

Taxon: <i>Alternanthera pungens</i> Kunth	Family: Amaranthaceae
Common Name(s): creeping chaffweed khakibur khakiweed	Synonym(s): Achyranthes repens L. <i>Alternanthera achyrantha</i> R. Br. ex <i>Alternanthera repens</i> (L.) Link <i>Illecebrum achyrantha</i> L.

Assessor: Chuck Chimera	Status: In Progress	End Date: 25 Mar 2020
WRA Score: 25.0	Designation: H(Hawai'i)	Rating: High Risk

Keywords: Perennial Weed, Spiny, Toxic, Dense Cover, Unintentionally Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
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	y
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	y
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
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		
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	n
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
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	y
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
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)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	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 of domestication] "Native to the Neotropics, but now widely naturalized in many parts of the world"

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2020). 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, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 24 Mar 2020]	"Native Southern America NORTHERN SOUTH AMERICA: Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Ecuador, Peru"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 24 Mar 2020]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Flora of North America. (2020). <i>Alternanthera pungens</i> . http://www.efloras.org . [Accessed]	[Broad distribution and elevation range, demonstrating environmental versatility] "Waste grounds, cleared limestone areas; 0-1500 m; introduced; Ala., Fla., La., N.Y., Tex.; West Indies; South 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.	[May be limited to lower, drier sites in the Hawaiian Islands] "in Hawai'i a common weed of beach parks and other low elevation, dry, disturbed areas"

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	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.	"Native to the Neotropics, but now widely naturalized in many parts of the world; in Hawai'i a common weed of beach parks and other low elevation, dry, disturbed areas, on O'ahu, Moloka'i, and Hawai'i, but probably also on the other main islands. First collected on O'ahu in 1959 (Uehara s.n., BISH)."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 24 Mar 2020]	"Native Southern America NORTHERN SOUTH AMERICA: Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Ecuador, Peru"

205	Does the species have a history of repeated introductions outside its natural range?	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.	"Native to the Neotropics, but now widely naturalized in many parts of the world; in Hawai'i a common weed of beach parks and other low elevation, dry, disturbed areas, on O'ahu, Moloka'i, and Hawai'i, but probably also on the other main islands."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Starr, F., Martz, K., & Loope, L.L. 2002. New plant records from the Hawaiian archipelago. Bishop Museum Occasional Papers. 69:16-27	[East Maui] "Alternanthera pungens Kunth Range extension Wagner et al. (1999: 183) reported A. pungens (khaki weed) to be a common weed of beach parks and other low elevation, dry, disturbed areas on O'ahu, Moloka'i, and Hawai'i, but probably also on the other main islands. Recently collected from West Maui (Oppenheimer & Bartlett, 2000: 1) and Lāna'i (Oppenheimer & Bartlett, 2002), this collection confirms its presence on East Maui, where it is widespread, and represents a range extension for Maui. Material examined. MAUI: E. Maui, near fire station at the Kahului Airport, 40 ft. [12 m], 23 Mar 2000, Starr & Martz 000323-1; E. Maui, Hāli'imaile, near Maui Land & Pineapple buildings, 1100 ft [335 m], 8 Jun 2000, Starr & Martz 000608-1."
	Lorence, D. & Flynn, T. 1999. New naturalized plant records for the Hawaiian Islands. Bishop Museum Occasional Papers. 59: 3-6	[Kauai] "Alternanthera pungens Kunth New island record This is a new island record for Khaki weed. It is also known from the islands of O'ahu, Moloka'i, and Hawai'i. Material examined. KAUA'I: Kōloa/Waimea District boundary: Hanapēpē, at Swinging bridge parking lot, . ca. 4.5 m, 13 Oct 1998, D. Jamieson s.n. (PTBG)."

Qsn #	Question	Answer
	Oppenheimer, H. L. & Bartlett, R. T. 2002. New plant records from the main Hawaiian Islands. Bishop Museum Occasional Papers. 69: 1-14	[Lanai] " <i>Alternanthera pungens</i> Kunth New island record Khaki weed was previously known from O'ahu, Moloka'i and Hawai'i (Wagner et al., 1999: 185). It was later documented from Kaua'i by Lorence & Flynn (1999: 3), and from Maui by Pu'u Kukui Watershed staff (Oppenheimer & Bartlett 2000: 1) Elsewhere in this years Records a range extension to East Maui is reported (F. Starr & K. Martz, in press). We now report a collection from the island of Lāna'i. Material examined. LĀNA'I: Kaunalapau Harbor, 6 m, 24 Oct 1999, Oppenheimer H109916."
	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.	[Oahu, Molokai, Hawaii] "Native to the Neotropics, but now widely naturalized in many parts of the world; in Hawai'i a common weed of beach parks and other low elevation, dry, disturbed areas, on O'ahu, Moloka'i, and Hawai'i, but probably also on the other main islands. First collected on O'ahu in 1959 (Uehara s.n., BISH)."
	Oppenheimer, H.L. & Bartlett, R.T. (2000). New plant records from Maui, O'ahu, and the Hawai'i Islands. Bishop Museum Occasional Papers 64: 1-10	[West Maui] " <i>Alternanthera pungens</i> Kunth New island record Common on O'ahu, Moloka'i, and Hawai'i (Wagner et al., 1999: 184), Khaki weed is also widespread, at least on West Maui. It has also been documented from Kaua'i Lorence & Flynn (1999: 3). Material examined: MAUI: West Maui, Wailuku District, North side of Hāna Hwy, West of Kanahā Pond, growing in an empty lot, 6 m, 2 Nov 1998, Oppenheimer H119810; South side of Hāna Hwy, South of Kanahā Pond, roadside weed, 6 m, 2 Nov 1998, Oppenheimer H119811; Waikapu, parking lot weed near intersection of Routes 30 & 31, 37 m, 28 Aug 1999, Oppenheimer H89940; Lahaina District, Mailepai, common roadside weed along HonoaPi'ilani Hwy, North of Kahanā Kai Bridge, near gate to pineapple fields, 18 m, 6 Aug 1999, Oppenheimer H89909."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Widely introduced and naturalized around the world

302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	Queensland Government. (2020). Weeds of Australia. <i>Alternanthera pungens</i> Kunth. https://keyserver.lucidcentral.org . [Accessed 25 Mar 2020]	"Khaki weed (<i>Alternanthera pungens</i>) is mainly regarded as a weed of lawns, pastures and disturbed sites near habitation. However, this species is also regarded as an environmental weed in large parts of northern Australia (i.e. in northern Queensland, the Northern Territory and northern Western Australia. In fact, during a recent survey, it was listed as a priority environmental weed in five Natural Resource Management regions throughout Australia."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[A disturbance weed that also affects lawns, pastures and the natural environment] "Khakiweed plant quickly colonizes bare or disturbed ground and, once established, it forms dense and persisting infestations excluding almost all other vegetation and preventing the regeneration of native species. The sharp spines of the flowerheads can cause damage to the feet and mouths of livestock and other animals (Parsons and Cuthbertson, 2001)."

303	Agricultural/forestry/horticultural weed	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Eyre Peninsula NRM Board. (2016). Pest Species Regional Management Plan. <i>Alternanthera pungens</i> - Khaki Weed. Government of South Australia. www.naturalresources.sa.gov.au	"Khaki weed is not known to affect agricultural yields greatly, but in New South Wales it competes with both irrigated and dryland Lucerne [8]."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The sharp spines of the flowerheads can cause damage to the feet and mouths of livestock and other animals (Parsons and Cuthbertson, 2001)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Bananas, Cereals, Cotton, Orchards & Plantations, Pastures"

304	Environmental weed	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	"Khakiweed plant quickly colonizes bare or disturbed ground and, once established, it forms dense and persisting infestations excluding almost all other vegetation and preventing the regeneration of native species."
	Queensland Government. (2020). Weeds of Australia. <i>Alternanthera pungens</i> Kunth. https://keyserver.lucidcentral.org . [Accessed 25 Mar 2020]	"This species initially tends to be found along roadsides and in other highly disturbed sites. However, it can spread from these areas into disturbed natural environments and occasionally invades native pastures on sandy soils, where it out-competes most other species with its mat forming habit In Queensland, where this species is very common, there are numerous references to it being somewhat of a problem in natural areas. For example, one Queensland Parks and Wildlife publication describes khaki weed (<i>Altrnanthera pungens</i>) as an "introduced environmental weed species" in the desert uplands region in Queensland. Thuringowa City Council includes it amongst other weeds species in its list of potential environmental pests and it is regarded as a medium priority weed species in the Mackay-Whitsunday Wet Tropics region. Nebo Shire places it amongst a list of species that cause damage to the environment if not managed accordingly, while it is regulated by local law in the Beaudesert Shire due to its adverse impact on the environment."

Qsn #	Question	Answer
305	Congeneric weed	y
	Source(s)	Notes
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CAB International, Wallingford, UK	" <i>Alternanthera philoxeroides</i> ... The plant grows rapidly and forms dense mats of interwoven stems as a result of vegetative proliferation, making it one of the worst invaders of wet areas. A single plant can cover several square metres within a short period of time. Parts of floating mats can become detached from the main body of the weed mass and move freely in water currents, establishing new colonies (Parsons and Cuthbertson, 2001). Infestations impair water flow, crowd out native species, and alter water flow and light penetration in water bodies (Julien and Broadbent, 1980; Parsons and Cuthbertson, 2001; Basset et al., 2012). The weed mass promotes sedimentation and creates anaerobic conditions, it also provides habitat for disease vectors such as mosquitoes. Alligator weed is also a weed of rice fields and pastures prone to waterlogging (Parsons and Cuthbertson, 2001)."

401	Produces spines, thorns or burrs	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.	[Spine-tipped flower parts] "Flowers in sessile, sparsely pubescent spikes, bract ca. 4 mm long, tipped with a spine 2-3 mm long, bracteoles 3-4 mm long, acute; sepals unequal, the 2 abaxial ones 4-5 mm long, spine-tipped, the spine usually more than 2 mm long"

402	Allelopathic	
	Source(s)	Notes
	Syed, S., Al-Haq, M. I., Ahmed, Z. I., Razaq, A., & Akmal, M. (2014). Root exudates and leaf leachates of 19 medicinal plants of Pakistan exhibit allelopathic potential. <i>Pakistan Journal of Botany</i> , 46(5), 1693-1701	[Possibly Yes] "Table 1. Allelopathic effect {growth (inhibition)} of plant leaf leachates (% of control) and their concentrations on lettuce hypocotyl as determined by sandwich method." [<i>Alternanthera pungens</i> leachates ranked 5th out of 19 plants for inhibitory activity]

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.	"Perennial herbs; stems prostrate, rarely ascending, sometimes rooting at the nodes, 1-5 dm long, pilose, the hairs multicellular." [Amaranthaceae. No evidence]

Qsn #	Question	Answer
404	Unpalatable to grazing animals	y
	Source(s)	Notes
	Eyre Peninsula NRM Board. (2016). Pest Species Regional Management Plan. <i>Alternanthera pungens</i> - Khaki Weed. Government of South Australia. www.naturalresources.sa.gov.au	[Generally unpalatable. Sometimes eaten by sheep] "Animals do not generally eat Khaki weed [1, 8]. It is suspected of poisoning sheep and pigs, and causing digestive disturbances and skin ailments in cattle [1, 8]. Horses that graze on areas containing large amounts of this species have developed a form of staggers [6]. At times young plants are moderately palatable to sheep and are consumed [1, 8]. Khaki weed is of low palatability to goats, but has no known risk of toxicity [9]."

405	Toxic to animals	
	Source(s)	Notes
	Eyre Peninsula NRM Board. (2016). Pest Species Regional Management Plan. <i>Alternanthera pungens</i> - Khaki Weed. Government of South Australia. www.naturalresources.sa.gov.au	"It is suspected of poisoning sheep and pigs, and causing digestive disturbances and skin ailments in cattle [1, 8]. Horses that graze on areas containing large amounts of this species have developed a form of staggers [6]. At times young plants are moderately palatable to sheep and are consumed [1, 8]. Khaki weed is of low palatability to goats, but has no known risk of toxicity [9]."
	Agriculture Victoria. (2020). Khaki weed. http://agriculture.vic.gov.au . [Accessed 25 Mar 2020]	"The seed heads of khaki weed cause damage to the feet and mouths of animals and causes a skin ailment in cattle. The weed is also believed to be poisonous to animals; they however rarely eat it."
	Western Australian Herbarium (1998–2020). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 25 Mar 2020]	"Toxicity. Causes allergies in humans, poisonous to stock."

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[<i>Alternanthera pungens</i> (Khaki weed) is a host of this pest] " <i>Hypogeococcus pungens</i> (cactus mealybug) ... The mealybug <i>Hypogeococcus pungens</i> is native to South America. It was first used as a biological control agent of invasive cacti in the subfamily Cactoideae in Queensland, Australia, in 1975 and South Africa in 1983, and has since become an invasive species in several other parts of the world, including Europe, North America and the Caribbean, probably through the ornamental plant trade. <i>H. pungens</i> is now a serious pest of the native columnar cacti in the subfamily Cactoideae in Puerto Rico and is a threat to native cacti in Florida and Hawaii (USA), Barbados and other Caribbean islands. <i>H. pungens</i> will probably spread to Mexico, where it may cause similar damage to the rich diversity of cacti. Besides feeding on species in the family Cactaceae, it also feeds on other ornamental plant families, including Portulacaceae, Apocynaceae and Amaranthaceae. <i>H. pungens</i> causes distorted plant growth. "

407	Causes allergies or is otherwise toxic to humans	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Western Australian Herbarium (1998–2020). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 25 Mar 2020]	"Causes allergies in humans, poisonous to stock. "
	Agriculture Victoria. (2020). Khaki weed. http://agriculture.vic.gov.au . [Accessed 25 Mar 2020]	"It is known to cause hay fever, asthma and dermatitis in some people."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Suspected of causing dermatitis."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Victorian Resources Online. (2020). Impact Assessment - Khaki weed (<i>Alternanthera pungens</i>) in Victoria. http://vro.agriculture.vic.gov.au . [Accessed 25 Mar 2020]	"Not likely to increase fuel load greatly. Small or negligible change to fire risk."
	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.	"Perennial herbs; stems prostrate, rarely ascending" [Low growth habit unlikely to carry fire or increase fire risk]

409	Is a shade tolerant plant at some stage of its life cycle	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	"Khakiweed plant quickly colonizes bare or disturbed ground ..." [High light environments]
	Dave's Garden. (2020). <i>Alternanthera</i> Species, Khaki Weed, Khakiweed - <i>Alternanthera pungens</i> . https://davesgarden.com/guides/pf/go/133369/ . [Accessed 25 Mar 2020]	"Sun Exposure: Full Sun Sun to Partial Shade Light Shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Pl@ntNet. (2020). Riceweeds en - Amaranthaceae - <i>Alternanthera pungens</i> H.B.K. http://publish.plantnet-project.org . [Accessed 25 Mar 2020]	"Common throughout East Africa on wide range of soil types."

411	Climbing or smothering growth habit	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.	"Perennial herbs; stems prostrate, rarely ascending, sometimes rooting at the nodes, 1-5 dm long, pilose, the hairs multicellular."

412	Forms dense thickets	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	"It is seldom a problem in well managed sown pastures but establishes occasionally in native pastures where it outcompetes most other species."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Khakiweed plant quickly colonizes bare or disturbed ground and, once established, it forms dense and persisting infestations excluding almost all other vegetation and preventing the regeneration of native species." [Forms dense cover that can exclude other vegetation]

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] "Perennial herbs... in Hawai'i a common weed of beach parks and other low elevation, dry, disturbed areas"

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 24 Mar 2020]	Family: Amaranthaceae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 24 Mar 2020]	Family: Amaranthaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	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	"Perennial herb with deep taproot. Stems reddish, prostrate, creeping, rooting at nodes, to 60 cm long, with soft and silky hairs."

Qsn #	Question	Answer
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.	[No evidence] "Native to the Neotropics, but now widely naturalized in many parts of the world"

602	Produces viable seed	y
	Source(s)	Notes
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	"Seeds germinate after spring and summer rains, and a stout taproot and prostrate stems develop during late spring and summer."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The plant spreads by seeds and by vegetative growth of rooting stem and root fragments."

603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	
	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.	"Flowers in axillary, head-like spikes, each flower subtended by a bract and 2 bracteoles; sepals 5; stamens 5, sometimes not all fertile, pseudostaminodes minute; anthers monothechal; stigma 1, capitate." [Self-fertility unknown]

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	"Roots form at stem nodes producing new plants and a dense ground cover." ... "In addition, patches increase in size as new plants form at the stem nodes, and cultivation carries these plants, as well as root fragments, to clean areas where they establish if moisture is adequate.
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The plant spreads by seeds and by vegetative growth of rooting stem and root fragments."

Qsn #	Question	Answer
607	Minimum generative time (years)	1
	Source(s)	Notes
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	"Seeds germinate after spring and summer rains, and a stout taproot and prostrate stems develop during late spring and summer. Roots form at stem nodes producing new plants and a dense ground cover. Plants flower and seed in summer and autumn and the aerial growth dies off by late autumn. New shoots are produced from the crown each spring."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	"Most dispersal occurs when the prickly burrs attach to animals, equipment, clothing and tyres. In addition, patches increase in size as new plants form at the stem nodes, and cultivation carries these plants, as well as root fragments, to clean areas where they establish if moisture is adequate."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The prickly burrs easily attach to animals, clothing and machinery."

702	Propagules dispersed intentionally by people	n
	Source(s)	Notes
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	[Dispersed unintentionally] "Most dispersal occurs when the prickly burrs attach to animals, equipment, clothing and tyres. In addition, patches increase in size as new plants form at the stem nodes, and cultivation carries these plants, as well as root fragments, to clean areas where they establish if moisture is adequate."

703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop"
	Eyre Peninsula NRM Board. (2016). Pest Species Regional Management Plan. <i>Alternanthera pungens</i> - Khaki Weed. Government of South Australia. www.naturalresources.sa.gov.au	"The burr containing the seeds readily becomes attached to animals, clothing and other objects (e.g. vehicle tyres). Burrs may also be dispersed by water movement and in contaminated agricultural produce (e.g. fodder and pasture seed)."
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	[Accidentally dispersed with cultivation practices] "Most dispersal occurs when the prickly burrs attach to animals, equipment, clothing and tyres. In addition, patches increase in size as new plants form at the stem nodes, and cultivation carries these plants, as well as root fragments, to clean areas where they establish if moisture is adequate."

704	Propagules adapted to wind dispersal	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The plant spreads by seeds and by vegetative growth of rooting stem and root fragments. The prickly burrs easily attach to animals, clothing and machinery."

705	Propagules water dispersed	y
	Source(s)	Notes
	Eyre Peninsula NRM Board. (2016). Pest Species Regional Management Plan. <i>Alternanthera pungens</i> - Khaki Weed. Government of South Australia. www.naturalresources.sa.gov.au	"The burr containing the seeds readily becomes attached to animals, clothing and other objects (e.g. vehicle tyres). Burrs may also be dispersed by water movement and in contaminated agricultural produce (e.g. fodder and pasture seed)."

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	"The plant spreads by seeds and by vegetative growth of rooting stem and root fragments. The prickly burrs easily attach to animals, clothing and machinery." [No evidence of internal dispersal by birds]

707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	"Most dispersal occurs when the prickly burrs attach to animals, equipment, clothing and tyres ."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The plant spreads by seeds and by vegetative growth of rooting stem and root fragments. The prickly burrs easily attach to animals, clothing and machinery."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Eyre Peninsula NRM Board. (2016). Pest Species Regional Management Plan. <i>Alternanthera pungens</i> - Khaki Weed. Government of South Australia. www.naturalresources.sa.gov.au	"Animals do not generally eat Khaki weed"
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Externally dispersed] "The plant spreads by seeds and by vegetative growth of rooting stem and root fragments. The prickly burrs easily attach to animals, clothing and machinery."

Qsn #	Question	Answer
801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Agriculture Victoria. (2020). Khaki weed. http://agriculture.vic.gov.au . [Accessed 25 Mar 2020]	"Khaki weed is a prolific seeder. The seeds remain viable for many years."
	Western Australian Herbarium (1998–2020). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 25 Mar 2020]	"Spreads vegetatively and by prolific amounts of seed that remains viable for a number of years." [Possibly. Densities unspecified]

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Eyre Peninsula NRM Board. (2016). Pest Species Regional Management Plan. <i>Alternanthera pungens</i> - Khaki Weed. Government of South Australia. www.naturalresources.sa.gov.au	"Khaki weed is a prolific seeder, with seeds remaining viable for up to 4-5 years in some areas."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	"Chemical control is also effective; dicamba kills seed, lings and both amitrole T and picloram are effective on actively growing, established plants before flowering. Bromacil is a long-term residual herbicide but gives selective control of khaki weed in such crops as asparagus, citrus and pineapples. A South Australian recommendation is to cut plants at ground level and swab the cut root with undiluted amitrole T or amine 2,4,D."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Seedlings can be treated with herbicides containing dicamba. Established plants are treated with amitrole or picloram herbicides, best applied before flowering occurs (Parsons and Cuthbertson, 2001)."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	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	"Manual removal can give effective control if the bulk of the taproot is removed, or if roots are cut well below the soil surface."
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	[Can resprout from taproot unless removed] "Cultivation destroys seedlings and established plants but roots must be cut well below the soil surface to reduce the chance of regrowth. On the other hand, cultivation can spread plant fragments and, if not covered by soil, they continue to grow. Follow-up cultivation is necessary to destroy new seedlings and any pieces of the original plants which survive. Hand hoeing is effective if the bulk of the taproot can be removed."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
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Qsn #	Question	Answer
	Source(s)	Notes
	Oppenheimer, H. L. & Bartlett, R. T. 2002. New plant records from the main Hawaiian Islands. Bishop Museum Occasional Papers. 69: 1-14	[Unlikely. Established on all Hawaiian Islands] "Khaki weed was previously known from O'ahu, Moloka'i and Hawai'i (Wagner et al., 1999: 185). It was later documented from Kaua'i by Lorence & Flynn (1999: 3), and from Maui by Pu'u Kukui Watershed staff (Oppenheimer & Bartlett 2000: 1) Elsewhere in this years Records a range extension to East Maui is reported (F. Starr & K. Martz, in press). We now report a collection from the island of Lana'i."

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability
- Thrives in tropical climates
- Naturalized on Kauai, Oahu, Molokai, Lanai, Maui and Hawaii (Hawaiian Islands) and widely naturalized elsewhere
- A weed of disturbed sites, lawns, agriculture and the natural environment (although primarily a weed of beach parks and low elevation disturbed sites in Hawaiian Islands)
- Other *Alternanthera* species are invasive
- Spine-tipped bracts
- Unpalatable to most animals
- Toxic to animals and people
- Tolerates many soil types
- Forms dense cover that can exclude other vegetation
- Reproduces by seeds and vegetatively by rooting at nodes and stem fragments
- Reaches maturity in one growing season
- Prickly burrs attach to animals, clothing and machinery
- Also dispersed by water, by cultivation and as a soil and crop contaminant
- Seeds can persist in soil for several years
- Able to resprout from taproot if not entirely removed from soil

Low Risk Traits

- May be shade intolerant
- Herbicides can provide effective control