Australia/New Zealand Weed Risk Assessment adapted for Florida

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.

Pennisetum purpureum -- Florida test			
	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	n	0
3.03	Weed of agriculture	y	4
3.04	Environmental weed	y	4
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	n	0
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	n	0
4.07	Causes allergies or is otherwise toxic to humans	n	0
4.08	Creates a fire hazard in natural ecosystems	n	0
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	y	1
6.03	Hybridizes naturally	?	
6.04	Self-compatible or apomictic	?	
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	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	y	1
7.05	Propagules water dispersed		
7.06	Propagules bird dispersed		
7.07	Propagules dispersed by other animals (externally)	?	
7.08	Propagules dispersed by other animals (internally)		
8.01	Prolific seed production	n	-1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)		
8.03	Well controlled by herbicides	y	-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			18

Outcome	**Reject**

section	# questions answered	satisfy minimum?
A	11	Yes
B	12	Yes
C	14	Yes
total	37	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%20lgnd.tif). 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?27208 (02 June 2008). 3. USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. 4. Henderson, L. (2001) Alien Weeds and Invasive Plants. Agricultural Research Council. 5. McMullen, C K. (1999) Flowering Plants of the Galápagos. Comstock Publishing Associates, Ithaca. 6. El Bassam, N. (1998) Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd, London. 7. Bor, N L. (1960) The grasses of Burma, Ceylon, India, and Pakistan, excluding Bambuseae. Pergamon Press, New York. 8. Pennisetum purpureum in Flora of China @ efloras.org. URL: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200025859. Accessed July 17,	1. Global plant hardiness zones 9-13. 2. "Distributional range: Native: AFRICA: Northeast Tropical Africa: Ethiopia [s.]; East Tropical Africa: Kenya; Tanzania; Uganda; West-Central Tropical Africa: Cameroon; West Tropical Africa: Cote D'Ivoire; Ghana; Guinea; Liberia; Nigeria; Sierra Leone; Togo; South Tropical Africa: Angola; Malawi; Mozambique; Zambia; Zimbabwe; Other: naturalized in s. Africa, tropical Asia, Australia, s. United States & Hawaii, Mexico, Central America, South America, West Indies, Macaronesia, Micronesia, & Galapagos." 3. "Temperature, Minimum (°F) 17." 4. "Origin: Tropical Africa." 5. "Range: Cultivated escape; also known from other tropical regions throughout the world, originally from Africa." 6. "Annual temperatures of 13.6-27.3°C". 7. "Distribution: A native of Tropical Africa". 8. "Cultivated. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan [native to Africa]."; "Native in Africa, but not introduced to many tropical countries". 9. "Origin and geographic distribution: Of tropical African origin".

	2008. 9. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	
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. URL: http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?27208 (02 June 2008). 3. Henderson, L. (2001) Alien Weeds and Invasive Plants. Agricultural Research Council. 4. McMullen, C K. (1999) Flowering Plants of the Galápagos. Comstock Publishing Associates, Ithaca. 5. Bor, N L. (1960) The grasses of Burma, Ceylon, India, and Pakistan, excluding Bambuseae. Pergamon Press, New York. 6. Pennisetum purpureum in Flora of China @ efloras.org. URL: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200025859. Accessed July 17, 2008. 7. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia	1. Three climatic regions. 2. "Distributional range: Native: AFRICA: Northeast Tropical Africa: Ethiopia [s.]; East Tropical Africa: Kenya; Tanzania; Uganda; West-Central Tropical Africa: Cameroon; West Tropical Africa: Cote D'Ivoire; Ghana; Guinea; Liberia; Nigeria; Sierra Leone; Togo; South Tropical Africa: Angola; Malawi; Mozambique; Zambia; Zimbabwe; Other: naturalized in s. Africa, tropical Asia, Australia, s. United States & Hawaii, Mexico, Central America, South America, West Indies, Macaronesia, Micronesia, & Galapagos." 3. "Origin: Tropical Africa." 4. "Range: Cultivated escape; also known from other tropical regions throughout the world, originally from Africa." 5. "A native of Tropical Africa". 6. "Cultivated. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan [native to Africa]."; "Native in Africa, but not introduced to many tropical countries". 7. "Origin and geographic distribution: Of tropical African origin".
2.04	1. Atlapedia Online (http://www.atlapedia.com/online/countries/ethiopia.htm). 2. Atlapedia Online (http://www.atlapedia.com/online/countries/kenya.htm). 3. Atlapedia Online (http://www.atlapedia.com/online/countries/tanzania.htm). 4. Atlapedia Online (http://www.atlapedia.com/online/countries/uganda.htm). 5. Atlapedia Online (http://www.atlapedia.com/online/countries/cameroon.htm). 6. Aquastat global information system on water and agriculture, Food and Agriculture Organization of the United Nations (http://www.fao.org/nr/water/aquastat/data/factsheets/aquastat_fact_sheet_civ.pdf). 7. Britannica Online Encyclopedia	1. For Ethiopia: the hot semiarid northeastern and southeastern lowlands receive less than 500 mm (20 inches) of precipitation annually and are highly susceptible to drought. 2. 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. 3. 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. 4. For Uganda: the areas of Lake Victoria as well as the west and

	(www.britannica.com/EBchecked/topic/232376/Ghana/55172/Climate). 8. Atlapedia Online (http://www.atlapedia.com/online/countries/guinea.htm). 9. Atlapedia Online (http://www.atlapedia.com/online/countries/liberia.htm). 10. Atlapedia Online (http://www.atlapedia.com/online/countries/nigeria.htm). 11. Atlapedia Online (http://www.atlapedia.com/online/countries/sierrale.htm). 12. Atlapedia Online (http://www.atlapedia.com/online/countries/togo.htm). 13. Aquastat global information system on water and agriculture, Food and Agriculture Organization of the United Nations (http://www.fao.org/nr/water/aquastat/data/factsheets/aquastat_fact_sheet_ago.pdf). 14. Atlapedia Online (http://www.atlapedia.com/online/countries/malawi.htm). 15. Atlapedia Online (http://www.atlapedia.com/online/countries/mozambiq.htm). 16. Atlapedia Online (http://www.atlapedia.com/online/countries/zambia.htm). 17. Atlapedia Online (http://www.atlapedia.com/online/countries/zimbabwe.htm). 18. USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. 19. El Bassam, N. (1998) Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd, London. 20. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	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. 5. For Cameroon: average annual precipitation is 4,030 mm (159 inches). 6. For Cote D'Ivoire: long-term average annual precipitation is 1348 mm/year (53.07 inches/year). 7. For Ghana: the mean annual precipitation is between 40 and 55 inches (1,020 and 1,400 mm), but there is a marked moisture deficit because of the long, intensely dry season that follows. In the southern forest country, where the annual mean precipitation from north to south has a range of about 50 to 86 inches (1,270 to 2,180 mm), there are two rainy seasons. 8. For Guinea: average annual precipitation at Conakry is 4,923 mm (193 inches). 9. For Liberia: average annual precipitation in Monrovia is 4,150 mm (163 inches) and average temperature ranges are from 22 degrees Celsius (72 degrees Fahrenheit) to 27 degrees Celsius (81 degrees Fahrenheit) all year. 10. For Nigeria: average annual precipitation varies from 1,770 mm (70 inches) in the west to 4,310 mm (170 inches) along the east coast, and to 470 mm (50 inches) in the central areas. 11. For Sierra Leone: average annual precipitation varies from 5,080 mm (200 inches) along the coast and decreases inland towards the north to 2,160 mm (86 inches). 12. For Togo: most rainfall occurs in the mountains while coastal regions are basically dry. Average annual precipitation is 1,020 mm (40 inches) in the north and 1,780 mm (70 inches) in the west, southwest and center. The northern regions have a savannah climate with a longer dry season. 13. For Angola: long-term average annual precipitation is 1010 mm/year (39.76 inches). 14. For Malawi:

		average annual precipitation is 740 mm (29 inches). 15. 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). 16. 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. 17. For Zimbabwe: rainfall is highest on the High Veld with an average annual precipitation of up to 1,020 mm (40 inches) while the Middle Veld receives 410 mm to 610 mm (16 to 24 inches) and the Low Veld receives less than 400 mm (12 inches). 18. "Drought Tolerance: High"; "Precipitation, Minimum: 36. Precipitation, Maximum: 100." 19. "*P. purpureum* is reported to tolerate annual precipitation of 200-4000mm (7.87-157.48 inches)". 20. "Naturalized throughout South-East Asia where annual rainfall exceeds 1000 mm (39.37 inches) and there is no long dry season."; "It does not tolerate sustained flooding."
2.05	1. Henderson, L. (2001) Alien Weeds and Invasive Plants. Agricultural Research Council. 2. McMullen, C K. (1999) Flowering Plants of the Galápagos. Comstock Publishing Associates, Ithaca. 3. Bor, N L. (1960) The grasses of Burma, Ceylon, India, and Pakistan, excluding Bambuseae. Pergamon Press, New York. 4. Pennisetum purpureum in Flora of China @ efloras.org. URL: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200025859. Accessed July 17, 2008. 5. Wagner, Herbst, and Sohmer (1999) Manual of the flowering plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press, Honolulu. 6. Mauchamp, A. (1997) Threats from Alien Plant Species in the Galápagos Islands. Conservation Biology. 11(1): 260-263. 7. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor,	1. "Cultivated for: Screening, ornament, fodder." 2. "Range: Cultivated escape". 3. "Now introduced into many other tropical countries." 4. "Cultivated. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan [native to Africa]."; "Native in Africa, but now introduced to many tropical countries". 5. "Native to tropical Africa, now widely cultivated in tropical regions worldwide" 6. "Today, two of the invasive species are still planted despite their known behavior, *Pennisetum purpureum* for pasture". 7. "This grass has been introduced to all tropical regions of the world".

	Indonesia.	
3.01	1. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network- (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?35092 Accessed June 2, 2008. 2. Kairo, Ali, Cheesman, Haysom, and Murphy (2003) Invasive Species Threats in the Caribbean Region. Report to the Nature Conservancy. 3. New Zealand Plant Conservation Network (2005) New Zealand adventive vascular plant list. Wellington. 4. Csurhes, S, Edwards, R. (1998) National Weeds Program. Potential Environmental Weeds in Australia: Candidate Species for Preventative Control. The Director of the National Parks and Wildlife, Canberra, Australia. 5. Mauchamp, A (1997) Threats from Alien Plant Species in the Galápagos Islands. Conservation Biology. 11(1): 260-263. 6. Mannetje, L 't, Jones, RM, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	1. "Naturalized in s. Africa, tropical Asia, Australia, s. United States & Hawaii, Mexico, Central America, South America, West Indies, Macronesia, Micronesia, & Galapagos." 2. "Naturalised and Invasive in: Bahama Islands; Puerto Rico". 3. *Pennisetum purpureum* is fully naturalized in New Zealand. 4. "Has become naturalised in many other parts of the world."; "Naturalised populations exist in northern parts of Western Australia, Darwin and the Gulf and the Queensland tropics." 5. "Today, 2.5% of the alien species, 5.6% of the naturalized species, are actually aggressive and represent a serious threat to native ecosystems. These invasive species [include] *Pennisetum pupureum*." 6. "Naturalized throughout South-East Asia".
3.02		No evidence.
3.03	1. Holm, L, et al. (1979) A Geographical Atlas of World Weeds. John Wiley and Sons, New York. 2. Waterhouse, D F. (1997) The Major Invertebrate Pests and Weeds of Agriculture and Plantation Forestry in the Southern and Western Pacific. The Australian Centre for International Agricultural Research. No. 44. Canberra, Australia.	1. *Pennisetum purpureum* is a Principal weed of agriculture in Colombia, Ghana, Mozambique, and Trinidad. 2. "Major weeds of agriculture in the southern and western Pacific: *Pennisetum purpureum*".
3.04	1. Weber, E (2003) Invasive Plant Species of the World. CABI Publishing. 2. Henderson, L (2001) Alien Weeds and Invasive Plants: a Complete Guide to Declared Weeds and Invaders in South Africa. Plant Protection Research Institute Handbook No. 12. 3. Mauchamp, A. (1997) Threats from Alien Plant Species in the Galápagos Islands. Conservation Biology. 11(1): 260-263.	1. Considered an environmental weed in southern Africa, southeastern US, and the Galapagos; "Invaded habitats: Forests, grass- and heathland, riparian habitats, coastal beaches." 2. "Invades: Forest margins, riverbanks, valley floors"; "Invasive status: Transformer." 3. "Today, 2.5% of the alien species, 5.6% of the naturalized species, are actually aggressive and represent a serious threat to native ecosystems. These invasive species [include]

		Pennisetum purpureum."
3.05	1. Holm et al. (1979) A Geographical Atlas of World Weeds. John Wiley and Sons, New York. 2. Henderson, L. (2001) Alien Weeds and Invasive Plants. Agricultural Research Council. 3. Parsons and Cuthbertson (2001) Noxious Weeds of Australia. CSIRO Publishing.	1. *Pennisetum clandestinum* is a Serious weed in Costa Rica, Kenya, Peru, Uganda, and Uruguay, and a Principal weed in Australia, Brazil, Colombia, Hawaii, India, New Zealand, and Tanzania. *Pennisetum japonicum* is a Principal weed in Japan. *Pennisetum macrourum* is a Principal weed in Australia. *Pennisetum pedicellatum* is a Serious weed in Nigeria and Thailand, and is a Principal weed in Australia. *Pennisetum polystachyon* is a Serious weed in Thailand and a Principal weed in India. 2. *Pennisetum clandestinum* is a declared invader (category 2). 3. *Pennisetum polystachion* and *Pennisetum villosum* are listed as noxious weeds in Australia.
4.01		No description of these traits.
4.02	USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	"Known Allelopath: No."
4.03		No description of parasitism.
4.04	1. USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. 2. FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000301.htm). 3. Pennisetum purpureum in Flora of China @ efloras.org. URL: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200025859. Accessed July 17, 2008. 4. Mauchamp, A. (1997) Threats from Alien Plant Species in the Galápagos Islands. Conservation Biology. 11(1): 260-263. 5. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	1. "Palatable Browse Animal: Medium. Palatable Graze Animal: Medium. Fodder Product: Yes." 2. "It is highly palatable in the leafy stage." 3. "This is an excellent forage grass." 4. *Pennisetum purpureum* is planted for pasture in the Galápagos Islands. 5. The main use of elephant grass is as a forage for ruminants."; "It is usually offered fresh to animals".
4.05	USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-	"Toxicity: None. Fodder Product: Yes." [and no other evidence of toxicity]

	4490 USA.	
4.06	Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	"Diseases and pests: The most common disease is a blight caused by *Helminthosporium sacchari*…No major pests have been recorded."
4.07	1. USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. 2. FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000301.htm).	1. "Toxicity: None. Palatable Human: No." 2. "García-Rivera and Morris (1955) recorded 2.48 percent of oxalates in the dry matter of elephant grass and 2.5 percent in the Merker variety but no toxicity was experienced. Ndyanabo (1974) recorded 3.1 percent total oxalates but again no toxicity." [and no other evidence of toxicity]
4.08	FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000301.htm).	"Elephant grass will burn if dry enough, and produce new growth afterwards, but it is seldom dry enough to burn in its normal environment."
4.09	USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	"Shade Tolerance: Intolerant."
4.10	1. USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. 2. El Bassam, N. (1998) Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd, London. 3. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	1. "Adapted to Coarse Textured Soils: Yes. Adapted to Fine Textured Soils: Yes. Adapted to Medium Textured Soils: Yes." 2. "It grows on a wide range of well drained soils". 3. "It will survive at much reduced productivity on all kinds of soils."
4.11	1. Henderson, L. (2001) Alien Weeds and Invasive Plants. Agricultural Research Council. 2. McMullen, C K. (1999) Flowering Plants of the Galápagos. Comstock Publishing Associates, Ithaca. 3. El Bassam, N. (1998) Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd, London. 4. *Pennisetum purpureum* in Flora of China @ efloras.org. URL: http://www.efloras.org/florataxon.aspx?flora_id=	1. "Robust, perennial, tufted grass forming bamboo-like clumps 2.0-2.0(-7.5) m high." 2. "Perennial herb 2-6 m tall, stems typically smooth, to 2 cm in diameter, usually growing in large clumps." 3. "*P. purpureum* is a robust bunch grass that may reach a height of 6 m". 4. "Perennial forming large tussock,s, often with short rhizomes. Culms robust, decumbent and rooting at the base, ascending to 2-4m tall." 5. "A

	2&taxon_id=200025859. Accessed July 17, 2008. 5. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	tall, robust, deep-rooting, erect perennial, with short rhizomes. Stem up to 7 m tall and 3 cm in diameter, up to 20-noded."
4.12	1. Weber, E (2003) Invasive Plant Species of the World. CABI Publishing. 2. El Bassam, N. (1998) Energy Plant Species: Their Use and Impact on Environment and Development. James & James (Science Publishers) Ltd, London. 3. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	1. "Where invasive, it forms dense reeds 3 m tall or more in moist and rich soils, displacing native vegetation and preventing any regeneration of native plants." 2. "Growing in dense clumps." 3. "Forms clumps to 1 m across."
5.01	Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	Terrestrial
5.02	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network- (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?35092 Accessed June 2, 2008.	*Poaceae*
5.03	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network- (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?35092 Accessed June 2, 2008.	*Poaceae*
5.04	USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	"Propagated by Bulb: No. Propagated by Corm: No. Propagated by Tubers: No."
6.01		No evidence.
6.02	1. USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. 2. Laegaard, S, Garcia2, P P. (2004) Invasive grasses in the Galapagos Islands. Lyonia (6)2:171 -175. 3. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of	1. "Propagated by Seed: Yes." 2. "Effectively reproducing by seeds." 3. "However, viability of pollen is poor and this may be the main cause of the typically poor seed set." 4. "It is propagated...by seedage."; "Seed is responsible for much of the introduction

	South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia. 4. Orsenigo, JR. (1975) Napiergrass Response to Glyphosate. Soil and Crop Science Society of Florida Proceedings 34: 125-127.	to and movement within sugarcane fields".
6.03	1. Techio, VH, et al. (2006) Meiosis in elephant grass (Pennisetum purpureum), pearl millet (Pennisetum glaucum) (Poaceae, Poales) and their interspecific hybrids. Genetics and Molecular Biology. 29(2): 353-362. 2. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia. 3. Reed, JD. (1992) Sorghum and millets as forage crops in the semi-arid tropics. Pp. 173-178 *in* Utilization of sorghum and millets (Gomes, MI, et al., eds.) Pantancheru, A.P., India: International Crops Research Institute for the Semi-Arid Tropics.	1. "The cultivated and sexually compatible species *Pennisetum purpureum* (elephant grass, 2n = 4x =28) and *Pennisetum glaucum* (pearl millet, 2n = 2x = 14) can undergo hybridization which favors the amplification of their genetic background and the introgression of favorable alleles into breedingprograms."; "Pearl millet and elephant grass are sexually compatible even though they integrate different gene pools and present differentiated ploidy levels"; However "The greatest problem related to the utilization of elephant grass and pearl millet hybrids is infertility caused by triploidy" 2. *P. purpureum* × *P. americanum* (L.) Leeke hybrids have been developed in many countries...The hybrid is sterile". 3. "The hybrids of...millet (*Pennisetum pupureum* × *P. glaucum*) may also be useful". [Does not stipulate any occurance of hybridization in the wild].
6.04	1. Matzk, F. (1980) Relationships between interspecific incompatibility and self-incompatibility in grasses. Incompatiblity Newsletter. No. 12. Pp. 88-94. 2. Techio, VH, et al. (2006) Meiosis in elephant grass (Pennisetum purpureum), pearl millet (Pennisetum glaucum) (Poaceae, Poales) and their interspecific hybrids. Genetics and Molecular Biology. 29(2): 353-362.	1. *Pennisetum purpureum* is a self-compatible species. BUT 2. an allogamic species
6.05		This is a grass, so pollen is most likely wind dispersed.
6.06	1. USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 20 May 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. 2. El Bassam, N. (1998) Energy Plant Species: Their Use and Impact on Environment and Development. James & James	1. "Growth Form: Rhizomatous. Resprout Ability: No. Propagated by cuttings: Yes" 2. "The grass is usually propagated vegetatively." 3. "Growing in loose tussocks with short rhizomes". 4. "Often with short rhizomes". 5. "With

	(Science Publishers) Ltd, London. 3. Laegaard, S, Garcia2, P P. (2004) Invasive grasses in the Galapagos Islands. Lyonia (6)2:171 -175. 4. Pennisetum purpureum in Flora of China @ efloras.org. URL: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200025859. Accessed July 17, 2008. 5. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia. 6. Orsenigo, JR. (1975) Napiergrass Response to Gyphosate. Soil and Crop Science Society of Florida Proceedings. Volume 34. Pp 125-127.	short rhizomes."; "The grass is usually propagated vegetatively." 6. "It is propagated vegetatively"; "It develops from both aerial and underground vegetative propagules".
6.07		
7.01		
7.02	1. Henderson, L. (2001) Alien Weeds and Invasive Plants. Agricultural Research Council. 2. McMullen, C K. (1999) Flowering Plants of the Galápagos. Comstock Publishing Associates, Ithaca. 3. Pennisetum purpureum in Flora of China @ efloras.org. URL: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200025859. Accessed July 17, 2008. 4. Mauchamp, A. (1997) Threats from Alien Plant Species in the Galápagos Islands. Conservation Biology. 11(1): 260-263. 5. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	1. "Cultivated for: Screening, ornament, fodder." 2. "Range: Cultivated escape". 3. "Cultivated. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan [native to Africa]."; "Native in Africa, but now introduced to many tropical countries". 4. "Today, two of the invasive species are still planted despite their known behavior, Pennisetum purpureum for pasture..." 5. "This grass has been introduced to all tropical regions of the world".
7.03		No evidence.
7.04	1. PIER, Institute of Pacific Islands Forestry (http://www.hear.org/pier/species/pennisetum_purpureum.htm). 2. Weber, E (2003) Invasive Plant Species of the World. CABI Publishing.	1. wind dispersed 2. each spikelet with many bristles
7.05		
7.06		
7.07	Weber, E (2003) Invasive Plant Species of the World. CABI Publishing.	each spikelet with many bristles
7.08		
8.01	1. Weber, E (2003) Invasive Plant Species of the World. CABI Publishing. 2. Henderson, L (2001) Alien Weeds and Invasive Plants: a Complete Guide to Declared Weeds and Invaders in South Africa. Plant Protection	1. "Seeds are rarely produced." 2. "occasionally setting seed" 3. "There is little or no seed formation."

	Research Institute Handbook No. 12. 3. Mannetje, L 't & Jones, R M, eds. (1992) Plant Resources of South-East Asia (PROSEA). No. 4. Forages. Prosea, Bogor, Indonesia.	
8.02		
8.03	1. Weber, E (2003) Invasive Plant Species of the World. CABI Publishing. 2. Orsenigo, JR. (1975) Napiergrass Response to Glyphosate. Soil and Crop Science Society of Florida Proceedings. Volume 34. Pp 125-127.	1. "Larger infestations are controlled by cutting or burning off and treating any regrowth with 2,2-DPA." 2. "Infestations may be controlled with either soil sterilant or foliar-spray herbicide programs." However "Control is neither simple nor inexpensive regardless of the method used."; "95 to 98% apparent control [by Glyphosate]."
8.04	1. Weber, E (2003) Invasive Plant Species of the World. CABI Publishing. 2. FAO, Grassland Index (http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000301.htm).	1. "Established plants are…fire tolerant, and vigorously resprout if cut." 2. "Elephant grass will stand heavy grazing".
8.05		