Tsvelev, N.N. 1976. <i>Grasses of the Soviet Union [Zlaki SSSR]</i>. Part II. Fedorov, A.A. (Editor-in-Chief). Translated from Russian. Published for the Smithsonian Institution Libraries, and the National Science Foundation, Washington, D.C., by Amerind Publishing Co. Pvt. Ltd., New Delhi, 1983. 5. Weber, E. 2003. <i>Invasive Plant Species of the World: A Reference Guide to Environmental Weeds</i>. CABI Publishing, U.K. 6. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>Tropical: Indian Subcontinent: India; Nepal; Pakistan; Indo-China: Indochina; Myanmar; Europe: East Europe: Ukraine - Krym [s.]; Other: cultivated elsewhere, naturalized in s. Europe, British Isles, Africa, Australia, New Zealand, w. United States & Hawaii, Mexico, West Indies, s. South America, & Macaronesia". 3. "This species is believed to be native to freshwaters of eastern Asia (Polunin and Huxley 1987)...". 4. "European part: Crimea (southern); Caucasus: western and eastern Transcaucasia, Talysh; Central Asia: Aral-Caspian (southern), Kyzylkum, Syr Darya, Amu Darya, Gissar-Darvaz, Turkmenia (mountains). Outside the USSR: Mediterranean, Asia Minor, Iran, Himalayas, Japan, China (southern part), South Asia, Africa (northern part), introduced or adventive in many other tropical and subtropical countries." 5. Listed as "Introduced, e.g. not native to the area, but not invasive in natural areas" in the British Isles, North Africa, Mexico, the Caribbean, Chile, Argentina, Cape Verde, the Canary and Madeira Islands, and Hawaii. Listed as "invasive in natural areas and not native to the area" in southern Europe, southern Africa, Australia, New Zealand, the western U.S., and the Azores. 6. "Native range: Considered native to the Indian sub-continent. Known introduced range: <i>Arundo donax</i> now occurs worldwide in tropical to warm-temperate regions, including tropical islands. It is present in the Federated States of Micronesia (Pohnpei), Guam (rare per Stone, 1970), Republic of Palau (Koror), Fiji, Hawaii, Nauru, New Caledonia, Norfolk Island and Samoa, as well as Christmas Island in the Indian Ocean."; "Alien Range: Australia; Bermuda; Cayman Islands; Cook Islands; Dominican Republic; Fiji; Gibraltar; Guam; Haiti; Kiribati; Mexico; Micronesia; Nauru; New Caledonia (Nouvelle Calédonie); New Zealand;</p>
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		Norfolk Island; Palau; Samoa; South Africa: Swaziland; Tonga; United States (USA); Venezuela; Native Range: India".
2.04	DiTomaso, Joseph M. 1998. Biology and ecology of giant reed. In: Bell, Carl E., ed. In: <i>Arundo</i> and saltcedar: the deadly duo: Proceedings of a workshop on combating the threat from arundo and saltcedar; 1998 June 17; Ontario, CA. Holtville, CA: University of California, Cooperative Extension: 1-5.	" <i>Arundo</i> survives in areas with average annual precipitation of 3 to 40 dm...". [~11.8 - 157.5 inches]
2.05	1. Bell, G.P. 1997. Ecology and Management of <i>Arundo donax</i> , and approaches to riparian habitat restoration in southern California. In: Brock, J.H., Wade, M., Pysek, P. and Green, D. (Editors). <i>Plant Invasions: studies from North America and Europe</i> . Backhuys Publishers, Leiden, pp. 103-113. 2. Tsvelev, N.N. 1976. <i>Grasses of the Soviet Union [Zlaki SSSR]. Part II</i> . Fedorov, A.A. (Editor-in-Chief). Translated from Russian. Published for the Smithsonian Institution Libraries, and the National Science Foundation, Washington, D.C., by Amerind Publishing Co. Pvt. Ltd., New Delhi, 1983. 3. Weber, E. 2003. <i>Invasive Plant Species of the World: A Reference Guide to Environmental Weeds</i> . CABI Publishing, U.K. 4. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and Impact on Environment and Development</i> . James & James (Science Publishers) Ltd., London. 5. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i> . Agricultural Research Council, South Africa.	1. "This species is believed to be native to freshwaters of eastern Asia (Polunin and Huxley 1987), but has been cultivated throughout Asia, southern Europe, north Africa, and the Middle East for thousands of years and has been planted widely in North and South America and Australasia in the past century (Perdue 1958, Zohary 1962)." 2. "Stems of <i>Arundo donax</i> are widely used not only as construction material for temporary structures, roofs and fences, but as raw materials for cellulose in the paper industry. In addition, this species is a good stabilizer for different kinds of embankments, dams and eroded sands (in shallow ground water conditions) and has significant ornamental value." 3. "CU [Commercial Use]: Ornamental, fibre". 4. "...being one of the most productive among the biomass crops currently cultivated in Europe...". 5. "Cultivated for: Ornament, screening."
3.01	1. Tsvelev, N.N. 1976. <i>Grasses of the Soviet Union [Zlaki SSSR]. Part II</i> . Fedorov, A.A. (Editor-in-Chief). Translated from Russian. Published for the Smithsonian Institution Libraries, and the National Science Foundation, Washington, D.C., by Amerind Publishing Co. Pvt. Ltd., New Delhi, 1983. 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?4439). 3. Weber, E.	1. "European part: Crimea (southern); Caucasus: western and eastern Transcaucasia, Talysh; Central Asia: Aral-Caspian (southern), Kyzylkum, Syr Darya, Amu Darya, Gissar-Darvaz, Turkmenia (mountains). Outside the USSR: Mediterranean, Asia Minor, Iran, Himalayas, Japan, China (southern part), South Asia, Africa (northern part), introduced or adventive in many other tropical and subtropical countries." 2. "Native: Africa: Northern Africa: Algeria; Egypt; Libya; Tunisia; Asia-Temperate:

	<p>2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>Arabian Peninsula: Saudi Arabia; Western Asia: Afghanistan; Cyprus; Iran; Iraq; Israel; Jordan; Lebanon; Syria; Turkey; Caucasus: Azerbaijan; Georgia; Middle Asia: Turkmenistan; Uzbekistan; China; Eastern Asia: Japan; Taiwan; Asia-Tropical: Indian Subcontinent: India; Nepal; Pakistan; Indo-China: Indochina; Myanmar; Europe: East Europe: Ukraine - Krym [s.]; Other: cultivated elsewhere, naturalized in s. Europe, British Isles, Africa, Australia, New Zealand, w. United States & Hawaii, Mexico, West Indies, s. South America, & Macaronesia". 3. Listed as "Introduced, e.g. not native to the area, but not invasive in natural areas" in the British Isles, North Africa, Mexico, the Caribbean, Chile, Argentina, Cape Verde, the Canary and Madeira Islands, and Hawaii. Listed as "invasive in natural areas and not native to the area" in southern Europe, southern Africa, Australia, New Zealand, the western U.S., and the Azores. 4. "Native range: Considered native to the Indian sub-continent. Known introduced range: <i>Arundo donax</i> now occurs worldwide in tropical to warm-temperate regions, including tropical islands. It is present in the Federated States of Micronesia (Pohnpei), Guam (rare per Stone, 1970), Republic of Palau (Koror), Fiji, Hawaii, Nauru, New Caledonia, Norfolk Island and Samoa, as well as Christmas Island in the Indian Ocean."; "Alien Range: Australia; Bermuda; Cayman Islands; Cook Islands; Dominican Republic; Fiji; Gibraltar; Guam; Haiti; Kiribati; Mexico; Micronesia; Nauru; New Caledonia (Nouvelle Calédonie); New Zealand; Norfolk Island; Palau; Samoa; South Africa: Swaziland; Tonga; United States (USA); Venezuela; Native Range: India".</p>
3.02	<p>1. Henderson, L. 1999. Alien Weeds and Invasive Plants. Agricultural Research Council, South Africa. 2. El Bassam, N. 1998. Energy Plant Species: Their Use and Impact on Environment and Development. James & James</p>	<p>1. "Invades: Watercourses; unlike indigenous reeds often occurs on roadsides and other sites away from water." 2. "However, it is also found in relatively dry and infertile soils, at field</p>

	(Science Publishers) Ltd., London. 3. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i> . Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].	borders, on field ridges or on roadsides, where it grows successfully." 3. "Occurs in: agricultural areas, coastland, desert, natural forests, planted forests, range/grasslands, riparian zones, ruderal/disturbed, scrub/shrublands, urban areas".
3.03	Holm, L. et al. 1979. <i>A Geographical Atlas of World Weeds</i> . John Wiley & Sons, New York.	Listed as a common weed in Iran and Spain (not enough evidence to be considered a weed).
3.04	1. Biosecurity New Zealand. 2009. Giant Reed. <i>Arundo donax</i> . Available online at http://www.biosecurity.govt.nz/pests/giant-reed . 2. Milton, S.J. 2004. Grasses as invasive alien plants in South Africa. <i>South African Journal of Science</i> 100: 69-75. 3. Weber, E. 2003. <i>Invasive Plant Species of the World: A Reference Guide to Environmental Weeds</i> . CABI Publishing, U.K. 4. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i> . Agricultural Research Council, South Africa.	1. "This grass forms tall dense clumps, usually on wasteland, but is a potential weed of river and stream margins that can block waterways, promoting flooding. It provides a habitat for rats and possums, and poses a fire risk." 2. "Fig. 1. [Photo]. A dense stand of Spanish reed (<i>Arundo donax</i>) in the Huis River, between Oudtshoorn and Calizdorp in the Little Karoo. Such stands can change hydrological processes and may increase transpiration." 3. "Invaded Habitats: Floodplains, riparian habitats, damp places."; Listed as being invasive in natural areas in Southern Europe, Southern Africa, Australia, New Zealand and the Azores. 4. "Invades: Watercourses; unlike indigenous reeds often occurs on roadsides and other sites away from water."; "Invasive status: Transformer. Declared weed."
3.05		no evidence
4.01	Tsvelev, N.N. 1976. <i>Grasses of the Soviet Union [Zlaki SSSR]. Part II</i> . Fedorov, A.A. (Editor-in-Chief). Translated from Russian. Published for the Smithsonian Institution Libraries, and the National Science Foundation, Washington, D.C., by Amerind Publishing Co. Pvt. Ltd., New Delhi, 1983.	no description of these traits
4.02		
4.03	Tsvelev, N.N. 1976. <i>Grasses of the Soviet Union [Zlaki SSSR]. Part II</i> . Fedorov, A.A. (Editor-in-Chief). Translated from Russian.	no description of parasitism

	Published for the Smithsonian Institution Libraries, and the National Science Foundation, Washington, D.C., by Amerind Publishing Co. Pvt. Ltd., New Delhi, 1983.	
4.04	Bor, N.L. 1960. The Grasses of Burma, Ceylon, India and Pakistan (Excluding Bambuseae). Pergamon Press, New York.	"As a fodder grass it is not of much account, but cattle will browse upon the young leaves."
4.05	Bor, N.L. 1960. The Grasses of Burma, Ceylon, India and Pakistan (Excluding Bambuseae). Pergamon Press, New York.	"As a fodder grass it is not of much account, but cattle will browse upon the young leaves." [and no other evidence of toxicity]
4.06	El Bassam, N. 1998. Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd., London.	"Giant reed is one of the most pest resistant plants. So far, no diseases have been reported or observed. Occasionally during the early growth stages of the new sprouts, while they are still in a succulent condition, they may be attacked by <i>Sesamia</i> spp. and die. However, very soon new sprouts appear from the rhizome buds and replace the damaged ones."
4.07	Perdue, R.E. 1958. <i>Arundo donax</i> - Source of Musical Reeds and Industrial Cellulose. Economic Botany 12: 368-404.	"Medicinally the rhizome has been used as a sudorific, a diuretic, and as an antilactant and in the treatment of dropsy...". [and no other evidence of toxicity]
4.08	1. Biosecurity New Zealand. 2009. Giant Reed. <i>Arundo donax</i> . Available online at http://www.biosecurity.govt.nz/pests/giant-reed . 2. Weber, E. 2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K. 3. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i> . Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].	1. "This grass forms tall dense clumps, usually on wasteland, but is a potential weed of river and stream margins that can block waterways, promoting flooding. It provides a habitat for rats and possums, and poses a fire risk." 2. "Dead shoots are highly flammable and the grass resprouts quickly after burning." 3. "The giant reed also promotes wildfire..."
4.09	Floridata (http://www.floridata.com/ref/A/arun_don.cfm).	"Light: Full sun."
4.10	USDA, National Resources Conservation Services (NRCS), Soil Survey Division, World	All of the soil order types except gelisols occur in the distribution range of this

	Soil Resources (http://soils.usda.gov/use/worldsoils/mapindex/order.html).	species.
4.11	1. Migahid, A.M. 1988. Flora of Saudi Arabia. 3rd Edition. Volume III. Monocotyledons. Hydrocharitaceae to Orchidaceae. King Saud University, Riyadh, Saudi Arabia. 2. Feinbrun-Dothan, N. 1986. Flora Palaestina. Part 4, Text. Alismataceae to Orchidaceae. The Israel Academy of Sciences and Humanities, Jerusalem. 3. Weber, E. 2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K.	1. "A perennial grass with woody rhizomes swollen here and there and with very stout erect culms up to 4 m or more in height...". 2. "Perennial, 3-6 m." 3. "A large grass ranging in height from 2-9 m and growing in many-stemmed tussocks." [no evidence of a climbing or smothering growth habit]
4.12	1. Biosecurity New Zealand. 2009. Giant Reed. <i>Arundo donax</i> . Available online at http://www.biosecurity.govt.nz/pests/giant-reed . 2. Weber, E. 2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K. 3. El Bassam, N. 1998. Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd., London. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i> . Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].	1. "This grass forms tall dense clumps, usually on wasteland, but is a potential weed of river and stream margins that can block waterways, promoting flooding. It provides a habitat for rats and possums, and poses a fire risk." 2. "The plant forms species poor clones that may cover hundreds of acres...". 3. "It is a very aggressive plant, suppressing any other vegetation under its canopy."; "Natural populations are usually very dense: more than 50 stems per m2 is quite common." 4. "Once established, it can form huge clones, sometimes covering hundreds of acres."
5.01		Terrestrial
5.02	1. 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?4439). 2. Weber, E. 2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K. 3. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i> . Available from: http://www.issg.org/database/species/ecology.a	1. Poaceae. 2. "A large grass ranging in height from 2-9 m...". 3. " <i>Arundo donax</i> is a large statured clump-forming grass, 3-10 metres tall with many stems from a shallow, horizontal rhizome."

	sp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].	
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?4439).	Poaceae
5.04	1. Feinbrun-Dothan, N. 1986. Flora Palaestina. Part 4, Text. Alismataceae to Orchidaceae. The Israel Academy of Sciences and Humanities, Jerusalem. 2. Weber, E. 2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K.	1. "Rhizome creeping, with tuber-like swellings." 2. "The grass spreads from horizontal rootstocks." [does not produce corms, bulbs or tubers]
6.01		no evidence
6.02	1. Perdue, R.E. 1958. Arundo donax - Source of Musical Reeds and Industrial Cellulose. Economic Botany 12: 368-404. 2. Henderson, L. 1999. Alien Weeds and Invasive Plants. Agricultural Research Council, South Africa. 3. El Bassam, N. 1998. Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd., London. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. Arundo donax. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].	1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual reproduction known outside indigenous distribution."
6.03	1. Perdue, R.E. 1958. Arundo donax - Source of Musical Reeds and Industrial Cellulose. Economic Botany 12: 368-404. 2. Henderson, L. 1999. Alien Weeds and Invasive Plants. Agricultural Research Council, South Africa. 3. El Bassam, N. 1998. Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd., London. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. Arundo donax. Available from:	1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual reproduction known outside indigenous distribution."

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6.04	<p>1. Perdue, R.E. 1958. <i>Arundo donax</i> - Source of Musical Reeds and Industrial Cellulose. <i>Economic Botany</i> 12: 368-404.</p> <p>2. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i>. Agricultural Research Council, South Africa.</p> <p>3. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and Impact on Environment and Development</i>. James & James (Science Publishers) Ltd., London.</p> <p>4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual reproduction known outside indigenous distribution."</p>
6.05	<p>Starr, F., Starr, K. and Loope, L. 2003. <i>Arundo donax</i>. Giant reed. Poaceae. Available online at http://www.hear.org/Pier/pdf/pohreports/arundo_donax.pdf.</p>	<p>"Pollination: Uncertain, probably wind pollinated."</p>
6.06	<p>1. Bell, G.P. 1997. Ecology and Management of <i>Arundo donax</i>, and approaches to riparian habitat restoration in southern California. In: Brock, J.H., Wade, M., Pysek, P. and Green, D. (Editors). <i>Plant Invasions: studies from North America and Europe</i>. Backhuys Publishers, Leiden, pp. 103-113.</p> <p>2. Feinbrun-Dothan, N. 1986. <i>Flora Palaestina</i>. Part 4, Text. Alismataceae to Orchidaceae. The Israel Academy of Sciences and Humanities, Jerusalem.</p> <p>3. Weber, E. 2003. <i>Invasive Plant Species of the World: A Reference Guide to Environmental Weeds</i>. CABI Publishing, U.K.</p> <p>4. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i>. Agricultural Research Council, South Africa.</p> <p>5. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed</p>	<p>1. "<i>Arundo donax</i> is well adapted to the high disturbance dynamics of riparian systems as it spreads vegetatively." 2. "Rhizome creeping, with tuber-like swellings." 3. "...spreads mainly by stem and rhizome fragments..."; "Even small rhizome fragments can regrow and form new plants...". 4. "Large, robust reed 2-6 m high...spreading from horizontal rootstocks." 5. "Asexual reproduction through lateral extension of rhizomes, and flow dislodgement of rhizomes and transport to deposition sites downstream."</p>

	1st July 2009].	
6.07	<p>1. Perdue, R.E. 1958. <i>Arundo donax</i> - Source of Musical Reeds and Industrial Cellulose. <i>Economic Botany</i> 12: 368-404. 2. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and Impact on Environment and Development</i>. James & James (Science Publishers) Ltd., London. 3. Hear.org (http://www.hear.org/pier/wra/pacific/arundo_donax_htmlwra.htm).</p>	<p>1. "Cane grows very rapidly. Growth at a rate of .3 to .7 m. per week over a period of several months is not unusual when conditions are favorable." [Reproduces vegetatively, so most likely fragments within 1 year with such rapid growth.] 2. "In the warm Mediterranean regions, the above ground giant reed parts remain viable during the winter months. If plants are not cut, in the following spring new shoots emerge at the upper part of the stem from buds located at stem nodes." 3. "Probably less than a year since the species mostly spreads/reproduces by vegetative means."</p>
7.01	<p>1. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i>. Agricultural Research Council, South Africa. 2. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and Impact on Environment and Development</i>. James & James (Science Publishers) Ltd., London. 3. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>1. "Invades: Watercourses; unlike indigenous reeds often occurs on roadsides and other sites away from water." 2. "However, it is also found in relatively dry and infertile soils, at field borders, on field ridges or on roadsides, where it grows successfully." 3. "Occurs in: agricultural areas, coastland, desert, natural forests, planted forests, range/grasslands, riparian zones, ruderal/disturbed, scrub/shrublands, urban areas..."</p>
7.02	<p>1. Bell, G.P. 1997. Ecology and Management of <i>Arundo donax</i>, and approaches to riparian habitat restoration in southern California. In: Brock, J.H., Wade, M., Pysek, P. and Green, D. (Editors). <i>Plant Invasions: studies from North America and Europe</i>. Backhuys Publishers, Leiden, pp. 103-113. 2. Tselev, N.N. 1976. <i>Grasses of the Soviet Union [Zlaki SSSR]</i>. Part II. Fedorov, A.A. (Editor-in-Chief). Translated from Russian. Published for the Smithsonian Institution Libraries, and the National Science Foundation, Washington, D.C., by Amerind Publishing Co. Pvt. Ltd., New Delhi, 1983. 3. Weber, E. 2003. <i>Invasive Plant Species of the World: A Reference Guide to Environmental Weeds</i>. CABI Publishing, U.K. 4. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and</i></p>	<p>1. "This species is believed to be native to freshwaters of eastern Asia (Polunin and Huxley 1987), but has been cultivated throughout Asia, southern Europe, north Africa, and the Middle East for thousands of years and has been planted widely in North and South America and Australasia in the past century (Perdue 1958, Zohary 1962)." 2. "Stems of <i>Arundo donax</i> are widely used not only as construction material for temporary structures, roofs and fences, but as raw materials for cellulose in the paper industry. In addition, this species is a good stabilizer for different kinds of embankments, dams and eroded sands (in shallow ground water conditions) and</p>

	Impact on Environment and Development. James & James (Science Publishers) Ltd., London. 5. Henderson, L. 1999. Alien Weeds and Invasive Plants. Agricultural Research Council, South Africa.	has significant ornamental value." 3. "CU [Commercial Use]: Ornamental, fibre". 4. "...being one of the most productive among the biomass crops currently cultivated in Europe...". 5. "Cultivated for: Ornament, screening."
7.03		no evidence
7.04	1. Perdue, R.E. 1958. Arundo donax - Source of Musical Reeds and Industrial Cellulose. Economic Botany 12: 368-404. 2. Henderson, L. 1999. Alien Weeds and Invasive Plants. Agricultural Research Council, South Africa. 3. El Bassam, N. 1998. Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd., London. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. Arundo donax. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].	1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual reproduction known outside indigenous distribution."
7.05	1. Feinbrun-Dothan, N. 1986. Flora Palaestina. Part 4, Text. Alismataceae to Orchidaceae. The Israel Academy of Sciences and Humanities, Jerusalem. 2. Weber, E. 2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K. 3. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. Arundo donax. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].	1. "Hab.: Near water on banks of rivers." [water dispersed] 2. "...rhizome fragments are carried by rivers and streams...". 3. "Water currents: Fragments of stems are often carried by water to new sites, where they emit roots."
7.06	1. Perdue, R.E. 1958. Arundo donax - Source of Musical Reeds and Industrial Cellulose. Economic Botany 12: 368-404. 2. Henderson, L. 1999. Alien Weeds and Invasive Plants. Agricultural Research Council, South Africa. 3. El Bassam, N. 1998. Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd., London. 4. Dudley, T.,	1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual reproduction known outside indigenous

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7.07	<p>1. Perdue, R.E. 1958. <i>Arundo donax</i> - Source of Musical Reeds and Industrial Cellulose. <i>Economic Botany</i> 12: 368-404. 2. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i>. Agricultural Research Council, South Africa. 3. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and Impact on Environment and Development</i>. James & James (Science Publishers) Ltd., London. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual reproduction known outside indigenous distribution."</p>
7.08	<p>1. Perdue, R.E. 1958. <i>Arundo donax</i> - Source of Musical Reeds and Industrial Cellulose. <i>Economic Botany</i> 12: 368-404. 2. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i>. Agricultural Research Council, South Africa. 3. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and Impact on Environment and Development</i>. James & James (Science Publishers) Ltd., London. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual reproduction known outside indigenous distribution."</p>
8.01	<p>1. Perdue, R.E. 1958. <i>Arundo donax</i> - Source of Musical Reeds and Industrial Cellulose. <i>Economic Botany</i> 12: 368-404. 2. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i>. Agricultural Research Council, South Africa. 3. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and Impact on Environment and</i></p>	<p>1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual</p>

	<p>Development. James & James (Science Publishers) Ltd., London. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>reproduction known outside indigenous distribution."</p>
8.02	<p>1. Perdue, R.E. 1958. <i>Arundo donax</i> - Source of Musical Reeds and Industrial Cellulose. <i>Economic Botany</i> 12: 368-404. 2. Henderson, L. 1999. <i>Alien Weeds and Invasive Plants</i>. Agricultural Research Council, South Africa. 3. El Bassam, N. 1998. <i>Energy Plant Species: Their Use and Impact on Environment and Development</i>. James & James (Science Publishers) Ltd., London. 4. Dudley, T., Department of Integrative Biology, University of California, Berkeley, USA and IUCN/SSC Invasive Species Specialist Group (ISSG). 2006. <i>Arundo donax</i>. Available from: http://www.issg.org/database/species/ecology.asp?si=112&fr=1&sts=sss&lang=EN [Accessed 1st July 2009].</p>	<p>1. "This species does not produce viable seed in most areas to which it is apparently well adapted." 2. "Fruits: None seen." 3. "Giant reed is a seedless plant." 4. "May form plume-like terminal inflorescence, but often non-flowering in higher latitudes."; "No sexual reproduction known outside indigenous distribution."</p>
8.03	<p>Bell, G.P. 1997. Ecology and Management of <i>Arundo donax</i>, and approaches to riparian habitat restoration in southern California. In: Brock, J.H., Wade, M., Pysek, P. and Green, D. (Editors). <i>Plant Invasions: studies from North America and Europe</i>. Backhuys Publishers, Leiden, pp. 103-113.</p>	<p>"A popular approach to dealing with <i>A. donax</i> has been to cut the stalks and remove the biomass, wait three to six weeks for the plants to grow about one meter tall, then apply a foliar spray of herbicide solution. The chief advantage of this approach is that less herbicide must be applied to treat the fresh growth compared with tall, established plants, and that coverage is often better because of the shorter and uniform-height plants. However, cutting of the stems may result in the plants returning to growth-phase, drawing nutrients from the rootmass. As a result there is less translocation of herbicide to the roots and less root-kill. Therefore many follow-up treatments must be made which negates any initial savings in herbicide and greatly increases manpower costs." [Control is possible, but labor-intensive, costly, and a large amount of follow-up is</p>

		necessary.]
8.04	Weber, E. 2003. Invasive Plant Species of the World: A Reference Guide to Environmental Weeds. CABI Publishing, U.K.	"Cutting the stems close to the ground or burning does not kill the rhizome system."
8.05	El Bassam, N. 1998. Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd., London.	"Giant reed is one of the most pest resistant plants. So far, no diseases have been reported or observed. Occasionally during the early growth stages of the new sprouts, while they are still in a succulent condition, they may be attacked by <i>Sesamia</i> spp. and die. However, very soon new sprouts appear from the rhizome buds and replace the damaged ones."