Taxon: Urochloa mutica (Forssk.) T. Q. Nguyen **Family:** Poaceae

Common Name(s): buffalo grass, California grass, Dutch grass, giant couch, Mauritius grass, para grass, Scotch grass

Synonym(s): Brachiaria mutica (Forssk.) Stapf, Panicum barbinode Trin., Panicum muticum Forssk., Panicum purpurascens Raddi

Assessor: Chuck Chimera **Status:** In Progress **End Date:** 15 May 2019

WRA Score: 18.0 **Designation:** H(Hawai'i) **Rating:** High Risk

Keywords: Palatable Grass, Environmental Weed, Monotypic Stands, Spreads Vegetatively, Rarely Seeds

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)	Intermediate
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		
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	y
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
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
405	Toxic to animals	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
406	Host for recognized pests and pathogens	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	y
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
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	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)		
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/m2)	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)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"economic plant introduced into most tropical countries and widely cultivated, usually nontoxic, one of the best of tropical grasses for pasture, forage grass, often used as green chopped forage" [The species is widely cultivated as a pasture grass but no evidence that it is a cultivar. Cultivated species similar to wild.]

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2019). 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**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native range unknown, now pantropical"
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Native to Africa. Introduced to Hawaii in 1902; now an important forage grass of lowland pastures."
	Whistler, A.W. 1995. Wayside Plants of the Islands: A Guide to the Lowland Flora of the Pacific Island. Isle Botanica, Honolulu, HI	"possibly native to North Africa, but is now pantropic in distribution. It was first recorded from the Pacific Islands in 1877 (Fiji), where it is common to abundant in wet areas along roadsides , in waste places, and in pastures at up to 1000 m elevation."

202	**Quality of climate match data**	**Intermediate**
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Whistler, A.W. 1995. Wayside Plants of the Islands: A Guide to the Lowland Flora of the Pacific Island. Isle Botanica, Honolulu, HI	"...common to abundant in wet areas along roadsides , in waste places, and in pastures at up to 1000 m elevation."

Qsn #	Question	Answer
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Adaptable to a wide range of moisture conditions. Prefers wet regions, growing luxuriantly in swampy areas; yet con survive severe drought. A very troublesome weed in cultivated areas, in wastelands, and along roadsides."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i naturalized and usually forming dense mats in areas of high soil moisture or nearby open water, such as along stream banks, drainage ditches, and roadsides, as well as other disturbed sites, 0-1,060 m"

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Whistler, W. A. (1983). Weed Handbook of Western Polynesia. Germany. Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ), Eschborn	"It is a weed of roadsides and waste places in Samoa."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native range unknown, now pantropical; in Hawai'i naturalized and usually forming dense mats in areas of high soil moisture or nearby open water, such as along stream banks, drainage ditches, and roadsides, as well as other disturbed sites, 0-1,060 m, on Midway Atoll, Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i. First collected on O'ahu in 1924 (Merrill 11, BISH).-"
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Pantropical."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Probably native to flood plains of sub-Saharan tropical Africa. Introduced pan-tropically as a pasture grass of seasonally inundated or high rainfall environments."
	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	"This is a forage grass (Para Grass) widely cultivated in tropical regions of the world and often found as a naturalized escape. Its country of origin is unknown."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Oppenheimer, Hank L. 2003. New plant records from Maui and Hawai'i Counties. Bishop Museum Occasional Papers. 73: 3-30	"According to Wagner et al. (1990: 1504), California grass is naturalized on the Hawaiian Islands of Midway Atoll, Kaua'i, O'ahu, Läna'i, Maui, and Hawai'i. Smith (1985: 208) noted its occurrence on Moloka'i, but did not consider it a pest there. The following collection documents its occurrence on Moloka'i; it was also observed to be fairly common at low elevations on the east end of the island. Material examined: MOLOKA'I: Kala'e, 520 m, 18 Nov 2001, Oppenheimer H110123."

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native range unknown, now pantropical; in Hawai'i naturalized and usually forming dense mats in areas of high soil moisture or nearby open water, such as along stream banks, drainage ditches, and roadsides, as well as other disturbed sites, 0-1,060 m, on Midway Atoll, Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i."
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 15 May 2019]	"Naturalized Africa WESTERN INDIAN OCEAN: Mauritius, Reunion Asia-Temperate EASTERN ASIA: Japan, Taiwan Asia-Tropical INDO-CHINA: Thailand, Vietnam MALESIA: Indonesia, Malaysia Australasia AUSTRALIA: Australia NEW ZEALAND: New Zealand Northern America Mexico, United States Pacific NORTH-CENTRAL PACIFIC: United States [Hawaii] NORTHWESTERN PACIFIC: Marshall Islands, United States [Guam] SOUTH-CENTRAL PACIFIC: Cook Islands, French Polynesia SOUTHWESTERN PACIFIC: Fiji, New Caledonia, Tonga, United States [American Samoa] Southern America CARIBBEAN: Cayman Islands, Cuba, Hispaniola, Jamaica, United States [Puerto Rico, Virgin Islands, U.S.] CENTRAL AMERICA: Central America, Costa Rica, Honduras, Panama NORTHERN SOUTH AMERICA: Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Colombia, Ecuador (incl. Galapagos Is.), Peru SOUTHERN SOUTH AMERICA: Argentina"

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"A very troublesome weed in cultivated areas, in wastelands, and along roadsides." [It is a weed of roadsides and waste places. Answer left blank because this species meets the more serious criteria of 3.03 and 3.04]

303	Agricultural/forestry/horticultural weed	y
	Source(s)	**Notes**
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"it may become a pest, forms dense monotypic stands, floating layers of vegetation, a pest of irrigation ditches and ponds, troublesome weed of sugar cane crops"

Qsn #	Question	Answer
	Low, T. (1997). Tropical pasture plants as weeds. Tropical Grasslands, 31, 337-343	"Para grass is also a major economic weed. It is a serious pest in supply and drainage channels, an aggressive weed of sugar cane (Kleinschmidt and Johnson 1977; Sainty and Jacobs 1981), and an unsightly weed in urban parks."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Para grass is also a significant agricultural weed in a number of crops (Holm et al., 1977)."

304	Environmental weed	y
	Source(s)	**Notes**
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Environmental impact: Interferes with stream flow and poses a nuisance to marine navigation when rafts of the grass float out to sea. Forms monotypic stands in forest openings and marshes, displacing native plants and destroying bird habitats."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i naturalized and usually forming dense mats in areas of high soil moisture or nearby open water, such as along stream banks, drainage ditches, and roadsides, as well as other disturbed sites, 0-1,060 m"
	Low, T. (1997). Tropical pasture plants as weeds. Tropical Grasslands, 31, 337-343	"Para grass is estimated to cover 100 000 ha of swampy land in Queensland, with the potential to invade twice this area (Walker and Weston 1990). In the Northern Territory, it infests 40 000 ha of land. It is a major weed on the Townsville Common, where it displaces water chestnut (Eleocharis dulcis), a major food of magpie geese and brolgas. Attempts to control it with sprays, burning and mechanical extraction, have been unsuccessful. Para grass is also displacing water chestnuts in Kakadu National Park. If the para grass invasion proceeds unchecked, Kakadu could lose one of its major tourist and ecological spectacles - the large flocks of magpie geese. Para grass is rated a category one, major environmental weed of northern Australia, defined by Humphries et al. (1991) as a "species capable of grossly and irreversibly destroying the structure and function of an ecosystem"."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The dense and monospecific stands of the weed choke out other plant species (Cowie and Werner, 1993)." … "In Australia expanding stands of U. mutica destroy breeding sites for waterbirds by replacing the native vegetation. Mats of the grass also reduce the ability to feed in open water, affecting, for example, the magpie goose (Anseranas semipalmata). The gTass contributes to the decline of the yellow chat (Epthianura crocea tunney), an endemic and endangered passerine bird."
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This perennial grass can reach heights of 2 m. It forms dense monotypic stands by layering from trailing stems. It will overgrow most shrubs and trees in its habitat. It has mild allelopathic activity (Chou and Young 1975)." … "The species grows in wet habitats between sea level and 700 m. Open marshy areas, such as Kawainui Swamp, O'ahu, are the principal habitat."

305	Congeneric weed	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed]	"B. humidicola is very aggressive. Its ability to spread rapidly and to form a dense bulk of herbage under light or no grazing prevents other species invading. This may also be related to its ability to inhibit nitrification. It is thus very useful for establishing a pasture in the humid tropics because it prevents the normal explosion of broad-leaved weeds. For the same reason, it is not compatible with most forage legumes, but can combine well with creeping legumes under moderate to high grazing pressures."
	Whistler, W. A. (1983). Weed Handbook of Western Polynesia. Germany. Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ), Eschborn	B. subquadripara is a weed in Samoa and Tonga. Also B. paspaloides and B. reptans are recognized as weeds. [Brachiaria subquadripara (Trin.) Hitchc. Synonym of Urochloa subquadripara (Trin.) R. D. Webster]

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Sprawling perennials; culms up to 6 m long, becoming decumbent and rooting at lower nodes, branching from lower and middle nodes, internodes glabrous, hollow, thick-walled, nodes prominent, retrorsely papillose-hirsute. Sheaths longer than internodes, papillose-hirsute to subglabrous; ligule membranous, 1.5 -1.8 mm long, densely white ciliate, collar finely velvety pubescent; blades flat, up to 25 cm long, up to 15 mm wide, usually glabrous or with a few hairs near base, midrib broad and white above near base, margins thick, purple, scabrous."

402	Allelopathic	y
	Source(s)	**Notes**
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"It has mild allelopathic activity (Chou and Young 1975)."

Qsn #	Question	Answer
	Chou, C. H. (1989). Allelopathic research of subtropical vegetation in Taiwan. IV. Journal of Chemical Ecology, 15 (7), 2149-2159	"The phytotoxicity of plant leachates was evaluated from four subtropical grasses: Brachiaria mutica, Digitaria decumbens, Imperata cylindrica var. Major, and Panicum repens. The aqueous leachate of each grass was used to water the growth of the four grasses in pots. The leachates exhibited variable inhibition of grass growth as compared to the tap water control. By the 41st day after treatment, the leachate of D. decumbens significantly suppressed the growth of itself and retarded that of B. mutica and P. repens. The growth of B. mutica was inhibited by its own leachate, but that of I. cylindrica was not affected by any of the grass leachates. In crop growth rate (CGR) analysis, the four grass leachates exhibited a similar inhibition pattern. In laboratory bioassays, the leachates showed a significant phytotoxic effect on the radicle growth of ryegrass and lettuce. Six phytotoxic phenolics were quantitatively compared by high performance liquid chromatography, and the amount of compounds varied with species. The highest total amount of phytotoxic phenolics occurred in D. decumbens, followed, in decreasing order, by P. repens, B. mutica, and I. cylindrica. These findings show that the leachates of four grasses possess phytotoxic compounds that may play a significant role in grass dominance in the field."

403	Parasitic	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Sprawling perennials" [Poaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"economic plant introduced into most tropical countries and widely cultivated, usually nontoxic, one of the best of tropical grasses for pasture, forage grass, often used as green chopped forage, not suitable for silage, used as fodder grass and for water treatment, stems and leaves very palatable"
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Leaf is highly palatable and selectively grazed. Mature stolons and stems are much less palatable but will be consumed by grazing cattle if no alternative feed is available."

Qsn #	Question	Answer
405	**Toxic to animals**	**n**
	Source(s)	**Notes**
	Ranacou, E. (1986). Review of research and observations on pastures in Fiji (1920 - 1985). Fiji Agricultural Journal, 48: 12-18	"... para grass caused osteoporosis, a bone disorder in horses. This disorder occurred by eating para grass as sole diet but was not observed with cattle."
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Palatability/acceptability - Leaf is highly palatable and selectively grazed. Mature stolons and stems are much less palatable but will be consumed by grazing cattle if no alternative feed is available. Toxicity - No reports of toxicity to ruminant livestock were cited."

406	**Host for recognized pests and pathogens**	**y**
	Source(s)	**Notes**
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"A sap-sucking leafhopper can attack para grass in Fiji. Coccid bug attack associated with sooty mould fungus (Capnodium sp.) can damage young leafy shoots. Pastures can suffer severe attacks from the striped grass worm (Mocis latipes). Blast (Piricularia sp.) and sheath blight (Rhizoctonia sp.) occur in Thailand. Seed heads can be attacked by smut (possibly Tilletia ayresii)."
	Holm, L.G., Plucknett, D.L., Pancho, J.V. & Herberger, J.P. 1977. The World's Worst Weeds: Distribution and Biology. The University Press of Hawaii, Honolulu	Listed as an alternate host of Cassytha filiformis, Helminthosporium sp., Piricularia oryzae, Pythium arrhenomanes, Pythium artotrogus, Pythium rostratum, Sclerospora graminicola and Thaia oryziphon

407	**Causes allergies or is otherwise toxic to humans**	**n**
	Source(s)	**Notes**
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"usually nontoxic" [May affect horses. No evidence for humans]

408	**Creates a fire hazard in natural ecosystems**	**y**
	Source(s)	**Notes**
	Wilson, C., & Mudita, W. (2000). Fire and weeds: interactions and management implications. In ACIAR PROCEEDINGS (pp. 65-68). Australian Centre for International Agricultural Research, Canberra	"Other African species implicated in increased intensity of wildfires include Brachiaria [=Urochloa] mutica (para grass) on seasonally inundated wetlands, which is blamed for the disappearance of some floodplain fringing monsoon rainforest patches in Kakadu National Park (P. Barrow pers. comm.)"
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Para grass can be burnt in the dry season and will recover. It is this ability to produce a bulk of fuel in the wet season when not grazed, together with subsequent hot fires that has caused para grass to be regarded as an environmental weed in ungrazed wetland environments in some countries."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai‘i Press and Bishop Museum Press, Honolulu, HI.	[Wetter habitats may reduce fire risk, but biomass of grass could increase fuel load and fire risk in dry periods or droughts] "in Hawai'i naturalized and usually forming dense mats in areas of high soil moisture or nearby open water, such as along stream banks, drainage ditches, and roadsides, as well as other disturbed sites,"

Qsn #	Question	Answer
409	**Is a shade tolerant plant at some stage of its life cycle**	**y**
	Source(s)	**Notes**
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Moderately tolerant of shade but prefers full sun. Lower shade tolerance than signal grass (B. decumbens). Grown under extensive areas of mature coconuts in the Philippines but prone to weed invasion."

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. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Well adapted to a wide range of soil types (from sandy to clay soils) of moderate to good fertility. Suited to poorly drained (swampy or seasonally waterlogged) land in the tropics and warmer subtropics, but will also grow productively on free-draining soils in high rainfall environments. Tolerates moderate salinity, low pH to 4.5 and high levels of trace elements normally produced under water-logged conditions."

Qsn #	Question	Answer
411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This perennial grass can reach heights of 2 m. It forms dense monotypic stands by layering from trailing stems. It will overgrow most shrubs and trees in its habitat." [It is not a climber and did not find any evidence of it having a smothering habit although with the support of shrubs it can grow to a height of about 15 m.]

Qsn #	Question	Answer
412	**Forms dense thickets**	**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	"Forming a dense cover along streams and in other wet places, sometimes forming floating rafts. Fujian, Hong Kong, cultivated in Taiwan [tropical Africa and America]."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i naturalized and usually forming dense mats in areas of high soil moisture or nearby open water, such as along stream banks, drainage ditches, and roadsides, as well as other disturbed sites, 0-1,060 m"
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This perennial grass can reach heights of 2 m. It forms dense monotypic stands by layering from trailing stems. It will overgrow most shrubs and trees in its habitat."

Qsn #	Question	Answer
501	**Aquatic**	**n**
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial, but common near aquatic habitats] "in Hawai'i naturalized and usually forming dense mats in areas of high soil moisture or nearby open water, such as along stream banks, drainage ditches, and roadsides, as well as other disturbed sites"

502	**Grass**	**y**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 15 May 2019]	Family: Poaceae (alt.Gramineae) Subfamily: Panicoideae Tribe: Paniceae Subtribe: Melinidinae

503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 15 May 2019]	Family: Poaceae (alt.Gramineae) Subfamily: Panicoideae Tribe: Paniceae Subtribe: Melinidinae

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Sprawling perennials; culms up to 6 m long, becoming decumbent and rooting at lower nodes, branching from lower and middle nodes"

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native range unknown, now pantropical" [No evidence of reproductive failure throughout its pantropical range]

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"a poor seed producer, seeds rarely viable,"
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Reproduction is generally by vegetative means, although para grass will flower and produce seed in humid, low latitude environments."

Qsn #	Question	Answer
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Viable seeds are rarely produced in Florida (Langeland and Craddock Burks, 1998)."

603	Hybridizes naturally	
	Source(s)	**Notes**
	Queiroz, D. S., Casagrande, D. R., Moura, G. D. S., Silva, E. A. D., Viana, M. C. M., & Ruas, J. R. M. (2012). Forage species for milk production in lowland soil. Revista Brasileira de Zootecnia, 41(2), 271-280	[Natural hybrid reportedly used in this study. No other reports of natural hybrids were found in the literature] "The objective of this study was to evaluate the forage availability, pasture morphological and chemical composition, pasture carrying capacity and the milk production of cows on three forage grasses under continues stocking and the variable rate on lowland soil. The experimental design was completely randomized with three treatments and three replicates. The treatments were the Paspalum atratum cv Pojuca grass, Brachiaria humidicola cv Llanero grass and tangola grass (natural hybrid of Brachiaria arrecta and Brachiaria mutica)."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Seed production is commonly apomictic, so that little genetic variation is thought to exist within the species."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Reproduction is generally by vegetative means, although para grass will flower and produce seed in humid, low latitude environments. Seed production is commonly apomictic, so that little genetic variation is thought to exist within the species."
	Zomlefer, W.B. 1994. Guide to Flowering Plant Families. The University of North Carolina Press, Chapel Hill & London	[Family Description] "The reduced flowers are anemophilous, although pollen-gathering insects have been reported for some grass species (Soderstrom and Calderon 1971; Terrell and Batra 1984)."

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"It forms dense monotypic stands by layering from trailing stems."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"It reproduces and spreads primarily vegetatively by stem fragments, which are carried by water."

607	Minimum generative time (years)	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Langeland, K.A. & Burks, K.C. (eds.). 2008. Identification and Biology of Nonnative Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL	"Reproduces and spreads primarily by stem fragments (Sainty and Jacobs 1981). Flowers from September through December in Florida (Hall 1978), but production of fertile seeds apparently low (Thompson 1919)."
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	[Time to maturity unknown, but probably irrelevant, as this grass primarily spreads vegetatively] "Reproductive development of para grass is poorly understood. Reported to be a short-day species that flowers most prolifically in humid environments at latitudes of 10–20º. Dry conditions may stimulate flowering in the subsequent wet season. Adequate soil N may also stimulate flowering and seed set. Little or no flowering is reported at subtropical latitudes. In northern Australia, para grass flowers in late April/early May and sets seed in May."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**n**
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"It reproduces and spreads primarily vegetatively by stem fragments, which are carried by water."
	WRA Specialist. (2019). Personal Communication	Unlikely. It is a poor seed producer and the underground stems by means of which it generally spreads are less likely to be dispersed unintentionally.

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Planted for grazing in flat, poorly drained or high rainfall environments. Also used as a cut-and carry forage. Can be cut for hay but is generally slow to dry in the humid environments where it grows productively."

703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	Langeland, K.A. & Burks, K.C. (eds.). 2008. Identification and Biology of Nonnative Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL	"Reproduces and spreads primarily by stem fragments (Sainty and Jacobs 1981). Flowers from September through December in Florida (Hall 1978), but production of fertile seeds apparently low (Thompson 1919)." [Would limit its ability to spread as a contaminant of other pasture crops & products]
	WRA Specialist. (2019). Personal Communication	Species is a poor seed producer. Even commercially cultivated pastures of this grass depend on vegetative means of propagation and not on seed.

704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Caryopsis infrequently developed." [Lack of seed production would minimize, if not eliminate, potential for wind dispersal]
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"It reproduces and spreads primarily vegetatively by stem fragments, which are carried by water. Viable seeds are rarely produced in Florida (Langeland and Craddock Burks, 1998)."

705	Propagules water dispersed	y
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"It reproduces and spreads primarily vegetatively by stem fragments, which are carried by water."
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Spreads rapidly (up to 5 m in a year) into suitably moist soils through its long stolons and possibly through water-borne seed. Para grass has spread throughout the humid tropics following introduction as a pasture grass ."

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"It reproduces and spreads primarily vegetatively by stem fragments, which are carried by water."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"It reproduces and spreads primarily vegetatively by stem fragments, which are carried by water." [Possibly in rare circumstances, but mostly spreads vegetatively and by water]

708	Propagules survive passage through the gut	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown, but it rarely produces seeds and gut passage may be an irrelevant means of dispersal

801	Prolific seed production (>1000/m2)	n
	Source(s)	**Notes**
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"a poor seed producer, seeds rarely viable,"
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Caryopsis infrequently developed."

Qsn #	Question	Answer
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Propagation: By seed, long runners, and cuttings. Rarely flowers."
	Crowder, L. V., & Chheda, H. R. (1982). Tropical Grassland Husbandry. Longman Group Ltd., London	"Seed yield is reported to range from nil to moderate. "
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Viable seeds are rarely produced in Florida (Langeland and Craddock Burks, 1998)."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Hannan-Jones, M. & Csurhes, S. 2012. Invasive species risk assessment: Para grass - Urochloa mutica. The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	"Seed longevity is not known. However, a related species, liverseed grass (Urochloa panicoides P. Beauv.) has 1% seed viability after 2 years buried 0–2 cm deep, and 20% when buried 10 cm deep in a controlled, non-disturbed experiment (Walker et al. 2006)."
	WRA Specialist. (2019). Personal Communication	Unknown, but limited or lack of seed production may make this irrelevant

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Larger stands may be treated with herbicides approved for use in aquatic environments; glyphosate and imazapyr arc effective (Chaudhari et al., 2012; Kaufman and Kaufman, 2012)."
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Management: A weed in wet open forests and aquatic environments. Drizzle applications of glyphosate at 1 lb/acre with a good surfactant cleared Wailoa Pond in Hilo (Robert Nishimoto, Div. of Aquatic Resources, Brachiaria mutica Hawai'i Dept. of Land and Natural Resources) and Hanama'ulu Stream on Kauai. A solution of 1–1.5% glyphosate product in water sprayed to wet the foliage provided control on Maui (Hank Oppenheimer, Maui Pine)"

Qsn #	Question	Answer
804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**n**
	Source(s)	**Notes**
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"it does not withstand heavy grazing"
	Cook, B.G. et al. 2005. Tropical Forages: an interactive selection tool., SIRO, DPI&F(Qld), CIAT and ILRI. http://www.tropicalforages.info/index.htm. [Accessed 15 May 2019]	"Para grass can be burnt in the dry season and will recover. It is this ability to produce a bulk of fuel in the wet season when not grazed, together with subsequent hot fires that has caused para grass to be regarded as an environmental weed in ungrazed wetland environments in some countries."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Small infestations can be removed manually or by mechanical harvesters. Cattle grazing has also been used to control this grass." … "Burning or cutting and subsequent flooding where appropriate has been shown to kill the plants (Chaudhari et al., 2012)."
	WRA Specialist. (2019). Personal Communication	May tolerate some fire, but fire is also recommended for control

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	**n**
	Source(s)	**Notes**
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"It has not been evaluated for biological control because it is a valued pasture grass in lowland areas."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai‘i Press and Bishop Museum Press, Honolulu, HI.	[No evidence of limiting factors in Hawaiian Islands] "in Hawai'i naturalized and usually forming dense mats in areas of high soil moisture or nearby open water, such as along stream banks, drainage ditches, and roadsides, as well as other disturbed sites, 0-1,060 m, on Midway Atoll, Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability, and elevation range exceeds 1000 m, demonstrating environmental versatility
• Thrives in tropical climates
• Naturalized on Midway Atoll, Kauai, Oahu, Lanai, Molokai, Maui, and Hawaii (Hawaiian Islands) and widely naturalized (native range unknown)
• An agricultural and significant environmental weed
• Other Urochloa (formerly Brachiaria) species are invasive
• Allelopathic
• May be toxic to horses in certain situations
• Host of crop pests and pathogens
• Increases fuel load and fire risk
• Moderately shade tolerant
• Tolerates many soil types
• Forms dense cover that excludes other vegetation
• Reproduces by seed (rarely) and vegetatively by trailing stems and fragments
• Apomictic
• Vegetative fragments and seeds (when produced) dispersed by water
• Intentionally cultivated by humans as cattle forage
• May tolerate some fire and moderate grazing

Low Risk Traits
• Regarded as a weed of sugar cane, which is no longer an important economic crop in Hawaii. Grass may now be more value for its palatability to cattle
• Unarmed (no spines, thorns, or burrs)
• Highly palatable to grazing animals
• Reduced, or lack of, seed production minimizes risk for long distance dispersal
• Herbicides may provide effective control