

Taxon: *Hemarthria altissima* (Poir.) Stapf & C. E. Hubb.

Family: Poaceae

Common Name(s): Batavian quick grass
halt grass
limpo grass
red quick
red swamp grass
snake grass
swamp couch

Synonym(s): *Manisuris altissima* (Poir.) Hitchc.
Rottboellia altissima Poir.

Assessor: Chuck Chimera

Status: In Progress

End Date:

WRA Score: 8.0

Designation: H(HPWRA)

Rating: High Risk

Keywords: Stoloniferous Grass, Environmental Weed (Florida), Allelopathic, Roots at Nodes, Poor Seed Production

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	y
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n

Qsn #	Question	Answer Option	Answer
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	y
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m ²)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	n
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	[No evidence of domestication] "Tropical Africa, India, Burma. Introduced to the United States."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Distribution. Tropical Africa, India, Burma. Introduced to the United States."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 13 Dec 2021]	"Native Africa MACARONESIA: Spain [Canarias] NORTHERN AFRICA: Algeria, Egypt, Tunisia NORTHEAST TROPICAL AFRICA: Ethiopia, Chad EAST TROPICAL AFRICA: Tanzania WEST TROPICAL AFRICA: Mali, Nigeria, Senegal SOUTH TROPICAL AFRICA: Mozambique, Malawi, Zambia, Zimbabwe SOUTHERN AFRICA: Botswana, Lesotho, Eswatini, South Africa WESTERN INDIAN OCEAN: Madagascar, Mauritius, Reunion Asia-Temperate ARABIAN PENINSULA: Saudi Arabia WESTERN ASIA: Lebanon, Turkey CAUCASUS: Georgia Asia-Tropical INDIAN SUBCONTINENT: India [Tamil Nadu] INDO-CHINA: Myanmar (s.), Thailand (n.), Vietnam (s.) MALESIA: Indonesia [Kalimantan] Europe SOUTHEASTERN EUROPE: Greece (incl. Crete), Italy (incl. Sicily) SOUTHWESTERN EUROPE: Spain (incl. Balears)"

202	Quality of climate match data	High
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Qsn #	Question	Answer
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 13 Dec 2021]	

203	Broad climate suitability (environmental versatility)	Y
	Source(s)	Notes
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). (2006). Flora of China. Vol. 22 (Poaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"In or near water, damp places; 700–1900 m. Anhui, Beijing, Guizhou, Heilongjiang, Henan, Hubei, Shandong, Yunnan, Zhejiang [India, Indonesia, Myanmar, Thailand, Vietnam; Africa, SW Asia, Mediterranean region; introduced in America and New Zealand]"
	Van den Heuvel, E., & Veldkamp, J. F. (2000). Revision of <i>Hemarthria</i> (Gramineae-Andropogoneae-Rottboelliinae). <i>Blumea</i> , 45(2), 443-475	"Moist meadows and other places, e.g. riverbanks, marshes, scrub, also in sandy dunes, beaches (salt resistant), savannahs, roadsides, weedy in (rice) fields and plantations, locally common, sometimes vegetation forming, 0-2000 m altitude."
	Skerman, P.J. & Riveros, F. (1990). <i>Tropical Grasses</i> . FAO, Rome	"Optimum temperature for growth. 31-35°C (Boyd & Perry. 1972). It was seriously affected by temperatures above 38°C. Altitude range. 1 500-2 000 m, 1 200 m in Panama (Ratray, 1973). Rainfall requirements. It requires a high rainfall."

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 13 Dec 2021]	"Native Africa MACARONESIA: Spain [Canarias] NORTHERN AFRICA: Algeria, Egypt, Tunisia NORTHEAST TROPICAL AFRICA: Ethiopia, Chad EAST TROPICAL AFRICA: Tanzania WEST TROPICAL AFRICA: Mali, Nigeria, Senegal SOUTH TROPICAL AFRICA: Mozambique, Malawi, Zambia, Zimbabwe SOUTHERN AFRICA: Botswana, Lesotho, Eswatini, South Africa WESTERN INDIAN OCEAN: Madagascar, Mauritius, Reunion Asia-Temperate ARABIAN PENINSULA: Saudi Arabia WESTERN ASIA: Lebanon, Turkey CAUCASUS: Georgia Asia-Tropical INDIAN SUBCONTINENT: India [Tamil Nadu] INDO-CHINA: Myanmar (s.), Thailand (n.), Vietnam (s.) MALESIA: Indonesia [Kalimantan] Europe SOUTHEASTERN EUROPE: Greece (incl. Crete), Italy (incl. Sicily) SOUTHWESTERN EUROPE: Spain (incl. Balears)"
	Starr, F., Starr, K. & Loope, L.L. (2004). New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 79: 20-30	[East Maui] "Native to Africa, temperate and tropical Asia, and Europe (GRIN, 2001), <i>H. altissima</i> (limpo grass) is locally common on Maui in pastures and roadsides from Pi'iholo to Ha'iku."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 13 Dec 2021]	"Cultivated Africa SOUTH TROPICAL AFRICA: Zimbabwe SOUTHERN AFRICA: South Africa Australasia AUSTRALIA: Australia Northern America REGION: United States Naturalized (natzd. elsewhere, incl. s. United States)"
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). (2006). Flora of China. Vol. 22 (Poaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"In or near water, damp places; 700–1900 m. Anhui, Beijing, Guizhou, Heilongjiang, Henan, Hubei, Shandong, Yunnan, Zhejiang [India, Indonesia, Myanmar, Thailand, Vietnam; Africa, SW Asia, Mediterranean region; introduced in America and New Zealand]."
	Hitchcock, A.S. (1936). Manual of the grasses of the West Indies. Miscellaneous Publication No. 243. U.S. Department of Agriculture, Washington, D.C.	"Shallow water, ditches, and moist ground. An Old World species introduced into the American Tropics. Mexico and Jamaica to Argentina."

301	Naturalized beyond native range	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Van den Heuvel, E., & Veldkamp, J. F. (2000). Revision of <i>Hemarthria</i> (Gramineae-Andropogoneae-Rottboelliinae). <i>Blumea</i> , 45(2), 443-475	"Distribution— Madagascar, Reunion, Mauritius, S and E Africa to Egypt, Saudi Arabia, Chad, Algeria, Tunisia, Canary Isl., S Spain, Balears, C Italy, Sicily, Crete, Rhodes, Turkey (W, NE), Lebanon ('Syria'), Georgia (Adzharskaya), Caucasus, then in S India (Tamil Nadu), S Burma, N Thailand (Chiangmai), S Vietnam (Can-Tho). Malasia: Borneo (Kalimantan). Introduced in America in the 19th century (or before?) and now widespread: Argentine, Bolivia, Brazil, El Salvador, Guyanas, Honduras, Jamaica, Mexico, Nicaragua, Peru, Puerto Rico, Uruguay, USA (Florida, ? Pennsylvania, Texas); also introduced, persistent, but not spreading in New Zealand [Edgar & Connor, <i>Fl. New Zeal.</i> 5 (2000) 613],"
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). (2006). <i>Flora of China</i> . Vol. 22 (Poaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	" <i>Hemarthria altissima</i> occurs naturally mainly from the Mediterranean region through Africa, but there are scattered records from Asia and it is now widely naturalized in warm parts of America."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 13 Dec 2021]	"Naturalized (natzd. elsewhere, incl. s. United States)"
	Starr, F., Starr, K. & Loope, L.L. (2004). New plant records from the Hawaiian Archipelago. <i>Bishop Museum Occasional Papers</i> 79: 20-30	[East Maui] " <i>Hemarthria altissima</i> (Poir.) Stapf & C.E. Hubb. New state record Native to Africa, temperate and tropical Asia, and Europe (GRIN, 2001), <i>H. altissima</i> (limpo grass) is locally common on Maui in pastures and roadsides from Pi'iholo to Ha'iku. This robust grass can be distinguished by the following characteristics. "Perennial; culms ascending from a long creeping base, compressed and 2-edged, 40–80 cm long, freely branching toward the ends; blades flat, 3–8 mm wide; flowering branches often short and fascicled, the racemes 3–5 cm, sometimes 10 cm long, compressed; pedicel free or partly adnate to the rachis joint; sessile spikelet 5–7 mm long, the keels of the first glume very narrowly winged toward the apex; pedicellate spikelet 5–6 mm long, acute." (Hitchcock, 1971). These collections represent a new state record for the Hawaiian Islands. Material examined: MAUI: East Maui, Ha'ikü, West Kuiaha, in pasture and side of road, 1100 ft [335 m], 29 Jun 2001, Starr & Martz 010629-1; East Maui, Makawao, Makawao Forest Reserve, on side of Kahakapau Rd, 2400 ft [731 m], 30 Oct 2001, Starr & Martz 011030-1."

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Cook, B.G. et al. (2020). <i>Tropical Forages: An interactive selection tool</i> . 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Due to poor seed set and limited adaptational range, <i>H. altissima</i> poses little or no weed threat on well-drained or heavily grazed land. However, it has been found in natural areas in Florida, and consequently placed on the Florida Exotic Pest Plant Council's Category II invasive plant list. As a precaution, it should be kept isolated from wetlands and regularly monitored in areas where unintended spread might occur. "

Qsn #	Question	Answer
303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Due to poor seed set and limited adaptational range, <i>H. altissima</i> poses little or no weed threat on well-drained or heavily grazed land. However, it has been found in natural areas in Florida, and consequently placed on the Florida Exotic Pest Plant Council's Category II invasive plant list. As a precaution, it should be kept isolated from wetlands and regularly monitored in areas where unintended spread might occur."

304	Environmental weed	y
	Source(s)	Notes
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Due to poor seed set and limited adaptational range, <i>H. altissima</i> poses little or no weed threat on well-drained or heavily grazed land. However, it has been found in natural areas in Florida, and consequently placed on the Florida Exotic Pest Plant Council's Category II invasive plant list. As a precaution, it should be kept isolated from wetlands and regularly monitored in areas where unintended spread might occur. "
	Bradley, B.A., Allen, J.M., Griffin, B., Laginhas, B.B. & Rockwell-Postel, M. (2020). Regional Invasive Species & Climate Change Management Challenge: Prioritizing range-shifting invasive plants High-impact species coming to the Northeast. Northeast RISSC Management	" <i>Hemarthria altissima</i> (limpoglass) HIGH Impact: Outcompetes native wetland plants via the creation of dense monocultures and the production of allelopathic compounds. MEDIUM Vulnerability: Invades wetlands and wet prairie grassland. Introduced as a pasture grass in Florida. Managed with glyphosate or grazing."
	Overholt, W. A., & Franck, A. R. (2017). The invasive legacy of forage grass introductions into Florida. <i>Natural Areas Journal</i> , 37(2), 254-264	"Table 1. Invasive grasses in Florida, their origins, introduction history, and ecological impacts" [<i>Hemarthria altissima</i> - Ecological impacts = Competes with native plant communities]
	Toth, L. A., & van der Valk, A. (2012). Predictability of flood pulse driven assembly rules for restoration of a floodplain plant community. <i>Wetlands Ecology and Management</i> , 20 (1), 59-75	[Interferes with restoration of a wetland plant community] "Restoration of a wetland plant community did not result in the predicted increase in species richness and diversity. Colonization and expansion of the exotic grass, <i>Hemarthria altissima</i> (Poir.) Stapf & C.E. Hubb., disrupted community reassembly processes." ... "Predicted reassembly processes also were disrupted by the post-restoration colonization and expansion of the exotic grass <i>H. altissima</i> . <i>Hemarthria</i> is a facultative wetland species that is native to riparian zones along rivers in South Africa (Oakes 1973), and was introduced to Florida for cattle forage in 1964 (Quesenberry et al. 1978). It invaded the restored floodplain from pastures in adjoining tributary watersheds and thrived at the periodically inundated wet prairie sites, as well as, in the deeper, more consistently flooded, central portions of the floodplain (Toth, unpublished). <i>Hemarthria</i> is capable of surviving flood pulses with wide-ranging amplitudes (Luo et al. 2009, 2011) and has vegetative growth characteristics (e.g., decumbent rooting culms) that allow it to spread rapidly (Lenssen et al. 2004). By 2007, management measures (i.e., herbicide treatments) were required to control its increasing dominance on the restored floodplain. The unexpected invasion of <i>Hemarthria</i> illustrates the predictability limitations of community assembly rules for floodplain restorations, particularly those with historically based reference conditions and goals."

Qsn #	Question	Answer
	Sellers, B. A., Ferrell, J. A., Haller, W. T., Mislevy, P., & Adje M. B. (2007). Phytotoxicity of selected herbicides on limpograss (<i>Hemarthria altissima</i>). <i>Journal of Aquatic Plant Management</i> 45: 54-57	[Reported as invasive in natural areas, but recommended by Florida weed risk assessment] "Limpograss has been found in natural areas, and is thought to be competing with native plant communities. As a result, limpograss has been placed on the Florida Exotic Pes Plant Council's Category II invasive plant list, which is a list of plants that are increasing in number, but not causing ecological harm (FLEPPC 2005). However, the University of Florida- IFAS invasive weed assessment indicates that limpograss can currently be recommended by Florida Extension faculty for forage production (Fox et al. 2005). Therefore, it is important that escaped limpograss swards be controlled so that Florida cattlemen can continue to utilize this important forage resource and to prevent the destruction of native ecosystems."

305	Congeneric weed	
	Source(s)	Notes
	Niroula, B. (2013). Pre-harvest weeds of a wheat field at Biratnagar, Nepal. <i>Our Nature</i> , 11(2), 187-191	"Table 1. Occurrence and phenophase of weeds in pre-harvest wheat field." [<i>Hemarthria compressa</i> recorded as an "++ (occasional)" weed in wheat fields. Negative impacts have not been specified]
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	[<i>Hemarthria compressa</i>] "Weed of: Cereals" [Possibly impacts crop yields, but impacts in cited references have not been quantified, or described]

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). <i>Tropical Grasses</i> . FAO, Rome	[No evidence] "A perennial with a creeping, branched rhizome; culms 30- 100 cm high, compressed, usually decumbent and rooting from the lower nodes, generally branched; leaves smooth, glabrous, the blades up to 6 mm wide, usually folded; inflorescence a solitary raceme terminating the culm and its branches, these often in clusters, so there are several racemes from each node; racemes 5-12 cm long, 2-3 mm wide, spikelike, tapering toward the apex."

402	Allelopathic	y
	Source(s)	Notes
	Cook, B.G. et al. (2020). <i>Tropical Forages: An interactive selection tool</i> . 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	" <i>H. altissima</i> is normally not sown with other grasses, although can be invaded by more grazing tolerant species such as <i>Cynodon dactylon</i> under prolonged heavy grazing. There may be issues with compatibility with some species because there is evidence of allelopathic properties due to root exudates."
	Bradley, B.A., Allen, J.M., Griffin, B., Laginhas, B.B. & Rockwell-Postel, M. (2020). <i>Regional Invasive Species & Climate Change Management Challenge: Prioritizing range-shifting invasive plants High-impact species coming to the Northeast</i> . Northeast RISCC Management	" <i>Hemarthria altissima</i> (limpograss) HIGH Impact: Outcompetes native wetland plants via the creation of dense monocultures and the production of allelopathic compounds."

Qsn #	Question	Answer
	Young, C. C. (1979). Allelopathy in a grass-legume association: A case study with <i>Hemarthria altissima</i> and <i>Desmodium intortum</i> . PhD Dissertation. University of Hawaii, Honolulu	"In Hawaii, the legume <i>Desmodium intortum</i> (Mill.) Urb. could not be established in a pasture of the tetraploid <i>Hemarthria altissima</i> (Poir.) Stapf and Hubb cv. <i>bigalta</i> limpoggrass, but <i>intortum</i> was easily established in a sward of the less vigorous <i>greenalta</i> limpoggrass. The effects of root residues and root exudates of <i>intortum</i> and the limpograsses on the growth, nodulation and nitrogen fixation of <i>intortum</i> were studied in experiments designed to avoid competition between root systems of the grass and legume for nutrients, water, and space and between aerial plant parts for light. Finally, allelochemicals in the root exudates of <i>bigalta</i> and <i>greenalta</i> limpograsses were collected, isolated and partially characterized." ... "It is concluded from the data that the inhibition of <i>intortum</i> growth by <i>bigalta</i> limpoggrass was allelopathic."

403	Parasitic	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). <i>Tropical Grasses</i> . FAO, Rome	"A perennial with a creeping, branched rhizome" [No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). <i>Tropical Grasses</i> . FAO, Rome	"Palatability. It is highly palatable and is valued as a fodder grass."
	Quattrocchi, U. (2006). <i>CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	"tolerates overgrazing, animal food, pasture, excellent forage grass, highly palatable, provides grazing and fodder, readily grazed by all stock, if not overgrazed will compete with most weedy grasses,"

405	Toxic to animals	n
	Source(s)	Notes
	Cook, B.G. et al. (2020). <i>Tropical Forages: An interactive selection tool</i> . 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"No record of toxicity."
	Skerman, P.J. & Riveros, F. (1990). <i>Tropical Grasses</i> . FAO, Rome	"Toxicity. In Zambia, scouring occurs when cattle move from the fibrous forest grazing to the rich plains grasses consisting of <i>Echinochloa pyramidalis</i> , <i>E. scabra</i> , <i>Acroceras macrum</i> , <i>Hemarthria altissima</i> , <i>Leersia hexandra</i> and <i>Vossia cuspidata</i> and it may be two to four months before they regain condition (Veerboom & Brunt, 1970)."

406	Host for recognized pests and pathogens	
	Source(s)	Notes

Qsn #	Question	Answer
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Diseases. It has good disease resistance. Pests. Sting nematodes (<i>Belonolaimus longicaudatus</i>) affected growth of <i>H. altissima</i> at soil temperatures of 18°C (Boyd, Schroder and Perry, 1972). The yellow sugar-cane aphid (<i>Sipha flava</i>) attacks some accessions, but other accessions exhibit a degree of resistance (Oakes, 1978)."
	Newman, Y., Vendramini, J., Sollenberger, L. E., & Quesenberry, K. (2009). Limpograss (<i>Hemarthria altissima</i>) Overview and Management. SSAGR320. Institute of Food and Agricultural Sciences, University of Florida. Gainesville, FL. http://edis.ifas.ufl.edu . [Accessed 13 Dec 2021]	"Spittlebugs may become a problem in limpograss if the grass is left ungrazed, and a thatch accumulates. Mowing or burning the excess grass growth or pasture thatch is the management-control option of choice. Occasionally, damage from chinchbugs (<i>Blissus insularis</i>) and caterpillars -- such as fall army worms (<i>Spodoptera</i>) and loopers (<i>Moscis</i>) -- have been reported. Drought stressed plants may be attacked by a blight characterized by browning of the new growth. This condition has been diagnosed as 'Take-all Root Rot' (<i>Gaeumannomyces graminis</i>), a condition that disappears when the plant tissue is removed by cutting or burning. Sting nematodes can be a significant pest on deep, well drained sands, so planting is not recommended on these areas."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"In Lesotho, children eat the raw rhizomes."
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	[Probably not. Occurs in wetter areas, does not tolerate long drought, or fire, and does not appear to be adapted to frequent fires] "Found in flooded areas, swamps, lakes and vleis. It can withstand short, seasonal dry periods, but does not tolerate long droughts." ... "Fire - It does not tolerate burning."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Light No information available."
	USDA Natural Resources Conservation Service. (2021). <i>Hemarthria altissima</i> . https://plantsorig.sc.egov.usda.gov/java/charProfile?symbol=HEAL5 . [Accessed 14 Dec 2021]	"Shade Tolerance: Intolerant"

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Soil requirements - Grows in soils of any texture, providing moisture is adequate. Tolerates acid soils down to pH 4.5, but is best between 5.5 and 6.5. However, at least one accession, PI 364344, has been shown to tolerate pH down to 4.0, and have a high level of tolerance of excess aluminium and manganese. Similarly, salt tolerance has also been recognized."
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Soil requirements. It tolerates acid soils (CIAT, 1978) and prefers moist, humid soils (Ratray, 1973)."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"A perennial with a creeping, branched rhizome; culms 30- 100 cm high, compressed, usually decumbent and rooting from the lower nodes, generally branched; leaves smooth, glabrous, the blades up to 6 mm wide, usually folded; inflorescence a solitary raceme terminating the culm and its branches, these often in clusters, so there are several racemes from each node; racemes 5-12 cm long, 2-3 mm wide, spikelike, tapering toward the apex."

412	Forms dense thickets	y
	Source(s)	Notes
	Bradley, B.A., Allen, J.M., Griffin, B., Laginhas, B.B. & Rockwell-Postel, M. (2020). Regional Invasive Species & Climate Change Management Challenge: Prioritizing range-shifting invasive plants High-impact species coming to the Northeast. Northeast RISSC Management	" <i>Hemarthria altissima</i> (limpoglass). HIGH Impact: Outcompetes native wetland plants via the creation of dense monocultures and the production of allelopathic compounds."
	Heuzé V., Tran G., Eugène M., Lebas F. (2015). Limpo grass (<i>Hemarthria altissima</i>). Feedipedia, a programme by INRAE, CIRAD, AFZ and FAO. https://www.feedipedia.org/node/617 . [Accessed 14 Dec 2021]	"It forms a dense mat because of its long spreading stolons rooting from the lower nodes."
	Fish, L., Mashau, A. C., Moeaha, M. J., & Nembudani, M. T. (2015). Identification guide to southern African grasses: an identification manual with keys, descriptions and distributions. Strelitzia 36. South African National Biodiversity Institute, Pretoria	"Wet places, in vleis and river margins. Frequency in southern Africa: Sometimes locally dominant."

501	Aquatic	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	[Terrestrial, but in proximity to aquatic habitats] "Natural habitat. Flooded areas, swamps and lakes, vleis."

502	Grass	y
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Qsn #	Question	Answer
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 13 Dec 2021]	Family: Poaceae (alt. Gramineae) Subfamily: Panicoideae Tribe: Andropogoneae Subtribe: Rottboelliinae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 13 Dec 2021]	Family: Poaceae (alt. Gramineae) Subfamily: Panicoideae Tribe: Andropogoneae Subtribe: Rottboelliinae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"A perennial with a creeping, branched rhizome; culms 30-100 cm high, compressed, usually decumbent and rooting from the lower nodes, generally branched"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	von Staden, L. (2020). <i>Hemarthria altissima</i> (Poir.) Stapf & C.E.Hubb. National Assessment: Red List of South African Plants version 2020.1. http://redlist.sanbi.org/species.php?species=1180-1 . [Accessed 14 Dec 2021]	" <i>Hemarthria altissima</i> is widespread, common and not in danger of extinction."
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	[No evidence. Wide distribution] "Native: Europe: Greece (incl. Crete); Italy (incl. Sicily); Spain (incl. Balearic Islands) Africa: Algeria; Botswana; Canary Islands; Chad; Egypt; Ethiopia; Lesotho; Malawi; Mali; Mozambique; Nigeria; Senegal; South Africa; Swaziland; Tanzania; Tunisia; Zambia; Zimbabwe Indian Ocean: Madagascar; Mauritius; Réunion Asia: Georgia; India (Tamil Nadu); Indonesia (Kalimantan); Lebanon; Myanmar; Saudi Arabia; Thailand; Turkey; Vietnam Cultivated: Africa: South Africa; Zimbabwe Australasia: Australia Northern America: USA"

Qsn #	Question	Answer
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). (2006). Flora of China. Vol. 22 (Poaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence] "In or near water, damp places; 700–1900 m. Anhui, Beijing, Guizhou, Heilongjiang, Henan, Hubei, Shandong, Yunnan, Zhejiang [India, Indonesia, Myanmar, Thailand, Vietnam; Africa, SW Asia, Mediterranean region; introduced in America and New Zealand]. <i>Hemarthria altissima</i> occurs naturally mainly from the Mediterranean region through Africa, but there are scattered records from Asia and it is now widely naturalized in warm parts of America."

602	Produces viable seed	Y
	Source(s)	Notes
	Sellers, B. A., Ferrell, J. A., Haller, W. T., Mislevy, P., & Adje M. B. (2007). Phytotoxicity of selected herbicides on limpograss (<i>Hemarthria altissima</i>). <i>Journal of Aquatic Plant Management</i> 45: 54-57	"Agronomically, it produces little to no viable seed and reproduction occurs vegetatively by rooting at individual nodes (Quesenberry et al. 1984). However, preliminary data indicate that seed is highly viable (unpublished data)."
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Seed is not commercially available due to generally poor seed-set."

603	Hybridizes naturally	
	Source(s)	Notes
	Zhang, J., Huang, X., Huang, D. J., Zhang, Y., Huang, L. K., Lu, L., & Yan, H. D. (2016). Studies on genetic diversity and phylogenetic relationships of limpograss (<i>Hemarthria altissima</i>) and related species based on combined chloroplast DNA intergenic spacer data. <i>Biochemical Systematics and Ecology</i> , 69, 91-100	[Unknown. Hybridization between clones may be possible] "Hemarthria R. Br. is a genus which includes important forage grasses. However, there is currently a lack of data analysis on the chloroplast DNA (cpDNA) of <i>Hemarthria</i> species. This study is to use three cpDNA intergenic spacers (trnL-F, trnC-ycf6 and psbC-trnS) to obtain phylogenetic information in 36 <i>Hemarthria</i> samples including four <i>Hemarthria</i> species: <i>Hemarthria altissima</i> (Poir.) Stapf et C. E. Hubb., <i>Hemarthria compressa</i> (L. f.) R. Br., <i>Hemarthria uncinata</i> R. Br., and <i>Hemarthria japonica</i> (Hack.) Roshev. Data analysis revealed that non-significant genetic diversity existed in our samples, which was implied by nucleotide sequences information and the results of haplotypic and nucleotide diversity. The results of phylogenetic trees based on maximum likelihood (ML) and Bayesian inference (BI) revealed that <i>H. altissima</i> and <i>H. compressa</i> samples were not entirely distinct, suggesting that the two species share an intimate genetic relationship. A haplotype median-joining (MJ) network revealed broadly similar results to those derived from the ML and BI trees and implied that haplotype H3 may represent an ancient haplotype. Analysis of the population statistic <i>F_{ST}</i> revealed little genetic differentiation among the seven populations of <i>H. altissima</i> in Africa."

604	Self-compatible or apomictic	
	Source(s)	Notes

Qsn #	Question	Answer
	Jank, L., Valle, C. D., & Resende, R. M. S. (2011). Breeding tropical forages. <i>Crop Breeding and Applied Biotechnology</i> , 11, 27-34	"Other tropical grasses as Pennisetum purpureum, Setaria sphacelata, Andropogon gayanus, Hemarthria altissima, Chloris gayana, Cynodon spp. and Digitaria decumbens reproduce by allogamy." [cross-fertilization]
	Gottschalk, W. (1977). Mutation. In <i>Progress in Botany/Fortschritte der Botanik</i> (pp. 153-172). Springer, Berlin, Heidelberg	"The South African grass Hemarthria altissima exists in the form of diploid, tetraploid, and hexaploid sibs, the polyploids being self-compatible while the diploids are self-incompatible."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Zomlefer, W.B. (1994). <i>Guide to Flowering Plant Families</i> . The University of North Carolina Press, Chapel Hill & London	Poaceae [anemophilous. Wind-pollinated]

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). <i>Tropical Grasses</i> . FAO, Rome	"Ability to spread naturally. It spreads rapidly by creeping rhizomes and culms rooting at the lower nodes."
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). (2006). <i>Flora of China</i> . Vol. 22 (Poaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Perennial, or sometimes annual. Culms loosely tufted to decumbent or stoloniferous, rooting at lower nodes, ascending up to 1.6 m tall, nodes glabrous."

607	Minimum generative time (years)	1
	Source(s)	Notes
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). (2006). <i>Flora of China</i> . Vol. 22 (Poaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Perennial, or sometimes annual. Culms loosely tufted to decumbent or stoloniferous, rooting at lower nodes, ascending up to 1.6 m tall, nodes glabrous."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). <i>Tropical Grasses</i> . FAO, Rome	"It is not a good seed producer." ... "It spreads rapidly by creeping rhizomes and culms rooting at the lower nodes." [No evidence. Unlikely given limited or absent seed production]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Cook, B.G. et al. (2020). <i>Tropical Forages: An interactive selection tool</i> . 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Cultivated: Africa: South Africa; Zimbabwe Australasia: Australia Northern America: USA"

703	Propagules likely to disperse as a produce contaminant	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"It is not a good seed producer." ... "It spreads rapidly by creeping rhizomes and culms rooting at the lower nodes." [No evidence. Unlikely given limited or absent seed production]

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"It is not a good seed producer." ... "It spreads rapidly by creeping rhizomes and culms rooting at the lower nodes." [No evidence. Unlikely given limited or absent seed production]

705	Propagules water dispersed	y
	Source(s)	Notes
	Toth, L. A., & van der Valk, A. (2012). Predictability of flood pulse driven assembly rules for restoration of a floodplain plant community. <i>Wetlands Ecology and Management</i> , 20 (1), 59-75	"Hemarthria is a facultative wetland species that is native to riparian zones along rivers in South Africa (Oakes 1973), and was introduced to Florida for cattle forage in 1964 (Quesenberry et al. 1978). It invaded the restored floodplain from pastures in adjoining tributary watersheds and thrived at the periodically inundated wet prairie sites, as well as, in the deeper, more consistently flooded, central portions of the floodplain (Toth, unpublished)."
	Fish, L., Mashau, A. C., Moeaha, M. J., & Nembudani, M. T. (2015). Identification guide to southern African grasses: an identification manual with keys, descriptions and distributions. <i>Strelitzia</i> 36. South African National Biodiversity Institute, Pretoria	"In a number of genera that are associated with water, the corks inflorescence axes breaks up into short sections, which then float to a new location (<i>Hemarthria altissima</i> , <i>Rottboellia cochinchinensis</i>)."
	Hatch, S.L., Schuster, J.L. & Drawe, D.L. (1999). Grasses of the Texas Gulf Prairies and Marshes. Texas A&M University Press, College Station, TX	"Infrequent on moist ditch banks and other disturbed area of lower and mid Gulf Coast."
	Hitchcock, A.S. (1936). Manual of the grasses of the West Indies. Miscellaneous Publication No. 243. U.S. Department of Agriculture, Washington, D.C.	"Shallow water, ditches, and moist ground."
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Common near aquatic and riparian habitats] "prefers moist humid soils, requires a high rainfall, can withstand seasonal flooding and seasonal droughts, it does not tolerate long droughts, adapted to the wetter flatwood sites, disturbed places, depressions, standing water, ponds, flooded areas, in rivers and on riverbanks, sandy soils, along vleis and stream edges, swamps and lakes, marshy areas"
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). (2006). Flora of China. Vol. 22 (Poaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Presumably Yes] "In or near water, damp places;700–1900 m."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"It is not a good seed producer." ... "It spreads rapidly by creeping rhizomes and culms rooting at the lower nodes." [No evidence. Unlikely given limited or absent seed production]

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"It is not a good seed producer." ... "It spreads rapidly by creeping rhizomes and culms rooting at the lower nodes." [No evidence. Unlikely given limited or absent seed production]

708	Propagules survive passage through the gut	
	Source(s)	Notes
	Sellers, B. A., Ferrell, J. A., Haller, W. T., Mislevy, P., & Adje M. B. (2007). Phytotoxicity of selected herbicides on limpograss (<i>Hemarthria altissima</i>). Journal of Aquatic Plant Management 45: 54-57	[Unknown. Probably dispersed by vegetative fragments, but it may be possible that viable seeds are dispersed by cattle grazing] "Agronomically, it produces little to no viable seed and reproduction occurs vegetatively by rooting at individual nodes (Quesenberry et al. 1984). However, preliminary data indicate that seed is highly viable (unpublished data). No underground rhizomes are produced." ... "limpograss appears to be spreading to other areas of the floodplain, where cattle ranchers did presumably not plant limpograss."

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Due to poor seed set and limited adaptational range, <i>H. altissima</i> poses little or no weed threat on well-drained or heavily grazed land. However, it has been found in natural areas in Florida, and consequently placed on the Florida Exotic Pest Plant Council's Category II invasive plant list. As a precaution, it should be kept isolated from wetlands and regularly monitored in areas where unintended spread might occur. "
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Seed production and harvesting. It is not a good seed producer."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Sellers, B. A., Ferrell, J. A., Haller, W. T., Mislevy, P., & Adje M. B. (2007). Phytotoxicity of selected herbicides on limpograss (<i>Hemarthria altissima</i>). Journal of Aquatic Plant Management 45: 54-57	[Seed longevity unknown] "Agronomically, it produces little to no viable seed and reproduction occurs vegetatively by rooting at individual nodes (Quesenberry et al. 1984). However, preliminary data indicate that seed is highly viable (unpublished data)."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Florida Natural Areas Inventory. (2021). <i>Hemarthria altissima</i> . https://www.fnai.org/species-communities/invasives/invasive-species?ID=68 . [Accessed 14 Dec 2021]	"Chemical: Foliar (96 fl oz/ac/year aquatic imazapyr). Imazapyr provides best control 9-12 months after treatment under dry and flooded conditions. However, repeat treatments when dry should include glyphosate (2% glyphosate+ 0.5% imazapyr)."

Qsn #	Question	Answer
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"H. altissima is tolerant of pre-emergence applications of atrazine. Control of broadleaf weeds is best done with dicamba since the grass is somewhat susceptible to 2,4-D. Annual grasses may be controlled by post-planting applications of atrazine, simazine, ethofumesate and metolachlor. H. altissima can be controlled using paraquat, glyphosate or fluazifop-butyl."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	n
	Source(s)	Notes
	Cook, B.G. et al. (2020). Tropical Forages: An interactive selection tool. 2nd and Revised Edn. International Center for Tropical Agriculture (CIAT), Cali, Colombia and International Livestock Research Institute (ILRI), Nairobi, Kenya. www.tropicalforages.info	"Intolerant of very heavy grazing."
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Tolerance to fire. It will not tolerate burning."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability and elevation range
- Thrives, and can spread, in regions with tropical climates
- Naturalized on Maui (Hawaiian Islands) and elsewhere in America
- An environmental weed in natural areas of Florida
- Allelopathic
- Tolerates many soil types
- May form dense monocultures that can exclude other vegetation
- Reproduces by seeds (rarely) and vegetatively by creeping rhizomes and culms rooting at the lower nodes
- Dispersed by water and intentionally by people

Low Risk Traits

- Naturalized, but no negative impacts, documented in the Hawaiian Islands to date
- Generally regarded as a valuable pasture grass, and non-invasive in most locations where cultivated
- Unarmed (no spines, thorns, or burrs)
- Palatable to grazing animals
- Thrives in high light environments (dense shade may inhibit spread)
- Limited seed production reduces risk of long distance or accidental dispersal
- Herbicides may provide effective control
- Does not tolerate heavy grazing or fire