

<b>Taxon:</b> <i>Setaria palmifolia</i>	<b>Family:</b> Poaceae
<b>Common Name(s):</b> highland pitpit palm grass	<b>Synonym(s):</b> <i>Chaetochloa palmifolia</i> Hitchc. & <i>Panicum palmifolium</i> Willd. ex Poir.

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 9 Jun 2015
<b>WRA Score:</b> 22.0	<b>Designation:</b> H(Hawai'i)	<b>Rating:</b> High Risk

**Keywords:** Tropical Grass, Agricultural Weed, Environmental Weed, Shade Tolerant, Dense Cover

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	n
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		
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
406	Host for recognized pests and pathogens	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans		
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	y

Qsn #	Question	Answer Option	Answer
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	n
607	Minimum generative time (years)		
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed		
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)		
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	y
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
	Sillitoe, P. 1983. Roots of the Earth: Crops in the Highlands of Papua New Guinea. Manchester University Press, Manchester, UK	"This vigorous herb is found throughout Asia and the Pacific, although rarely is it cultivated outside Melanesia, which suggest it was possibly domesticated here (where today both wild and cultivated forms occur together)."
	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 domestication of grass naturalized in the Hawaiian Islands] "Native to tropical Asia; in Hawai'i naturalized and often common in mesic valleys, wet forest, and along streams, 240-1,160 m, on O'ahu, Lana'i, Maui, and Hawai'i."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2015. 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
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/">http://www.ars-grin.gov/</a> . [Accessed 7 Jun 2015]	"Native: ASIA-TEMPERATE China: China - Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Xizang, Yunnan, Zhejiang Eastern Asia: Japan - Kyushu [s.], Ryukyu Islands; Taiwan ASIA-TROPICAL Indian Subcontinent: Bhutan; India - Arunachal Pradesh, Assam, Bihar, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, West Bengal; Nepal; Pakistan; Sri Lanka Indo-China: Cambodia; Laos; Myanmar; Thailand; Vietnam Malesia: Indonesia; Malaysia; Papua New Guinea; Philippines"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/">http://www.ars-grin.gov/</a> . [Accessed ]	

Qsn #	Question	Answer
203	<b>Broad climate suitability (environmental versatility)</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"This is a tropical grass that suffers when temperatures fall below about 4.4°C (40°F), and dies to the ground when it freezes. If the roots do not freeze, though, it usually comes back in spring."
	Greenlee, J. 2009. <i>The American Meadow Garden: Creating a Natural Alternative to the Traditional Lawn</i> . Timber Press, Portland, OR	"Zones 9 and 10."
	Meyer, J-Y. 2000. Preliminary review of the invasive plants in the Pacific islands (SPREP Member Countries). Pp. 85-144 in Sherley, G. (ed.). <i>Invasive species in the Pacific: a technical review and draft regional strategy</i> . SPREP, Apia, Samoa	[Elevation range exceeds 1000 m in French Polynesia] "French Polynesia Preliminary list of invasive plants" [ <i>Setaria palmifolia</i> - Habitat (and Locations) = Wet 300–2000 m]

204	<b>Native or naturalized in regions with tropical or subtropical climates</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to tropical Asia; in Hawai'i naturalized and often common in mesic valleys, wet forest, and along streams, 240-1,160 m, on O'ahu, Lana'i, Maui, and Hawai'i. First collected on Hawai'i in 1903 (Carter s.n., BISH)."

205	<b>Does the species have a history of repeated introductions outside its natural range?</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"No precise information is available but records suggest introductions prior to 1923 in Australia, 1927 in Madagascar, 1939 in Belize, 1958 in New Zealand, 1964 in Liberia, 1971 in Venezuela, 1976 in Ethiopia, 1983 in Tenerife, 1994 in Uganda and 1996 in Niger and Zambia (GBIF, 2012)."

301	<b>Naturalized beyond native range</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Edgar, E., & Shand, J. E. (1987). Checklist of Panicoid grasses naturalised in New Zealand; with a key to native and naturalized genera and species. <i>New Zealand Journal of Botany</i> , 25(3), 343-353	"DISTRIBUTION: Auckland City and environs, Rotorua, Hastings."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to tropical Asia; in Hawai'i naturalized and often common in mesic valleys, wet forest, and along streams, 240-1,160 m, on O'ahu, Lana'i, Maui, and Hawai'i. First collected on Hawai'i in 1903 (Carter s.n., BISH)."

Qsn #	Question	Answer
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/">http://www.ars-grin.gov/</a> . [Accessed 8 Jun 2015]	"Naturalized: NORTHERN AMERICA Mexico United States SOUTHERN AMERICA Caribbean: West Indies Mesoamerica: Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua; Panama Northern South America: Guyana; Venezuela Brazil: Brazil Western South America: Colombia; Ecuador"
	Oppenheimer, H.L. 2006. New Hawai'i Plant Records for 2004. Bishop Museum Occasional Papers 88: 10-15	"Palmgrass was known from the islands of O'ahu, Maui, and Hawai'i (Wagner et al. 1999: 1592–1593). On Moloka'i, it may be restricted to a small area; if so, it should be eradicated before it spreads. Material examined. MOLOKA'I: Kaunakakai, 900 m, at intersection of Forestry Rd and rd to Pu'u Kauwa, couple of small patches in Eucalyptus plantings, 31 Mar 2004, Oppenheimer H30414."
	Staples, G. W., Imada, C.T. & Herbst, D. R. 2003. New Hawaiian plant records for 2001. Bishop Museum Occasional Papers. 74: 7-21	"Previously recorded from the islands of O'ahu, Lana'i, Maui, and Hawai'i, <i>Setaria palmifolia</i> is now documented as naturalized on the island of Kaua'i. Although the grass is common on Kaua'i and has been naturalized on the island for many years, this is the first time that it has been collected on the island. Material examined. KAUA'I: Hanalei Distr., near coast adjacent to Pohaku Malumalu, 22° 12' N, 159° 21' W, 6 m, 28 Sep 2001, C. Imada 2001-73 (BISH, K, PTBG)."

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	Aplet, G. H., Anderson, S. J., & Stone, C. P. (1991). Association between feral pig disturbance and the composition of some alien plant assemblages in Hawaii Volcanoes National Park. <i>Vegetatio</i> , 95(1), 55-62	"Alternatively, the strong association of pig digging activity with certain species suggests that alien species assemblages may be the result of localized soil disturbance. Many weedy species require soil disturbance for establishment (Baker & Stebbins 1965; Baker 1974), and Ehrharta, Paspalum, and <i>S. palmifolia</i> are known to invade disturbed sites in Hawaii (Smith 1985; Wagner et al. 1990)."
	Cole, R. J., Litton, C. M., Koontz, M. J., & Loh, R. K. (2012). Vegetation recovery 16 years after feral pig removal from a wet Hawaiian forest. <i>Biotropica</i> , 44(4), 463-471	[Thrives in pig-disturbed sites] "As our data show, the cover of nonnative herbaceous plants was highest in the pig-present sites and cover in that treatment increased substantially over time. This was largely due to the invasive grass, <i>S. palmifolia</i> , which, in contrast to <i>P. cattleianum</i> , had established in dense patches in four of five sites in the pig-present treatment by 2010 but remained confined to a single site on the pig-free side. Similarly, an earlier study in HAVO showed that <i>S. palmifolia</i> was frequently found in conjunction with soil disturbance caused by feral pigs (Aplet et al. 1991) and this species is known to invade disturbed sites throughout Hawaii (Smith 1985, Wagner et al. 1990)."
	WRA Specialist. 2015. Personal Communication	A disturbance-adapted weed with negative environmental impacts. See 3.04

303	Agricultural/forestry/horticultural weed	y
-----	--	---

Qsn #	Question	Answer
	Source(s)	Notes
	Komolafe, D. A. (1976). Weed problems in tree crops in Nigeria. <i>International Journal of Pest Management</i> , 22(2), 250-256	"A preliminary survey of weeds of cocoa, kola, coffee and cashew was made to identify problem weeds in order to understand their distribution and later formulate appropriate methods for their control. " [ <i>Setaria palmifolia</i> listed as a weed of tree crops]
	Malik, Z. H., & Hussain, F. (1990). The distribution of some weeds in wheat field of Kotli, Azad Kashmir. <i>Sarhad Journal of Agriculture</i> , 6(1), 1-4	"A total of 24 weed species belonging to 13 families were identified in wheat fields at 3 sites in Kotli during Mar.-Apr. 1985. The most frequent weeds were <i>Anagallis arvensis</i> and <i>Medicago laciniata</i> , while <i>Scandix pecten veneris</i> , <i>Poa annua</i> , <i>Lathyrus aphaca</i> and <i>Setaria palmifolia</i> were also prevalent."
	Veldkamp, J. F. (1994). Miscellaneous notes on southeast Asian Gramineae. IX. <i>Setaria</i> and <i>Paspalidium</i> . <i>Blumea</i> 39 (1/2), 373-384	"Moist places under thickets, stream banks, forest paths, in coffee (some times in tea) plantations, locally abundant, up to 2050 m altitude."
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	" <i>S. palmifolia</i> is recorded as a weed of transplanted rice in Indonesia, upland rice in Thailand and Vietnam and also in unspecified rice systems in India and Nepal (IRRI, 1989). It can be abundant in tea plantations in Assam and has been recorded in wheat in Kashmir, but there are no data on economic losses or other costs incurred."
	Ohsawa, M. (1982). Weeds of tea plantations. In <i>Biology and ecology of weeds</i> (pp. 435-448). Springer, Netherlands	"The weedy forest plants which can grow under the tea canopy are, for example, <i>Oplismenus compositus</i> , <i>Oxalis lalifolia</i> , <i>Drymaria cordata</i> , and <i>Setaria palmifolia</i> ."
	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	[Potential pasture weed] "Displaces forages in pastures and natives in disturbed areas in mesic to wet forests."
	Moody, K. 1989. Weeds Reported in Rice in South and Southeast Asia. International Rice Research Institute, Manila, Philippines	Listed as a weed of rice in Indonesia
	Dutta, S. K. (1965). Weed control in tea of North East India. <i>International Journal of Pest Management C</i> , 11(1), 9-12	<i>Setaria palmifolia</i> listed among the "most serious monocotyledonous weeds"

304	Environmental weed	y
	Source(s)	Notes
	Stone, C.P., Cuddihy, L.W. & Tunison, J.T. 1992. Responses of Hawaiian Ecosystems to Removal of Feral Pigs and Goats. Pp. 666-704 in Stone et al. (eds.). <i>Alien Plant Invasions in Native Ecosystems of Hawai'i: Management and Research</i> . CPSU, University of Hawaii, Manoa, Honolulu, HI	"Population expansion of these and probably other species subsequent to feral animal removal is likely to occur in some areas without aggressive alien plant management programs. Yellow Himalayan raspberry ( <i>Rubus ellipticus</i> ), Hilo grass ( <i>Paspalum conjugatum</i> ), meaaow ricegrass, strawberry guava, kahili ginger, firetree, banana poka ( <i>Passiflora mollissima</i> ), and palm grass ( <i>Setaria palmifolia</i> ) are the rain forest invaders of most concern in the Park, once feral pigs are gone."

Qsn #	Question	Answer
	<p>U.S. Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants; Designations of Critical Habitat for Plant Species From the Island of Oahu, HI. Federal Register. Vol. 67, No. 102: 37108-37272</p>	<p>"The major threats to <i>Cyanea crispa</i> are habitat alteration and predation by feral pigs; competition with the alien plant species <i>Zingiber zerumbet</i> (awapuhi), <i>Setaria palmifolia</i> (palm grass),..." ...                      "The major threats to <i>Cyanea grimesiana</i> ssp. <i>obatae</i> are habitat degradation by feral pigs; competition from alien plant species such as <i>Buddleia asiatica</i>, <i>Passiflora suberosa</i>, <i>Blechnum occidentale</i>, <i>Thelypteris parasitica</i> (NCN), <i>Psidium cattleianum</i>, <i>Aleurites moluccana</i>, <i>Toona ciliata</i>, <i>Setaria palmifolia</i> ... " ... "The major threats to <i>Tetraplasandra gymnocarpa</i> are competition with the alien plant species <i>Pterolepis glomerata</i>, <i>Aleurites moluccana</i>, <i>Eucalyptus</i> sp. (gum tree), <i>Setaria palmifolia</i> ..."</p>
	<p>U.S. Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Thirteen Plants From the Island of Hawaii, State of Hawaii. Federal Register Volume 61, Number 198: 53138-53153</p>	<p>"The major threats to <i>Phyllostegia warshaueri</i> are habitat destruction by pigs; competition from alien plant taxa, like thimbleberry, strawberry guava, <i>Setaria palmifolia</i> (palmgrass) ... " ...                      "<i>Setaria palmifolia</i> (palmgrass), native to tropical Asia, has become naturalized in mesic valleys, wet forests, and along streams on Oahu, Lanai, Maui, and Hawaii. First collected in 1903, major infestations can now be found in the Olaa area and the windward side of the island of Hawaii (Cuddihy and Stone 1990, O'Connor 1990). Palmgrass is a threat to <i>Sicyos alba</i> and <i>Phyllostegia warshaueri</i> (HPCC 1993c; M. Brueggemann, in litt., 1994)."</p>
	<p>Space, J.C. &amp; Flynn, T. 2002. Report to the Government of Samoa on invasive plant species of environmental concern. USDA Forest Service, Honolulu, HI</p>	<p>"Vigorous, monospecific stands of the grass <i>Setaria palmifolia</i> (vao 'ofe'ofe, palmgrass, short pitpit) were seen in the Vailima Reserve and the Alaoa area. Wind or birds distribute its seeds. It is invasive in Tahiti and Hawai'i and is on the New Zealand noxious weed list. "</p>
	<p>Harrington, R. A., &amp; Ewel, J. J. (1997). Invasibility of tree plantations by native and non-indigenous plant species in Hawaii. <i>Forest Ecology and Management</i>, 99(1-2), 153-162</p>	<p>[Reduces native plant diversity in understory of tree plantations]                      "The abundance of native plants in the understory was inversely related to the density of non indigenous plant species in our study plots (Fig. 5). Although the correlation was imperfect, high numbers of native plants were observed only at low densities of alien plants, and low numbers of natives were observed when the density of aliens was high. A similar decrease in the density of native plants was observed with increasing cover of the exotic palmgrass, <i>Setaria palmifolia</i>..."</p>
	<p>Tunison, J.T. &amp; Stone, C.P. 1992. Special Ecological Areas: An Approach to Alien Plant Control in Hawaii Volcanoes National Park. Pp. 781-798 in Stone et al. (eds.). <i>Alien Plant Invasions in Native Ecosystems of Hawai'i: Management and Research</i>. CPSU, University of Hawaii, Honolulu, HI</p>	<p>[<i>S. palmifolia</i> controlled in SEAs] "Eleven alien plant species were targeted for control in Special Ecological Areas: firetree, kahili ginger, strawberry guava, banana poka, Jerusalem cherry (<i>Solanum pseudocapsicum</i>), palm grass (<i>Setaria palmifolia</i>), silk oak, olive (<i>Olea europaea</i> subsp. <i>africana</i>), fountain grass (<i>Pennisetum setaceum</i>), yellow Himalayan raspberry (<i>Rubus ellipticus</i>), and nasturtium (<i>Tropaeolum majus</i>)."</p>
	<p>Lorence, D. H., &amp; Perlman, S. (2007). A new species of <i>Cyrtandra</i> (Gesneriaceae) from Hawai'i, Hawaiian Islands. <i>Novon</i>, 17(3), 357-361</p>	<p>[<i>S. palmifolia</i> threatens a rare taxon] "A new Hawaiian species of the Pacific genus <i>Cyrtandra</i> J. R. Forster &amp; G. Forster, <i>C. wagneri</i> Lorence &amp; Perlman, is described from the island of Hawaii." ... "Due to its restricted distribution, small population size, and vulnerability to threats from feral animals, weeds, and stochastic events, it is considered to be critically endangered (CR) based on IUCN Red List criteria." ... "Two other highly invasive weeds, <i>Hedychium gardnerianum</i> Ker Gawler and <i>Setaria palmifolia</i> (J. Konig) Stapf, were recently observed to be gaining a strong foothold just downstream of the Kilau stream population (K. Wood, pers. comm., Jan. 2007). All these factors threaten the long-term survival of this new <i>Cyrtandra</i> species."</p>

Qsn #	Question	Answer
	Oppenheimer, H., & Lorence, D. H. (2012). A new species of <i>Cyanea</i> (Campanulaceae, Lobelioideae) from Maui, Hawaiian Islands. <i>PhytoKeys</i> 13: 15–23	[ <i>Setaria palmifolia</i> listed among weed threats] " <i>Cyanea kauaulaensis</i> should be considered Critically Endangered due to its limited range, low population numbers, lack of population structure and poor seedling recruitment, probable loss of most or all of its avian pollinators and dispersal agents, landslides, flooding, herbivory by alien slugs and rats, and competition with alien plants"
	U.S. Fish and Wildlife Service. 2010. <i>Poa mannii</i> (Mann's bluegrass). 5-Year review. Pacific Islands Fish and Wildlife Office, Honolulu, HI	[ <i>Setaria palmifolia</i> listed among weed threats] "Threats to <i>Poa mannii</i> include habitat damage and trampling by pigs ( <i>Sus scrofa</i> ) and goats ( <i>Capra hircus</i> ) (Factors A and D), and competition with invasive introduced plant species"
	U.S. Fish and Wildlife Service. 2000. Endangered and Threatened Wildlife and Plants; Determinations of Prudency and Designations of Critical Habitat for Plant Species From the Islands of Maui and Kahoolawe, Hawaii. Federal Register Vol. 65, No. 243: 79192-79275	[Threat to <i>Cyanea mceldowneyi</i> ] "The threats to this species are habitat degradation and physical destruction by feral pigs; small number of populations and individuals (57 FR 20772); and competition with alien plant species, especially <i>Setaria palmifolia</i> (palmgrass) (USFWS 1997)."
	U.S. Fish and Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Determination of Endangered Species Status for 15 Species on Hawaii Island. Final Rule. Federal Register Vol. 78, No. 209: 64638-64690	[Threat to <i>Cyanea tritomantha</i> , <i>Pritchardia lanigera</i> , and <i>Stenogyne cranwelliae</i> ] "The nonnative grasses <i>Axonopus fissifolius</i> , <i>Ehrharta stipoides</i> , <i>Paspalum conjugatum</i> , and <i>Setaria palmifolia</i> also pose a threat to the three species in this ecosystem (HBMP 2010c; HBMP 2010f; HBMP 2010k), because they form thick mats that prevent growth and regeneration. These nonnative plant species pose serious and ongoing threats to the three species that depend on this ecosystem."

305	Congeneric weed	y
	Source(s)	Notes
	Boonman, J.G. 1993. East Africa's grasses and fodders: their ecology and husbandry. Kluwer Academic Publishers, Dordrecht, The Netherlands	"A drawback of <i>Setaria</i> when fields are ploughed is that seedlings volunteer in subsequent crops. Seedlings can achieve a complete cover and dominate other grasses. This characteristic is shared with <i>Brachiaria</i> and <i>Panicum</i> , but not with <i>Rhodesgrass</i> (Table 6.6)."
	Rhoades, C.C., Eckertl, G.E. & Coleman, D.C. 1998. Effect of Pasture Trees on Soil Nitrogen and Organic Matter: Implications for Tropical Montane Forest Restoration. <i>Restoration Ecology</i> 6(3): 262-270	"In lower-montane ecosystems of Ecuador, <i>Setaria sphacelata</i> (foxtail grass), the predominant introduced pasture species, forms a tussock grassland that reduces soil nitrogen and resists recolonization of forest vegetation."



Qsn #	Question	Answer
	Dekker, J. 2003. The Foxtail ( <i>Setaria</i> ) Species-Group. Weed Science 51(5): 641-656	" <i>Setaria</i> spp. are very successful invasive, agricultural weeds. Their success is founded on genetic and phenotypic biodiversity, which results in complex, dynamic soil seed bank behaviour (dormancy, after ripening, germination and seedling emergence). Observed seed behaviour is a consequence of interactions between heterogeneous seed and changing environmental inputs. Given the restraints imposed by seed morphology and the stimulatory effects of oxygen and carbon monoxide on seed germination, it is hypothesized that foxtail seed behaviour is regulated by the amount of oxygen dissolved in water taken into the seed over time. This hypothesis implies that the signal stimulating foxtail behaviour is the quantity of oxygen within the water content of the seed symplast (caryopsis) per time unit: mass O <sub>2</sub> -1 volume H <sub>2</sub> O-1 time-1 seed-1. If this hypothesis is true, then the nature of the signal stimulating foxtail seed behavior can be deduced by computations with hourly soil temperature and daily moisture weather data and used as a predictive tool. We discuss the knowledge with which this hypothesis is derived and present sample calculations of the acute and chronic H <sub>2</sub> O-O <sub>2</sub> signals we are currently attempting to correlate with observed foxtail seedling emergence patterns in the field. Sustainable weed management systems could be improved when real-time information is available to the producer about weedy pests. Predicting foxtail seedling emergence may be possible by combining information about the heterogeneity of dormancy states among seed in the soil and computations of oxygen mass per seed from real time soil meteorological data."

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] "Perennials; culms erect, 10-20 dm tall, appressed-hispid below and at nodes. Sheaths papillose-hispid; ligule membranous, margins ciliate, apex rounded to truncate; blades narrowly elliptic, up to 50 cm long, up to 90 mm wide, strongly nerved, plicate, upper surface scabrous, lower surface pubescent, apex acuminate, base narrowed."

402	Allelopathic	n
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Unknown

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.	"Perennials; culms erect, 10-20 dm tall" [Poaceae. No evidence]

404	Unpalatable to grazing animals	n
-----	--------------------------------	---

Qsn #	Question	Answer
	Source(s)	Notes
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"It is included in a mix of grasses fed to cattle in Sikkim (Das, 2005) and is regarded as an important component of natural pastures for goats in Meghalaya (Singh and Mudgal, 1999). Its nutritive value of was estimated in goats: the grass contained 47.6% TDN, 8.16% DCP and 28% starch equivalent with a nutritive ratio of 1:4.8; however, Gupta and Balaraman (1988) concluded that intake of grass in terms of TDN and minerals were inadequate to meet maintenance requirements of goats."
	Borah, J., & Deka, K. (2002). Nutritional Evaluation of Forage Preferred by Wild Elephants in the Rani Range Forest, Assam, India. <i>Gajaha</i> 28: 41-43	"Table 1. Proximate analysis of grasses, plants and tree leaves preferably eaten by elephants in Rani Range Forest, Assam, India (% on DM basis)." [ <i>Setaria palmifolia</i> consumed by elephants]
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). <i>Hawaii's terrestrial ecosystems: preservation &amp; management</i> . CPSU, Honolulu, HI	"The young shoots are eaten by feral pigs, which intensify infestations by uprooting neighboring vegetation, creating new areas for establishment."
	Bora, J., Saikia, A., & Baruah, K. K. (1986). Chemical Composition and Nutritive Value of Aruna ( <i>Setaria palmifolia</i> ) Grass for Cattle. <i>Indian Journal of Animal Nutrition</i> , 3(4), 282-284	[Palatable to cattle] "The nutritive value of a luxuriant, local fodder Aruna ( <i>Setaria palmifolia</i> ) grass found in plains and hilly tracts of North-Eastern state of India was determined by conducting a metabolism and balance trial in 5 crossbred cattle. The voluntary DM intake was 2.1 ±0.04 kg per 100 kg body weight. The digestibility coefficients of DM, EE, CF and NFE were 64.57±1.68, 62.53±1.61, 63.85±1.75, 72.05±1.30 and 62.33±1.87, respectively. Anuna grass contained 8.76±0.23% DCP, 57.87±1.46% TDN, 48.52±1.56% SE 2553 Kcal DE, and 2093 Kcal ME/kg in DM basis. The positive N, Ca, P balances suggested the suitability of the fodder for cattle."

405	Toxic to animals	n
	Source(s)	Notes
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	[No evidence] "It is included in a mix of grasses fed to cattle in Sikkim (Das, 2005) and is regarded as an important component of natural pastures for goats in Meghalaya (Singh and Mudgal, 1999). Its nutritive value of was estimated in goats: the grass contained 47.6% TDN, 8.16% DCP and 28% starch equivalent with a nutritive ratio of 1:4.8; however, Gupta and Balaraman (1988) concluded that intake of grass in terms of TDN and minerals were inadequate to meet maintenance requirements of goats."
	Wagstaff, D.J. 2008. <i>International poisonous plants checklist: an evidence-based reference</i> . CRC Press, Boca Raton, FL	No evidence

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

Qsn #	Question	Answer
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Natural enemies of <i>S. palmifolia</i> include the eriophyd mite <i>Catarhinus palmifolies</i> in Taiwan (Huang KunWei, 2005); <i>Phacellium paspali</i> and <i>Cercospora setariae</i> are also reported from Taiwan by Kirschner et al. (2004). The fungus <i>Phyllachora setariicola</i> is also quite widely reported (Cannon, 2001). It is a host of root-knot nematodes ( <i>Meloidogyne</i> spp.) in Fiji (Singh et al., 2010). None have been used or tested for biological control."
	Rosenkranz, E. 1978. Grasses native or adventive to the United States as new hosts of maize dwarf mosaic and sugarcane mosaic viruses. <i>Phytopathology</i> 68: 175-179	"One hundred gramineous species, comprising 51 native and 49 adventive grasses, were tested for reaction to inoculation with maize dwarf mosaic virus strains A (MDMV-A) and B (MDMV-B) and sugarcane mosaic virus strain B (SCMV-B)." ... "The overseasoning of MDMV-B also may be sought in perennial ornamental grasses, such as <i>Pennisetum latifolium</i> and <i>Setaria palmifolia</i> , both of which are susceptible to MDMV-B."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	Notes
	Macfarlane, D. 2000. Country Pasture/Forage Resource Profiles - Papua New Guinea. FAO. Rome, Italy	"Coix lachrma-jobi, maize, <i>Setaria palmifolia</i> , <i>Saccharum edule</i> are grown as cereals or vegetables;"
	Green, K. 2014. Plantiful: Start Small, Grow Big with 150 Plants That Spread, Self-Sow, and Overwinter. Timber Press, Portland, OR	"Palm grass leaves last well in water but are covered in a pelt of splintery filaments that lodge invisibly in finger skin so don't pick them without gloves on (or use a piece of tape to remove the splinters)."
	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	"Stiff hairs at nodes make it irritating to handle."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"The hairs on the foliage proved to be an irritant, however, and gardeners disliked the itching that resulted from working around the plant."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence of toxicity

408	Creates a fire hazard in natural ecosystems	
	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	"Palmgrass is well-adapted to fire."
	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.	[Possibly, although common in less fire prone areas] "in Hawai'i naturalized and often common in mesic valleys, wet forest, and along streams"
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Possibly. Dense stands may increase fuel loads, but occurs in areas with low fire risk] "It thrives in shady, moist, sheltered situations and needs no special care."

409	Is a shade tolerant plant at some stage of its life cycle	y
-----	---	---

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Sillitoe, P. 1983. Roots of the Earth: Crops in the Highlands of Papua New Guinea. Manchester University Press, Manchester, UK	"Although it cannot tolerate conditions that are too wet, this plant likes damp situations and thrives in shade ones."
	Michael, P. (ed.). 2012. The Master Weed Wackers Manual. A compilation of the most common weeds found on Port Macquarie Landcare sites. Port Macquarie Landcare Group, Inc., Port Macquarie, NSW	"Ecology: An escaped ornamental that produces prolific seed. The plants are strongly rooted and form tussocks that exclude other vegetation. It is tolerant of shade and prefers damp areas."
	Greenlee, J. 2009. The American Meadow Garden: Creating a Natural Alternative to the Traditional Lawn. Timber Press, Portland, OR	"Grows in sun or considerable shade."
	Hitchcock, A.S. 1936. Manual of the grasses of the West Indies. Miscellaneous Publication No. 243. U.S. Department of Agriculture, Washington, D.C.	"Rocky woods and shady banks, often growing in large colonies, a native of southeastern Asia; introduced in Jamaica."

<b>410</b>	<b>Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Sillitoe, P. 1983. Roots of the Earth: Crops in the Highlands of Papua New Guinea. Manchester University Press, Manchester, UK	"It is adaptable and will grow well in a large range of soils. Hence it may be cultivated in any kind of garden except a waterlogged one."
	Greenlee, J. 2009. The American Meadow Garden: Creating a Natural Alternative to the Traditional Lawn. Timber Press, Portland, OR	"Tolerates a wide variety of soils."

<b>411</b>	<b>Climbing or smothering growth habit</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	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.	"Perennials; culms erect, 10-20 dm tall, appressed-hispid below and at nodes."

<b>412</b>	<b>Forms dense thickets</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Pratt, L. W., & Abbott, L. L. (1997). Rare plants within managed units of 'Ola'a Forest, Hawaii Volcanoes National Park. Coop. Nat. Park Res. Studies Unit, University of Hawaii, Honolulu, HI	"The eastern third of the large tract of 'Ola'a was found to be heavily invaded by palmgrass ( <i>Setaria palmifolia</i> ); because of dense palmgrass and other weeds, few significant rare plant resources are thought to be in the southeastern reaches of 'Ola'a Tract."
	Space, J.C. & Flynn, T. 2002. Report to the Government of Samoa on invasive plant species of environmental concern. USDA Forest Service, Honolulu, HI	"Vigorous, monospecific stands of the grass <i>Setaria palmifolia</i> (vao 'ofe'ofe, palmgrass, short pitpit) were seen in the Vailima Reserve and the Alaoa area."
	Harrington, R. A., & Ewel, J. J. (1997). Invasibility of tree plantations by native and non-indigenous plant species in Hawaii. Forest Ecology and Management, 99(1-2), 153-162	[Dense cover reduces native recruitment] "Recruitment and/or survival of native seedlings may have also been suppressed by the dense cover of the non-indigenous palmgrass. <i>Setaria palmifolia</i> . in plots where the Eucalyptus and Psidium canopies were open; we observed fewer native species in plots where the cover of palmgrass was high."

Qsn #	Question	Answer
	Cole, R. J., Litton, C. M., Koontz, M. J., & Loh, R. K. (2012). Vegetation recovery 16 years after feral pig removal from a wet Hawaiian forest. <i>Biotropica</i> , 44(4), 463-471	[Establishes dense patches] "As our data show, the cover of nonnative herbaceous plants was highest in the pig-present sites and cover in that treatment increased substantially over time. This was largely due to the invasive grass, <i>S. palmifolia</i> , which, in contrast to <i>P. cattleianum</i> , had established in dense patches in four of five sites in the pig-present treatment by 2010 but remained confined to a single site on the pig-free side."

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 grass] "in Hawai'i naturalized and often common in mesic valleys, wet forest, and along streams"

502	Grass	y
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/">http://www.ars-grin.gov/</a> . [Accessed 7 Jun 2015]	"Family: Poaceae (alt. Gramineae) subfamily: Panicoideae tribe: Paniceae"

503	Nitrogen fixing woody plant	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.	Poaceae

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.	"Perennials; culms erect, 10-20 dm tall, appressed-hispid below and at nodes."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes

Qsn #	Question	Answer
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: Invasive Species Compendium. Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	[No evidence] " <i>S. palmifolia</i> is native to tropical Asia but has been introduced deliberately or otherwise further east to Australia, New Zealand, Pacific Islands and South and Central America. There are single records for Florida and Texas in the USA in 2003 (Missouri Botanic Garden, 2012). A number of sources suggest occurrence in West Africa, from Sierra Leone to Cameroon (Burkhill, 1985). However, Burkhill mentions that some specimens at least have been re determined. However, there are apparently sound sporadic records from southern Ethiopia in 1976, Liberia in 1964, Uganda in 1994, Niger in 1996 and Madagascar in 1927 (GBIF, 2012). There is no indication as to whether these populations had become naturalized. But a record from southern Zambia in 1996 indicates it was 'widespread in shady under-story' (Missouri Botanic Garden, 2012). In Japan most modern records are from the extreme south of the country or from the Island of Okinawa, but there is one fossil record from Honshu Island further north (GBIF, 2012)."

602	Produces viable seed	y
	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.	"Caryopsis pale brown, ovoid, compressed, ca. 2 mm long."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Propagation is usually be seed."
	Moreno-Casasola, P., Rosas, H. L., & Rodríguez-Medina, K. (2014). From tropical wetlands to pastures on the coast of the gulf of Mexico. <i>Pastos</i> , 42(2), 185-217	"reproduces only by seeds, dispersed by wind, animals"
	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	" <i>Setaria palmaefolia</i> (Koen.) Stapf (Palmgrass) This large-leaved, perennial grass reaches heights of almost 2 m, shading out other herbaceous vegetation. The seeds are distributed passively or by granivorous birds."

603	Hybridizes naturally	
	Source(s)	Notes
	Veldkamp, J. F. (1994). Miscellaneous notes on southeast Asian Gramineae. IX. <i>Setaria</i> and <i>Paspalidium</i> . <i>Blumea</i> 39 (1/2), 373-384	[Unknown. Hybridization documented in genus] " <i>Setaria italica</i> " ... "Supposed to have been derived from <i>S. viridis</i> with which it may hybridize naturally (Darmency et al., 1987). The generally sterile (but not all!) hybrids are indistinguishable from <i>S. viridis</i> var. <i>major</i> (Gaud.) Posp., which may have originated a wild x crop hybrid."

Qsn #	Question	Answer
604	<b>Self-compatible or apomictic</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Floridata. 2015. <i>Setaria palmifolia</i> . <a href="http://mobile.floridata.com/Plants/Poaceae/Setaria%20palmifolia/816">http://mobile.floridata.com/Plants/Poaceae/Setaria%20palmifolia/816</a> . [Accessed 9 Jun 2015]	"It will self-seed in warm climates but seedlings are shallow rooted and easy to eliminate."
	Darmency, H. 2005. Incestuous relations of foxtail millet ( <i>Setaria italica</i> ) with its parents and cousins. Pp 81-96 in <i>Crop fertility and volunteerism</i> . CRC Press, Boca Raton, FL	[Unknown for <i>S. palmifolia</i> ] "Setaria species are usually considered as highly autogamous (self-fertile)."

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

606	Reproduction by vegetative fragmentation	n
	<b>Source(s)</b>	<b>Notes</b>
	Michael, P. (ed.). 2012. <i>The Master Weed Wackers Manual</i> . A compilation of the most common weeds found on Port Macquarie Landcare sites. Port Macquarie Landcare Group, Inc., Port Macquarie, NSW	"Dispersal: Seeds which drop from a parent freely germinate, helping create dense infestations. It is dispersed over long ranges in riparian water flow and during grass cutting."
	Moreno-Casasola, P., Rosas, H. L., & Rodríguez-Medina, K. (2014). From tropical wetlands to pastures on the coast of the gulf of Mexico. <i>Pastos</i> , 42(2), 185-217	"Perennial, rhizomes, forms pure colonies, rhizome mass excludes all other vegetation; reproduces only by seeds"
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	[Possibly, but a tussock grass, so rhizome fragmentation should be minimal] "The plant may be dispersed as rhizome fragments but the spread of individual plants by rhizome is very limited. Most spread is therefore by seeds which are produced quite abundantly. There is little published, however, on germination requirements or dormancy."

607	Minimum generative time (years)	
	<b>Source(s)</b>	<b>Notes</b>
	Horticopia Inc. 2014. <i>Setaria palmifolia</i> 'Rubra Variegata'. <a href="http://www.horticopia.com/hortpip/Plants/html/008/P17508.shtml">http://www.horticopia.com/hortpip/Plants/html/008/P17508.shtml</a> . [Accessed 9 Jun 2015]	"Growth rate: Fast"
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Unknown] "Perennials; culms erect, 10-20 dm tall"

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Michael, P. (ed.). 2012. The Master Weed Wackers Manual. A compilation of the most common weeds found on Port Macquarie Landcare sites. Port Macquarie Landcare Group, Inc., Port Macquarie, NSW	"It is dispersed over long ranges in riparian water flow and during grass cutting."
	Queensland Government. 2011. Weeds of Australia. Palm-leaved setaria <i>Setaria palmifolia</i> . <a href="http://keyserver.lucidcentral.org/weeds/data/080c0106-040c-4508-8300-0b0a06060e01/media/Html/Setaria_palmifolia.htm">http://keyserver.lucidcentral.org/weeds/data/080c0106-040c-4508-8300-0b0a06060e01/media/Html/Setaria_palmifolia.htm</a> . [Accessed 9 Jun 2015]	"This species reproduces only by seed, which are mainly dispersed by wind or seed-eating (i.e. granivorous) birds. They may also be spread by water or in dumped garden waste."
	Goodland, T. & Healey, J.R. 1996. The invasion of Jamaican montane rainforests by the Australian tree <i>Pittosporum undulatum</i> . School of Agricultural and Forest Sciences, University of Wales, Bangor, UK	[Common along trails] " <i>Setaria palmifolia</i> (J. Koenig) Stapf is a shade tolerant grass now common along trails in the area, forming dense patches."
	Taylor, B. D., & Goldingay, R. L. (2003). Cutting the carnage: wildlife usage of road culverts in north-eastern New South Wales. <i>Wildlife Research</i> , 30(5), 529-537	[Dominates roadside disturbed areas during wildlife culvert construction] "Disturbance caused by the bypass construction generally extended 5 m from the exclusion fencing/culvert entrance and was dominated by thick stands of exotic palm grass ( <i>Setaria palmifolia</i> ) and molasses grass ( <i>Melinis minutiflora</i> )."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Hitchcock, A.S. & Chase, A. 1951. Manual of the Grasses of the United States. Second Edition. U.S. Department of Agriculture, Washington, D.C.	"Cultivated in the South and in greenhouses for ornament"
	Greenlee, J. 2009. The American Meadow Garden: Creating a Natural Alternative to the Traditional Lawn. Timber Press, Portland, OR	Cultivated as an ornamental

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: Invasive Species Compendium. Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	[Possibly. No documented evidence cited] "The seeds are very small and inconspicuous and could readily be introduced as contaminants of other pasture grass seed."

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Moreno-Casasola, P., Rosas, H. L., & Rodríguez-Medina, K. (2014). From tropical wetlands to pastures on the coast of the gulf of Mexico. <i>Pastos</i> , 42(2), 185-217	"dispersed by wind, animals"



Qsn #	Question	Answer
705	<b>Propagules water dispersed</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Michael, P. (ed.). 2012. The Master Weed Wackers Manual. A compilation of the most common weeds found on Port Macquarie Landcare sites. Port Macquarie Landcare Group, Inc., Port Macquarie, NSW	"Dispersal: Seeds which drop from a parent freely germinate, helping create dense infestations. It is dispersed over long ranges in riparian water flow and during grass cutting."

706	Propagules bird dispersed	
	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	[Possibly. Granivorous birds would likely act as seed predators, but may possibly disperse viable seeds] "The seeds are distributed passively or by granivorous birds."

707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	Aplet, G. H., Anderson, S. J., & Stone, C. P. (1991). Association between feral pig disturbance and the composition of some alien plant assemblages in Hawaii Volcanoes National Park. <i>Vegetatio</i> , 95(1), 55-62	"In addition to creating good seedbed conditions, pigs may act as seed dispersers. All five of the species in the Ehrharta group are animal dispersed (Smith 1985). Ehrharta produces awned fruits which are easily dispersed on animal fur. <i>S. palmifolia</i> is passively dispersed, and <i>Paspalum conjugatum</i> Bergius (Hilo grass), a congener of <i>P. urvillei</i> , is animal dispersed."
	Moreno-Casasola, P., Rosas, H. L., & Rodríguez-Medina, K. (2014). From tropical wetlands to pastures on the coast of the gulf of Mexico. <i>Pastos</i> , 42(2), 185-217	[Possibly externally dispersed due to small size, although seeds lack specific means of external attachment] "dispersed by wind, animals"

708	Propagules survive passage through the gut	
	Source(s)	Notes
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"Presumably domestic livestock could also cause dispersal on a local basis."

Qsn #	Question	Answer
	Shiels, A. B. (2011). Frugivory by introduced black rats ( <i>Rattus rattus</i> ) promotes dispersal of invasive plant seeds. <i>Biological Invasions</i> , 13(3), 781-792	"Rats ate pericarps (fruit tissues) and seeds of most species, and the impacts on these plants ranged from potential dispersal of smallseeded (B1.5 mm length) species via gut passage (e.g., <i>Clidemia hirta</i> , <i>Buddleia asiatica</i> , <i>Ficus microcarpa</i> , <i>Miconia calvenscens</i> , <i>Rubus rosifolius</i> ) to predation where \15% of the seeds survived (e.g., <i>Bischofia javanica</i> , <i>Casuarina equisetifolia</i> , <i>Prosopis pallida</i> , <i>Setaria palmifolia</i> )." ... "Seeds of four of these 15 species, including <i>Miconia</i> , <i>Setaria</i> , <i>Casuarina</i> , and <i>Prosopis</i> , appeared most attractive to rats because <12% of their seed masses remained (Fig. 1)." ... "Of the nine species with the lowest seed survival (\35%), <i>Bischofia</i> , <i>Casuarina</i> , <i>Setaria</i> , and <i>Prosopis</i> had <15% survival (Fig. 2), which amounts to an average of ca. one or three surviving seeds per fruit for <i>Casuarina</i> and <i>Prosopis</i> , respectively, and generally no surviving seeds per fruit for <i>Bischofia</i> and <i>Setaria</i> " ... "Almost every seed of <i>Setaria</i> that was offered to black rats was consumed and destroyed, as were [80% of the seeds of the grass <i>Urochloa</i> (formerly <i>Panicum maximum</i> ), which is an aggressive colonizer in tree plantations and disturbed sites (Ostertag et al. 2008). Both <i>Setaria</i> and <i>Urochloa</i> seed fragments and vegetative stalks were found in stomachs of black rats captured near agricultural fields in Hawaii (Kami 1966)."
	Kami, H. T. (1966). Foods of rodents in the Hamakua District, Hawaii. <i>Pacific Science</i> 20: 367-373	[Rodents are seed predators of <i>S. palmifolia</i> ] "The seeds and stalks of <i>Panicum maximum</i> , <i>P. purpurascens</i> , and <i>Setaria palmifolia</i> were preferred to other available grasses by both <i>R. rattus</i> and <i>R. exulans</i> ,"

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Michael, P. (ed.). 2012. <i>The Master Weed Wackers Manual</i> . A compilation of the most common weeds found on Port Macquarie Landcare sites. Port Macquarie Landcare Group, Inc., Port Macquarie, NSW	[Densities unknown] "Ecology: An escaped ornamental that produces prolific seed."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Royal Botanic Gardens Kew. 2008. Seed Information Database (SID). Version 7.1. <a href="http://data.kew.org/sid/">http://data.kew.org/sid/</a> . [Accessed 9 Jun 2015]	"Storage Behaviour: No data available for species. Of 12 known taxa of genus <i>Setaria</i> , 100.00% Orthodox"
	WRA Specialist. 2015. Personal Communication	Soil seed longevity unknown

803	Well controlled by herbicides	y
	Source(s)	Notes
	Tu, M., Hurd, C., & Randall, J. M. (2001). <i>Weed control methods handbook: tools &amp; techniques for use in natural areas</i> . The Nature Conservancy. <a href="http://digitalcommons.usu.edu/govdocs/533">http://digitalcommons.usu.edu/govdocs/533</a> . [Accessed ]	" <i>Andropogon virginicus</i> (broomsedge), <i>Paspalum conjugatum</i> (buffalograss), <i>Melinis minutiflora</i> (molasses grass) and <i>Setaria palmifolia</i> (palmgrass) Pat Bily (TNC-Hawaii) used a 2% solution of RoundUp Pro® with water-soluble packets of blue Turfmark® dye for foliar applications in Hawaii. A surfactant was already included in the RoundUp Pro® formulation so there was no need to add any other adjuvants."

Qsn #	Question	Answer
	Michael, P. (ed.). 2012. The Master Weed Wackers Manual. A compilation of the most common weeds found on Port Macquarie Landcare sites. Port Macquarie Landcare Group, Inc., Port Macquarie, NSW	"Control: HAND: Chip, crown or mattock out clumps, being careful to exacerbate erosion risk. CHEMICAL: Spot spray with glyphosate (eg RoundUp Biactive) at 10mL L-1 or wick-wipe with glyphosate at 100mL L-1. Use caution in riparian situations to minimize runoff."
	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	"DOFAW foresters on Kauai controlled palmgrass with drizzle applications of glyphosate at 0.75 lb/acre. However, reinvasion required constant monitoring and re-treatment until the seed reservoir was exhausted. HAVO staff reported control with foliar application of glyphosate at 1% of product. (Chris Zimmer, HAVO)."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	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	"Palmgrass is well-adapted to fire."
	Weedbusters. 2015. Palm Grass. <i>Setaria palmifolia</i> . <a href="http://www.weedbusters.org.nz/weed-information/setaria-palmifolia/59/">http://www.weedbusters.org.nz/weed-information/setaria-palmifolia/59/</a> . [Accessed 9 Jun 2015]	"Rhizomes and root masses resprout constantly and seed banks occasionally reinfest bared areas. Frequent and regular follow up required until eradication."
	CABI, 2015. <i>Setaria palmifolia</i> [original text by Chris Parker]. In: Invasive Species Compendium. Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"Small clumps can be dug out but protective clothing may be needed to protect against irritant hairs (Auckland Council, 2012)."

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. It is found in wet areas on all major islands from 300-2,000 m elevation. There are major infestations in the 'Ola'a, Hilo, Kohala, and Waiakea Forest Reserves, Hawaii, and the Koolau Forest Reserve, Maui."

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Naturalized in the Hawaiian Islands and elsewhere
- A disturbance-adapted grass
- A weed of several agricultural crops of the tropics
- An environmental weed
- Other *Setaria* species have become invasive
- Host of plant pests and pathogens
- Covered with irritating hairs
- Shade tolerant
- Tolerates many soil types
- Forms dense ground cover & excludes other vegetation
- Reproduces by seed
- Seeds dispersed by gravity, water, as a contaminant, animals & intentionally by people
- Tolerates fire and able to resprout after cutting
- No effective biocontrol agents known

## Low Risk Traits

- Palatable to animals and edible to people
- Limited vegetative spread
- Herbicides may provide effective control