Taxon: Chloris gayana Kunth **Family:** Poaceae

Common Name(s): Abyssinian Rhodes grass
Rhodes grass

Synonym(s): Chloris abyssinica Hochst. ex A. Rich.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 24 Sep 2021

WRA Score: 15.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Annual/Perennial Grass, Disturbance Weed, Forage, Shade Intolerant, Stoloniferous

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		
304	Environmental weed		
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	n
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	n

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	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	y
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/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
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**
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence of domestication] "weed species widely naturalized and grown in tropical countries, escaped from cultivation, suitable for silage and hay, thatching, pasture grass in subtropical areas, cultivated fodder, relished by livestock, high grazing value, a valuable forage species, young growth very palatable"

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

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

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 22 Sep 2021]	"Native Africa MACARONESIA: Spain [Canarias], Portugal [Madeira Islands] NORTHERN AFRICA: Algeria, Egypt, Morocco, Tunisia NORTHEAST TROPICAL AFRICA: Ethiopia, Sudan, Somalia EAST TROPICAL AFRICA: Kenya, Tanzania, Uganda WEST TROPICAL AFRICA: Mali, Niger, Senegal SOUTH TROPICAL AFRICA: Mozambique, Zimbabwe SOUTHERN AFRICA: Botswana, Lesotho, Namibia, South Africa"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 22 Sep 2021]	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Duke, J. A. (1983). Chloris gayana. Handbook of Energy Crops. https://hort.purdue.edu/newcrop/duke_energy/Chloris_gayana.html. [Accessed 23 Sep 2021]	"Ranging from Cool Temperate Wet to Steppe through Tropical Desert to Wet Forest Life Zones, Rhodesgrass is reported to tolerate annual precipitation of 3.1 to 40.3 dm (mean of 30 cases = 12.6) annual tamperatures of 8.4 to 27.8°C (mean of 30 cases = 20.3), and pH of 4.5 to 8.4 (mean of 28 cases = 6.4) (Duke, 1978, 1979). Rhodesgrass is suitable and adaptable to tropical and subtropical summer-rainfall areas with rainfall of 7.5–12.5 dm annually, and a moderately long dry season. It does not thrive in areas with more than 18 dm rainfall. Thrives on soda-rich alkaline soils too alkaline for sugarcane. Adaptable to sands and alkaline clays, but grows best on fertile soils of medium texture. It is moderately frost-resistant, but unsuited to areas with more than an occasional heavy frost. Often forms almost pure stands (Reed, 1976)."
	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.	[Elevation range >1000 m] "in Hawai'i naturalized and common in open, disturbed areas, especially in pastures and along roadsides, 15 -1,040 m,"

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 Africa, now naturalized throughout the Neotropics; in Hawai'i naturalized and common in open, disturbed areas, especially in pastures and along roadsides, 15-1,040 m, on Ni'ihau, O'ahu, Lana'i, Maui, and Hawai'i. First collected on Lana'i in 1913 (Forbes 1B1.L, BISH)."

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 22 Sep 2021]	"Native Africa MACARONESIA: Spain [Canarias], Portugal [Madeira Islands] NORTHERN AFRICA: Algeria, Egypt, Morocco, Tunisia NORTHEAST TROPICAL AFRICA: Ethiopia, Sudan, Somalia EAST TROPICAL AFRICA: Kenya, Tanzania, Uganda WEST TROPICAL AFRICA: Mali, Niger, Senegal SOUTH TROPICAL AFRICA: Mozambique, Zimbabwe SOUTHERN AFRICA: Botswana, Lesotho, Namibia, South Africa Cultivated Africa EAST TROPICAL AFRICA: Kenya, Tanzania SOUTH TROPICAL AFRICA: Zambia, Zimbabwe SOUTHERN AFRICA: South Africa Asia-Temperate CAUCASUS: Georgia EASTERN ASIA: Korea, Japan Asia-Tropical INDIAN SUBCONTINENT: India INDO-CHINA: Thailand MALESIA: Philippines Australasia AUSTRALIA: Australia Northern America REGION: United States (s.) Pacific SOUTHWESTERN PACIFIC: Fiji Southern America BRAZIL: Brazil SOUTHERN SOUTH AMERICA: Argentina, Uruguay Naturalized Australasia NEW ZEALAND: New Zealand Europe SOUTHWESTERN EUROPE: Spain Northern America SOUTHEASTERN U.S.A.: United States [Florida] REGION: Mexico Pacific NORTH-CENTRAL PACIFIC: United States [Hawaii] Southern America CARIBBEAN: Cuba, Dominican Republic, Jamaica BRAZIL: Brazil [Paraná, Rio Grande do Sul] WESTERN SOUTH AMERICA: Bolivia, Peru SOUTHERN SOUTH AMERICA: Argentina, Chile, Paraguay"

205	**Does the species have a history of repeated introductions outside its natural range?**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Africa, now naturalized throughout the Neotropics"
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"weed species widely naturalized and grown in tropical countries, escaped from cultivation"

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Hughes, G. D. (1995). New Hawaiian plant records II. Bishop Museum Occasional Papers. 42: 1-10	"Chloris gayana Kunth Previous knowledge: First collected on Lanai in 1913 (Forbes 181.L, BISH). Hawaiian Archipelago distribution Niihau, Oahu, Lanai, Maui, and Hawaii. Native to Africa, and naturalized throughout the Neotropics (Wagner et al. 1990:1515). Significance: New island record for Molokai on Kapaakea ridge in 1992 (Hughes 367, US). This species is naturalized at least in the mixed Kiawe/Haole koa lowland shrublands and Cenchrus ciliaris lowland grasslands from Kalamaula Game Management Area to Kaunakakai gulch from 50–400 m."
	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 Africa, now naturalized throughout the Neotropics; in Hawai'i naturalized and common in open, disturbed areas, especially in pastures and along roadsides, 15-1,040 m, on Ni'ihau, O'ahu, Lana'i, Maui, and Hawai'i. First collected on Lana'i in 1913 (Forbes 1B1.L, BISH)."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 22 Sep 2021]	"Naturalized Australasia NEW ZEALAND: New Zealand Europe SOUTHWESTERN EUROPE: Spain Northern America SOUTHEASTERN U.S.A.: United States [Florida] REGION: Mexico Pacific NORTH-CENTRAL PACIFIC: United States [Hawaii] Southern America CARIBBEAN: Cuba, Dominican Republic, Jamaica BRAZIL: Brazil [Paraná, Rio Grande do Sul] WESTERN SOUTH AMERICA: Bolivia, Peru SOUTHERN SOUTH AMERICA: Argentina, Chile, Paraguay"

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	Pastures Australia. (2007). Rhodes grass - Chloris gayana. https://keys.lucidcentral.org/keys/v3/pastures/Html/Rhodes_grass.htm. [Accessed 23 Sep 2021]	"It invades disturbed ground and is a weed of cultivation. However, it usually dies out after 4 - 5 years in the absence of further disturbance or nitrogen fertilisation. It rarely invades natural areas."

Qsn #	Question	Answer
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Weed of roadsides and areas adjacent to plantings. Minor environmental weed and unlikely to seriously invade natural bushland because it doesn't tolerate shade. It may invade disturbed areas but usually dies out in 4-5 years if no further disturbance occurs or if it is controlled to allow taller growing species to establish. Suppresses woody regrowth."
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"weed species widely naturalized and grown in tropical countries, escaped from cultivation"

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	Duke, J. A. (1983). Chloris gayana. Handbook of Energy Crops. https://hort.purdue.edu/newcrop/duke_energy/Chloris_gayana.html. [Accessed 23 Sep 2021]	"Plants seed freely but also spread by stolons. However, it is easily controlled and seldom becomes a troublesome weed."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Cotton, Nursery Production, Orchards and Plantations, Pastures"
	Low, T. (1997). Tropical pasture plants as weeds. Tropical Grasslands, 31, 337-343	[Impacts unquantified] "The impact of pasture plants when they occur as weeds in crop farming is also impossible to measure. For example, sugar cane farms are often invaded by para grass (Brachiaria mutica), green panic (Panicum maximum), centro (Centrosema pubescens), setaria, siratro and rhodes grass (Chloris gayana) (BSES 1989), but there is no way to measure their total cost to farmers."
	Pastures Australia. (2007). Rhodes grass - Chloris gayana. https://keys.lucidcentral.org/keys/v3/pastures/Html/Rhodes_grass.htm. [Accessed 23 Sep 2021]	[Potentially. Impacts ambiguous] "It invades disturbed ground and is a weed of cultivation. However, it usually dies out after 4 - 5 years in the absence of further disturbance or nitrogen fertilisation. It rarely invades natural areas."

304	Environmental weed	
	Source(s)	**Notes**
	Pastures Australia. (2007). Rhodes grass - Chloris gayana. https://keys.lucidcentral.org/keys/v3/pastures/Html/Rhodes_grass.htm. [Accessed 23 Sep 2021]	"It invades disturbed ground and is a weed of cultivation. However, it usually dies out after 4 - 5 years in the absence of further disturbance or nitrogen fertilisation. It rarely invades natural areas."
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Weed of roadsides and areas adjacent to plantings. Minor environmental weed and unlikely to seriously invade natural bushland because it doesn't tolerate shade. It may invade disturbed areas but usually dies out in 4-5 years if no further disturbance occurs or if it is controlled to allow taller growing species to establish. Suppresses woody regrowth."

Qsn #	Question	Answer
	Queensland Government. (2021). Weeds of Australia. Chloris gayana. https://keyserver.lucidcentral.org. [Accessed 23 Sep 2021]	[Environmental weed in Australia] "Rhodes grass (Chloris gayana) is regarded as an environmental weed in parts of Queensland, the Northern Territory and New South Wales. It was recently listed among the top 50 invasive plants in south-eastern Queensland, where it spreads from roadsides and pastures to invade native bushland and rainforest margins. Its tolerance of a wide range of conditions and its ability to rapidly reproduce, combined with its capacity to smother native ground cover species and form almost pure stands, has led to its developing reputation as an invasive species. Rhodes grass (Chloris gayana) is actively managed by community groups in the Northern Territory and is listed as a priority environmental weed in at least one Natural Resource Management region. It is also on the New South Wales North Coast environmental weed list and is regarded as an environmental weed in the wider Sydney and Blue Mountains region. In New South Wales it is known to replace native vegetation, particularly at disturbed sites, and is regarded as one of the perennial grasses that contributes to the "key threatening process" of "invasion of native plant communities by exotic perennial grasses".
	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.	[Not a significant environmental weed in Hawaii] "in Hawai'i naturalized and common in open, disturbed areas, especially in pastures and along roadsides, 15-1,040 m,"
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potentially, although other references state it rarely, if ever, invades natural areas] "Chloris gayana is listed as an invasive species and an environmental weed in Australia, Argentina, Paraguay, Mexico, Spain, Costa Rica, Cuba, Anguilla, New Zealand, New Caledonia, and Hawaii. It has been listed among the top 50 invasive plants in Queensland, Australia, where it spreads from roadsides and pastures to invade native bushland and rainforest margins. Once established, this species grows forming almost pure stands that smother native vegetation (Wagner et al., 1999; Dana et al., 2004; Connor, 2008; IABIN, 2008; Chacón and Saborio, 2012; Oviedo and Gonzalez-Oliva, 2015; Randall, 2017; PIER, 2018; Weeds of Australia, 2020)."

305	Congeneric 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	[Chloris virgata] "Where invasive, the plant is a successful competitor to native grasses and forbs. Establishment is facilitated by disturbances and the grass quickly colonizes bare ground. Once established it has the capability to displace native vegetation by forming dense swards. The species spreads mainly vegetatively by stolons and rooting culms. In Australia, Chloris virgata spreads in native grasslands and sand dune vegetation (State of Queensland, 2014)."

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Glabrous perennials; culms erect or sometimes decumbent, usually with long, stout, flattened, leafy stolons, ocasionally rooting at lower nodes, 50-150(-200) em tall. Lower sheaths about as long as internodes, upper sheaths somewhat shorter, striate, compressed, keeled; ligule membranous, ca. 0.5 mm long, ciliate; blades flat, rarely involute, 10-50 em long, 3-5(-9) mm wide, usually keeled, upper surface near base sparsely papillose-hispid, apex attenuate."

402	Allelopathic	
	Source(s)	**Notes**
	Fujii, Y., & Appiah, K. S. (2018). Allelopathy for sustainable weed management. Pp. 166-190 in Korres, N. E. et al. (eds.). Weed Control: Sustainability, Hazards, and Risks in Cropping Systems Worldwide. CRC Press, Boca Raton, FL	"Table 9.2. Assessment of allelopathic activity by Sandwich method" [Potentially. Extracts of Chloris gayana demonstrated 69% and 46% radicle growth inhibition compared to control]

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.	"Glabrous perennials; culms erect or sometimes decumbent, usually with long, stout, flattened, leafy stolons, ocasionally rooting at lower nodes, 50-150(-200) cm tall." [No evidence. Poaceae]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"suitable for silage and hay, thatching, pasture grass in subtropical areas, cultivated fodder, relished by livestock, high grazing value, a valuable forage species, young growth very palatable"

Qsn #	Question	Answer
405	**Toxic to animals**	**n**
	Source(s)	**Notes**
	Pastures Australia. (2007). Rhodes grass - Chloris gayana. https://keys.lucidcentral.org/keys/v3/pastures/Html/Rhodes_grass.htm. [Accessed 23 Sep 2021]	"Livestock disorders/toxicity - None recorded."
	McKenzie, R. (2020). Australia's Poisonous Plants, Fungi and Cyanobacteria: A Guide to Species of Medical and Veterinary Importance. CSIRO Publishing, Clayton South, VIC	[Indirect toxicity possible due to over-fertilization] "Heavily fertilised crops. Applying nitrogen fertilisers to crops in excessive amounts boosts the nitrate content of crops and may make nutritious plants potentially deadly for cattle, sheep and other ruminants. For example, Rhodes grass (Chloris gayana) hay is normally wholesome feed for all types of livestock, but can be made poisonous to ruminants by too much nitrogen fertiliser applied to the growing plants."
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence] "suitable for silage and hay, thatching, pasture grass in subtropical areas, cultivated fodder, relished by livestock, high grazing value, a valuable forage species, young growth very palatable"

406	Host for recognized pests and pathogens	n
	Source(s)	**Notes**
	Pastures Australia. (2007). Rhodes grass - Chloris gayana. https://keys.lucidcentral.org/keys/v3/pastures/Html/Rhodes_grass.htm. [Accessed 23 Sep 2021]	"Major pests - Severe attack by armyworm and pasture webworm can destroy much of the leaf, particularly young leaf - largely restricted to coastal areas. Major diseases - No serious diseases."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**
	Pollen Library. (2021). Rhodes Grass (Chloris gayana). https://www.pollenlibrary.com/Specie/Chloris+gayana/. [Accessed 23 Sep 2021]	"Allergenicity: Rhodes Grass (Chloris gayana) is a mild allergen."
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence of toxicity to humans

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 23 Sep 2021]	"Recovers well after 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.	[May contribute to fuel load in fire prone areas] "Hawai'i naturalized and common in open, disturbed areas, especially in pastures and along roadsides,"

Qsn #	Question	Answer
409	**Is a shade tolerant plant at some stage of its life cycle**	**n**
	Source(s)	**Notes**
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"it does not grow well in shade"
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"It doesn't tolerate shady conditions."
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 23 Sep 2021]	"Light - Generally poor shade tolerance."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Prefers red earths and loams but grows on a wide range of soils from clays through to sands."
	Pastures Australia. (2007). Rhodes grass - Chloris gayana. https://keys.lucidcentral.org/keys/v3/pastures/Html/Rhodes_grass.htm. [Accessed 23 Sep 2021]	"Rhodes grass will grow on most well drained soils, providing fertility is adequate. It prefers well-structured loams and clays of volcanic origin, but is not suited to very heavy clays. It is best in soils with pH between about 5.5 and 7.5, but will grow down to pH 4.5 (if available aluminium and manganese levels are low) and up to 10. It is the most salt-tolerant of the commonly sown tropical grasses, tolerating soil salt levels where electrical conductivity exceeds 10 dS/m."

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.	"Glabrous perennials; culms erect or sometimes decumbent, usually with long, stout, flattened, leafy stolons, occasionally rooting at lower nodes, 50-150(-200) cm tall."

Qsn #	Question	Answer
412	**Forms dense thickets**	**y**
	Source(s)	**Notes**
	Duke, J. A. (1983). Chloris gayana. Handbook of Energy Crops. https://hort.purdue.edu/newcrop/duke_energy/Chloris_gayana.html. [Accessed 23 Sep 2021]	" Often forms almost pure stands (Reed, 1976)."
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Cultivar Callide has strong runners (stolons) and forms a dense covering."
	Queensland Government. (2021). Weeds of Australia. Chloris gayana. https://keyserver.lucidcentral.org. [Accessed 23 Sep 2021]	"Its tolerance of a wide range of conditions and its ability to rapidly reproduce, combined with its capacity to smother native ground cover species and form almost pure stands, has led to its developing reputation as an invasive species."

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] "in Hawai'i naturalized and common in open, disturbed areas, especially in pastures and along roadsides,"

502	**Grass**	**y**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 23 Sep 2021]	Family: Poaceae (alt. Gramineae) Subfamily: Chloridoideae Tribe: Cynodonteae Subtribe: Eleusininae

503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 23 Sep 2021]	Family: Poaceae (alt. Gramineae) Subfamily: Chloridoideae Tribe: Cynodonteae Subtribe: Eleusininae

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Short-lived perennial or annual, very variable, leafy, glabrous, erect or ascending, culms often decumbent at the base then erect, simple or usually branched, tall and robust, tough and wiry, vigorous root system"

Qsn #	Question	Answer
601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence] "weed species widely naturalized and grown in tropical countries, escaped from cultivation"

602	Produces viable seed	y
	Source(s)	**Notes**
	Duke, J. A. (1983). Chloris gayana. Handbook of Energy Crops. https://hort.purdue.edu/newcrop/duke_energy/Chloris_gayana.html. [Accessed 23 Sep 2021]	"Plants seed freely but also spread by stolons. However, it is easily controlled and seldom becomes a troublesome weed. Good land preparation is necessary to insure stands, maximum yields and minimum weed competition. Crop may be propagated by seeding, at rate of 8–9 kg/ha broadcast or 2–3 kg/ha sown in drills 50–70 cm apart."
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Reproduction: By seed and stolons. Generally cross pollinates with only 1-4% self compatibility. Cultivar Callide appears to be self pollinating."
	't Mannetje, L. & Jones, R.M. (Eds.). (1992). Plant Resources of South-East Asia. No. 4. Forages. Pudoc Scientific Publishers, Wageningen, Netherlands	"Rhodes grass can be propagated from seed and stolons. Propagation from seed gives more rapid establishment."
	Pastures Australia. (2007). Rhodes grass - Chloris gayana. https://keys.lucidcentral.org/keys/v3/pastures/Html/Rhodes_grass.htm. [Accessed 23 Sep 2021]	"Up to three crops/year can be produced in most cultivars, but only one or two in 'Callide'. Crops are fertilised with 50 kg/ha N on fertile soils, or 100 - 150 kg/ha N on infertile soils. Header harvested yields of 100-200 kg/ha can be achieved from properly managed crops."

603	Hybridizes naturally	
	Source(s)	**Notes**
	Varadarajan, G. S., & Gilmartin, A. J. (1983). Phenetic and Cladistic Analyses of North American Chloris (Poaceae). Taxon, 32(3), 380–386	[Unknown. Hybrids documented in genus] "Chloris cucullata is quite distinct from most other species in the genus. It readily hybridizes with C. andropogonoides and C. verticillata, but in pure form, it differs markedly from these two species."

604	Self-compatible or apomictic	n
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 23 Sep 2021]	"Primarily cross-pollinating, with only 1–4% self-compatibility. This can lead to "genetic drift" in seed crops."

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

606	Reproduction by vegetative fragmentation	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.	"Glabrous perennials; culms erect or sometimes decumbent, usually with long, stout, flattened, leafy stolons, occasionally rooting at lower nodes, 50-150(-200) cm tall."
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"sometimes forming tufts, usually strongly stoloniferous, rooting stolons"

607	Minimum generative time (years)	1
	Source(s)	**Notes**
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Short-lived perennial or annual"

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	**Notes**
	Queensland Government. (2021). Weeds of Australia. Chloris gayana. https://keyserver.lucidcentral.org. [Accessed 23 Sep 2021]	"This species reproduces by seed and also vegetatively via its creeping stems (i.e. stolons). The seeds may be spread by wind and water, and may also become attached to clothing, animals, vehicles and machinery. They may also be spread by slashers, graders, and in contaminated agricultural produce (e.g. pasture seed)."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Duke, J. A. (1983). Chloris gayana. Handbook of Energy Crops. https://hort.purdue.edu/newcrop/duke_energy/Chloris_gayana.html. [Accessed 23 Sep 2021]	"Rhodesgrass is one of the best grasses for rotation grasslands in tropical and subtropical areas, useful for establishment of pasture leys. It is suitable for silage and hay, as well as for fodder."

Qsn #	Question	Answer
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, Herbal, Ornamental, Pasture Dispersed by: Humans, Cattle, Livestock, Vehicles, Escapee"
	Queensland Government. (2021). Weeds of Australia. Chloris gayana. https://keyserver.lucidcentral.org. [Accessed 23 Sep 2021]	"They may also be spread by slashers, graders, and in contaminated agricultural produce (e.g. pasture seed)."

704	**Propagules adapted to wind dispersal**	**y**
	Source(s)	**Notes**
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Seed is spread in water flows, by wind and by adhering to animal fur."
	Queensland Government. (2021). Weeds of Australia. Chloris gayana. https://keyserver.lucidcentral.org. [Accessed 23 Sep 2021]	"This species reproduces by seed and also vegetatively via its creeping stems (i.e. stolons). The seeds may be spread by wind and water, and may also become attached to clothing, animals, vehicles and machinery. They may also be spread by slashers, graders, and in contaminated agricultural produce (e.g. pasture seed)."

705	**Propagules water dispersed**	**y**
	Source(s)	**Notes**
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Seed is spread in water flows, by wind and by adhering to animal fur."
	Queensland Government. (2021). Weeds of Australia. Chloris gayana. https://keyserver.lucidcentral.org. [Accessed 23 Sep 2021]	"This species reproduces by seed and also vegetatively via its creeping stems (i.e. stolons). The seeds may be spread by wind and water, and may also become attached to clothing, animals, vehicles and machinery. They may also be spread by slashers, graders, and in contaminated agricultural produce (e.g. pasture seed)."

706	**Propagules bird dispersed**	**n**
	Source(s)	**Notes**
	Queensland Government. (2021). Weeds of Australia. Chloris gayana. https://keyserver.lucidcentral.org. [Accessed 23 Sep 2021]	"This species reproduces by seed and also vegetatively via its creeping stems (i.e. stolons). The seeds may be spread by wind and water, and may also become attached to clothing, animals, vehicles and machinery. They may also be spread by slashers, graders, and in contaminated agricultural produce (e.g. pasture seed). Plants can spread laterally and colonise nearby areas via their creeping stems (i.e. stolons). It is also deliberately spread as a pasture grass and planted on road margins as a soil stabiliser."

707	**Propagules dispersed by other animals (externally)**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Seed is spread in water flows, by wind and by adhering to animal fur."
	Queensland Government. (2021). Weeds of Australia. Chloris gayana. https://keyserver.lucidcentral.org. [Accessed 23 Sep 2021]	"The seeds may be spread by wind and water, and may also become attached to clothing, animals, vehicles and machinery."

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	Gardener, C.J., McIvor, J.G. & Jansen, A. (1993). Survival of Seeds of Tropical Grassland Species Subjected to Bovine Digestion. Journal of Applied Ecology 30(1): 75-85	[Poor survival] "Seeds of seven of the lines used in Experiments 1 and 2 were placed in nylon bags in the rumen for a wide range of times. Five lines (Pennisetum clandestinum, Axonopus affinis, Digitaria ciliaris, Leucaena leucocephala cv. Peru, and Stylosanthes scabra cv. Fitzroy) had survived well in the rumen over 48h, and two (Macroptilium atropurpureum and Chloris gayana) had survived poorly."

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**
	Duke, J. A. (1983). Chloris gayana. Handbook of Energy Crops. https://hort.purdue.edu/newcrop/duke_energy/Chloris_gayana.html. [Accessed]	"Seeds 3.3–4.4 million per kilogram (Reed, 1976)."
	't Mannetje, L. & Jones, R.M. (Eds.). (1992). Plant Resources of South-East Asia. No. 4. Forages. Pudoc Scientific Publishers, Wageningen, Netherlands	[Seed densities unspecified, but it may be possible that dense stands produce high soil seed densities] "There are 7000-10000 seeds/g." ... "Widely scattered seedlings can quickly produce dense stands."

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	**Notes**
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	[Generally No] "Seed from diploid forms have little or no dormancy. Seed from tetraploid forms may not reach maximum germination for 3-6 months after harvest and occasionally up to 18 months after harvest."

Qsn #	Question	Answer
803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Pastures Australia. (2007). Rhodes grass - Chloris gayana. https://keys.lucidcentral.org/keys/v3/pastures/Html/Rhodes_grass.htm. [Accessed 23 Sep 2021]	"It is very susceptible to the selective grass herbicide, haloxyfop (Verdict®), even when mature. While weakened, by glyphosate at normal rates, it mostly survives unless resprayed."
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Tolerates normal rates of glyphosate. Use 100 mL of glyphosate (450g/L) in 10 L water in early summer when the plants are actively growing or 6 L/ha on larger areas. 2 L/ha of metolachlor (720g/L) can be used as a pre emergence treatment in spring to stop seedling establishment. Haloxyfop can be used in bushland or where damage to broad leaved species needs to be minimised. Repeat sprays may be required when regrowth is actively growing."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 23 Sep 2021]	"C. gayana is tolerant of heavy grazing, but production is reduced by very frequent defoliation (e.g. 14 days vs. 28 days). Makes good hay if cut at or just before very early flowering, giving up to six 25- to 50-day harvests. Fire - Recovers well after fire."
	HerbiGuide. (2021). Rhodes Grass - Chloris gayana. http://www.herbiguide.com.au/Descriptions/hg_Rhodes_Grass.htm. [Accessed 23 Sep 2021]	"Tolerates fire and grazing when well established."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	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.	[Unknown] "in Hawai'i naturalized and common in open, disturbed areas, especially in pastures and along roadsides, 15-1,040 m, on Ni'ihau, O'ahu, Lana'i, Maui, and Hawai'i. First collected on Lana'i in 1913"

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability and elevation range
• Thrives, and spreads, in regions with tropical climates
• Naturalized on Niihau, Oahu, Lanai, Molokai, Maui, and Hawaii, and widely naturalized elsewhere
• A disturbance-adapted weedy grass that may impact agriculture or the natural environment
• Other Chloris species are invasive weeds
• Can be made poisonous to ruminants by too much nitrogen fertilizer applied to the growing plants
• Tolerates many soil types (not substrate-limited)
• Forms almost pure stands
• Reproduces by seeds and vegetatively by stolons
• A short-lived perennial or annual, able to reach maturity in one growing season
• Seeds can be spread by wind, water, attachment to clothing, animals, vehicles, and machinery and in contaminated agricultural produce
• When established, tolerates fire and heavy grazing

Low Risk Traits
• Although reported as a weed of agriculture and the environment elsewhere, in the Hawaiian Islands, generally occurring in disturbed habitats or roadsides, but otherwise valued as a forage grass
• Unarmed (no spines, thorns, or burrs)
• Very palatable forage species
• Non-toxic (if too much nitrogen has not been applied)
• Generally poor shade tolerance (dense shade may limit ability to spread)
• Primarily cross-pollinating (very low or absent seed set after self-pollination)
• Seeds do not survive well after ingestion by grazers (i.e., animals unlikely to spread seeds internally)
• Seeds have little or no dormancy and are unlikely to form a persistent seed bank
• Herbicide may provide effective control