

Taxon: <i>Gunnera tinctoria</i> (Molina) Mirb.	Family: Gunneraceae
Common Name(s): Chilean rhubarb giant rhubarb	Synonym(s): <i>Gunnera chilensis</i> Lam. <i>Panke tinctoria</i> Molina

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 7 Oct 2018
WRA Score: 12.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Giant Herb, Dense Stands, N-Fixing, Bird-Dispersed, Water-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
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)	Intermediate
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)	Intermediate
202	Quality of climate match data	(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
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	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	n
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-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
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed		

Qsn #	Question	Answer Option	Answer
303	Agricultural/forestry/horticultural weed		
304	Environmental 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
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	y
401	Produces spines, thorns or burrs	y=1, n=0	y
402	Allelopathic		
402	Allelopathic		
403	Parasitic	y=1, n=0	n
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	n
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	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	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
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
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	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
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
603	Hybridizes naturally		
604	Self-compatible or apomictic		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
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	>3
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
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
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	y=1, n=-1	y

Qsn #	Question	Answer Option	Answer
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	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
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)		
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
	Wilkinson, H. P., & Wanntorp, L. (2007). Gunneraceae. In Flowering Plants- Eudicots (pp. 177-183). Springer, Berlin, Heidelberg	[No evidence of domestication in genus or family] "Uses. Species of subg. Panke are sometimes used as garden ornamentals; a few of the smaller species are grown in rock-gardens. Gunnera perpensa has been reported to have antifertility and antiabortifacient properties in rats by Mafatle and Joseph (1992). The stems and petioles of Gunnera chilensis are used by indigenous people on a small scale for tanning and dyeing, and petioles are eaten as salad ("nalca" or "rahuay")."
	Mora-Osejo, L., Pabón-Mora, N., & González, F. (2011). Gunneraceae. Flora Neotropica, 109: 1-166	No evidence of domestication

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2018. 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"	Intermediate
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Gunnera tinctoria ... Preferred Climate/s: Mediterranean"
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 5 Oct 2018]	"Native Southern America SOUTHERN SOUTH AMERICA: Argentina, [Chubut, Neuquen, Rio Negro] Chile Cultivated (also cult.) Naturalized Africa MACARONESIA: Portugal [Azores] Australasia NEW ZEALAND: New Zealand Europe NORTHERN EUROPE: Ireland, United Kingdom SOUTHWESTERN EUROPE: France Northern America SOUTHWESTERN U.S.A.: United States [California]"

Qsn #	Question	Answer
202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 5 Oct 2018]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Dave's Garden. (2018). Giant Rhubarb, Chilean Gunnera, Chilean Rhubarb, Dinosaur Food - <i>Gunnera tinctoria</i> . https://davesgarden.com/guides/pf/go/56632/ . [Accessed 6 Oct 2018]	"Hardiness: USDA Zone 7a: to -17.7 °C (0 °F) USDA Zone 7b: to -14.9 °C (5 °F) USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15 °F) USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F)"
	Silva, L., Tavares, J., & Pena, A. (1996). Ecological basis for the control of <i>Gunnera tinctoria</i> in São Miguel Island. Proceedings Second International Weed Control Congress Copenhagen, Denmark, 233-239. Department of Weed Control and Pesticide Ecology, Flakkebjerg	[Elevation range exceeds 2000 m in native range, demonstrating environmental versatility] " <i>Gunnera tinctoria</i> , an herbaceous plant from South America, is naturalised in Sao Miguel island (Azores) ." ... "Infestation structure, altitudinal range, associated plants, phenology and natural enemies were studied. <i>G. tinctoria</i> was found from 100 to 900 m of altitude" ... "In Chile <i>G. tinctoria</i> is found from the coast to 2000 m of altitude, always in humid habitats, near water streams, rivers, lakes. in wetlands, wet sloped terrain, and in landslides"

204	Native or naturalized in regions with tropical or subtropical climates	n
	Source(s)	Notes
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"Climate - Cf - Warm temperate climate, wet all year; Status - Preferred"
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 5 Oct 2018]	"Naturalized Africa MACARONESIA: Portugal [Azores] Australasia NEW ZEALAND: New Zealand Europe NORTHERN EUROPE: Ireland, United Kingdom SOUTHWESTERN EUROPE: France Northern America SOUTHWESTERN U.S.A.: United States [California]"

205	Does the species have a history of repeated introductions outside its natural range?	y
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Qsn #	Question	Answer
	Source(s)	Notes
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"All cases of introduction and spread of <i>G. tinctoria</i> have been through planting as an ornamental followed by the species becoming naturalized as a garden escape. In Britain and Ireland this species was introduced into cultivation around 1850, but was not recorded in the wild until the early 1900s indicating an establishment phase of 60 years. Significant records of this species in the wild were not, however, found until the 1950s indicating a further lag phase of 40 years before any significant spread (Osborne and Gioria, 2005). The earliest known record of a naturalized stand in Ireland is from 1939, at Killary Harbour in County Mayo, although it is likely that it had been naturalized prior to this. Based on pollen identification in conjunction with analysis of soil sequences suggests it could have been present in Ireland for 100 years (Hickey and Osborne, 2001). <i>G. tinctoria</i> was first collected in the wild in New Zealand in 1968. By 1988 it had been found naturalised in Hawke's Bay, Taranaki, Wanganui, Banks Peninsula, Dunedin and Stewart Island and has continued to spread (Williams et al., 2005)."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Chilean rhubarb (<i>Gunnera tinctoria</i> [Molina] Mirbel) has been recognised as a weed of conservation land in New Zealand only within the last decade" ... "Chilean rhubarb has become naturalised in the British Isles and is particularly common in western Ireland (Hickey & Osborne 1998). It also occurs in northwestern France and the Azores (Philips & Rix 1993), and coastal California (Hickman 1993). Of these countries, only in Ireland is it considered a weed (Campbell & Osborne 1990)."
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 5 Oct 2018]	"Naturalized Africa MACARONESIA: Portugal [Azores] Australasia NEW ZEALAND: New Zealand Europe NORTHERN EUROPE: Ireland, United Kingdom SOUTHWESTERN EUROPE: France Northern America SOUTHWESTERN U.S.A.: United States [California]"

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	[Invades disturbed sites but primarily impacts native ecosystems] "In New Zealand, Chilean rhubarb occupies mainly damp coastal bluffs, riparian zones and disturbed ground, with its greatest abundance in Egmont Ecological District, western North Island."

Qsn #	Question	Answer
303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	[May impact grazing areas in Ireland] "G. tinctoria is an environmental weed so its economic impact is largely through the cost of control measures rather than a reduction of agricultural or forest productivity. However there are sites in Ireland where the species has invaded native species-rich native grassland, (Hickey and Osborne, 1998), which reduces the value of the land for grazing. National or regional governments and hence taxpayers in, for example, Ireland, UK, the Azores, Australia and New Zealand have to bear the cost of regulation, raising public awareness and of control measures."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

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	"Chilean rhubarb has become invasive in several countries and the plant forms dense stands eliminating almost all other species by shading and competing for nutrients (Hickey and Osborne, 1998; Heenan et al., 2009). In Ireland, invasion of native grasslands by this herb strongly reduces plant species richness. Vegetation cover is much lower compared with the dense grassland turf, and areas invaded by <i>Gunnera tinctoria</i> harbour broadleaved forbs not present in the grassland. The invasive plant changes the composition of the soil seed banks of native species, which may have long-lasting effects even after removal of the invader (Hickey and Osborne, 2001; Gioria and Osborne, 2009). Along rivers, the invasive plant replaces grey willow (<i>Salix cinerea</i>) with consequences for natural succession (Hickey and Osborne, 1998). In New Zealand, Chilean rhubarb is of concern because it colonizes coastal cliffs harbouring a number of threatened plant species (Williams et al., 2005)."

305	Congeneric weed	y
	Source(s)	Notes
	Skeffington, M. S., & Hall, K. (2011). The ecology, distribution and invasiveness of <i>Gunnera</i> L. species in Connemara, Western Ireland. <i>Biology and Environment: Proceedings of the Royal Irish Academy</i> 111B(3) 12-19	" <i>Gunnera manicata</i> (Brazilian giant rhubarb) is here confirmed for Connemara and both species are mapped. <i>G. manicata</i> appears to occur through accidental transfer of rhizome parts, while <i>G. tinctoria</i> can also spread by its abundant seed. The exceptionally severe winter of 2009/2010 checked the growth of <i>G. tinctoria</i> away from the coast, but not <i>G. manicata</i> ." [Impacts unspecified, but may be similar to <i>G. tinctoria</i>]
	Global Invasive Species Database. (2018). Species profile: <i>Gunnera manicata</i> . http://www.iucngisd.org/gisd/species.php?sc=167 . [Accessed 5 Oct 2018]	" <i>Gunnera manicata</i> can reduce natural biodiversity and compete with native species. The large leaves of <i>G. manicata</i> can prevent native species from growing underneath them and it may also form dense stands."

Qsn #	Question	Answer
	Jones, T. M. (2010). Population dynamics and management of <i>Gunnera tinctoria</i> (Molina) <i>Mirb.</i> and <i>Gunnera manicata</i> Linden at Eden Project, Cornwall, U.K. MSc Thesis. University of Plymouth, Plymouth, UK	" <i>Gunnera tinctoria</i> is considered to be a newly emerging invasive species with potential global significance (Gioria & Osborne, 2009), in part due to its rapid growth and early sexual maturity (Williams et al, 2005), whereas <i>Gunnera manicata</i> is yet to be observed as invasive and subsequently assigned a potential for significant detrimental effects to native plant communities (Williams et al, 2005), perhaps due to its slow vegetative increase and as yet unrecorded reproduction by seed (Preston et al, 2002)."

401	Produces spines, thorns or burrs	y
	Source(s)	Notes
	Dave's Garden. (2018). Giant Rhubarb, Chilean <i>Gunnera</i> , Chilean Rhubarb, Dinosaur Food - <i>Gunnera tinctoria</i> . https://davesgarden.com/guides/pf/go/56632/ . [Accessed 6 Oct 2018]	"Danger: Plant has spines or sharp edges; use extreme caution when handling"
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Stout herb up to 2 m tall, with leaves emerging from a thick rhizome. Leaves covered with stiff prickles."

402	Allelopathic	
	Source(s)	Notes
	Skeffington, M. S., & Hall, K. (2011). The ecology, distribution and invasiveness of <i>Gunnera</i> L. species in Connemara, Western Ireland. <i>Biology and Environment: Proceedings of the Royal Irish Academy</i> 111B(3) 12-19	[Possibly] "Where <i>G. tinctoria</i> occurred in large colonies near Letterfrack, the vegetation was sparse, probably due to shade from the leaves. But the leaves also produce large amounts of tannins, which, when released into the soil on leaf decay, may have allelopathic effects on the ground flora (Palkovic 1974). The tannins are also said to affect soil nitrogen status, inhibiting nitrification and resulting in ammonia accumulation in soils (Rice and Panchoy 1973)."

403	Parasitic	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	"Stout herb up to 2 m tall, with leaves emerging from a thick rhizome. Leaves covered with stiff prickles."

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"In both the Egmont Ecological District and the Pohangina Valley we found Chilean rhubarb leaves browsed by cattle. We also observed a lack of seedlings in pasture— despite the many large plants adjacent and the consequent seed rain— suggesting that grazing limits Chilean rhubarb's encroachment into pasture."

Qsn #	Question	Answer
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"In the Outer Hebrides, cattle and sheep appear to damage seedlings and scattered adult plants (R. Reid, pers. comm.). In Ireland, young individuals may be subject to some grazing by sheep during early spring in coastal grasslands, although there is no evidence of leaf damage by sheep on adult individuals during the growing season (Gioria 2007). Evidence of rodents chewing inflorescences was provided by Skeffington & Hall (2011) in Ireland. On São Miguel Island, Silva, Tavares & Pena (1996) reported damage to leaves by rabbits and goats. In Chile, the rhizomes of <i>G. tinctoria</i> represent one of the main sources of food for introduced wild boar <i>Sus scrofa</i> L. (Skewes, Rodríguez & Jaksic 2007). There, seeds of <i>G. tinctoria</i> are eaten by rodents, in particular by <i>Oryzomys longicaudatus philippi</i> (Landbeck) (Rodentia: Muridae) and <i>Akodon longipilis hirtus</i> Thomas (Rodentia: Cricetidae; Reise & Venegas 1987)."
	Silva, L., Tavares, J., & Pena, A. (1996). Ecological basis for the control of <i>Gunnera tinctoria</i> in São Miguel Island. <i>Proceedings Second International Weed Control Congress Copenhagen, Denmark</i> , 233-239. Department of Weed Control and Pesticide Ecology, Flakkebjerg	"Leaves are damaged by rabbits and goats."

405	Toxic to animals	n
	Source(s)	Notes
	Silva, L., Tavares, J., & Pena, A. (1996). Ecological basis for the control of <i>Gunnera tinctoria</i> in São Miguel Island. <i>Proceedings Second International Weed Control Congress Copenhagen, Denmark</i> , 233-239. Department of Weed Control and Pesticide Ecology, Flakkebjerg	"Leaves are damaged by rabbits and goats."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	[No evidence] "In the Outer Hebrides, cattle and sheep appear to damage seedlings and scattered adult plants (R. Reid, pers. comm.). In Ireland, young individuals may be subject to some grazing by sheep during early spring in coastal grasslands, although there is no evidence of leaf damage by sheep on adult individuals during the growing season (Gioria 2007). Evidence of rodents chewing inflorescences was provided by Skeffington & Hall (2011) in Ireland. On São Miguel Island, Silva, Tavares & Pena (1996) reported damage to leaves by rabbits and goats. In Chile, the rhizomes of <i>G. tinctoria</i> represent one of the main sources of food for introduced wild boar <i>Sus scrofa</i> L. (Skewes, Rodríguez & Jaksic 2007). There, seeds of <i>G. tinctoria</i> are eaten by rodents, in particular by <i>Oryzomys longicaudatus philippi</i> (Landbeck) (Rodentia: Muridae) and <i>Akodon longipilis hirtus</i> Thomas (Rodentia: Cricetidae; Reise & Venegas 1987)."
	Quattrocchi, U. 2012. <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	No evidence

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

Qsn #	Question	Answer
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"In New Zealand, Chilean rhubarb's relative lack of insect pests and diseases made the species attractive to horticulturalists."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"In Southern Chile (at latitudes of 36°–42°S) it is a delicacy associated with Mapuche Indian customs. The young petioles are commonly sold by street vendors and eaten raw, along with salt and chilli to enhance the flavor (E. Villouta pers. comm. 2004)."
	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
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Chilean rhubarb grows on leached soils in high rainfall areas (Campbell 1994; Jarzen 1980; Osborne 1989)." [No evidence. A large herb of high rainfall areas]
	Silva, L., Tavares, J., & Pena, A. (1996). Ecological basis for the control of <i>Gunnera tinctoria</i> in São Miguel Island. Proceedings Second International Weed Control Congress Copenhagen, Denmark, 233–239. Department of Weed Control and Pesticide Ecology, Flakkebjerg	"Natural populations of <i>Gunnera</i> sp. are restricted to super-humid areas with heavy rainfall; they prefer high altitudes and open or lightly shaded areas, and are often pioneers on bare land (Bergman et al., 1992)."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	[No evidence. An herbaceous plant of wet habitats] " <i>Gunnera tinctoria</i> is a gynomonocious, clonal, perennial herb that is naturalized in parts of Britain, becoming invasive in parts of Ireland and, more recently, Scotland." ... "Typical habitats in Britain and Ireland include stream and river banks, lake and pond margins, coastal cliffs, as well as disturbed areas, such as roadsides, quarries and ditches. In its native range it occurs predominantly on the banks of rivers and streams, on coastal cliffs and within canopy gaps or at the margins of temperate-humid rain forests."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes

Qsn #	Question	Answer
	Silva, L., Tavares, J., & Pena, A. (1996). Ecological basis for the control of <i>Gunnera tinctoria</i> in São Miguel Island. Proceedings Second International Weed Control Congress Copenhagen, Denmark, 233-239. Department of Weed Control and Pesticide Ecology, Flakkebjerg	"Natural populations of <i>Gunnera</i> sp. are restricted to super-humid areas with heavy rainfall; they prefer high altitudes and open or lightly shaded areas"
	Dave's Garden. (2018). Giant Rhubarb, Chilean <i>Gunnera</i> , Chilean Rhubarb, Dinosaur Food - <i>Gunnera tinctoria</i> . https://davesgarden.com/guides/pf/go/56632/ . [Accessed 6 Oct 2018]	"Sun Exposure: Full Sun" ... "On Sep 8, 2015, Jan26 from Sequim, WA wrote: ... Needs a lot of space, water and partial shade otherwise the leaves will burn." ... "On Feb 22, 2006, delosfox from Portland, OR (Zone 8b) wrote: ... Does best in partial shade. Mine is wind protected, under a heavily pruned magnolia tree in a peaty, acid soil with lots of leaf mold and organic matter" ... "On Jan 17, 2005, Ursula from Santiago, Chile (Zone 9b) wrote: ... This plant requires full or partial shade, although it can grow with some sun in which case it will not reach its full size."
	CABI. 2018. Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Tolerant of shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	" <i>Gunnera tinctoria</i> occurs on a variety of substrates, mainly on alluvial or colluvial soils derived from volcanic material or on thin gley soils of marine origin. In Ireland, it occurs naturally on soils with a pH ranging from 4.6 to 6.2 and has been cultivated in soils with a pH up to 7. Soil moisture content and soil organic matter vary greatly, although it rarely colonizes highly organic soils such as peat. It is susceptible to even mild water deficits at all stages of development, and its seedlings are also sensitive to waterlogged conditions." ... " <i>Gunnera tinctoria</i> grows on a variety of soil types."
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"In New Zealand, Chilean rhubarb grows on substrates derived from a wide range of sedimentary rocks but, because its greatest concentrations at present are in the western North Island, most soils also have a large component of volcanic material. The coastal cliffs in Egmont Ecological District from Manaia westwards are mudstone, overlain by volcanic (andesitic) material. The two are often intermixed on talus slopes. The most vigorous stands of Chilean rhubarb are found on colluvium or alluvium"

411	Climbing or smothering growth habit	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	"Stout herb up to 2 m tall, with leaves emerging from a thick rhizome."

412	Forms dense thickets	y
	Source(s)	Notes

Qsn #	Question	Answer
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Chilean rhubarb has become invasive in several countries and the plant forms dense stands eliminating almost all other species by shading and competing for nutrients (Hickey and Osborne, 1998; Heenan et al., 2009)."
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"The ecological impacts of Chilean rhubarb in New Zealand are particularly severe where it has formed dense stands in Egmont Ecological District, displacing native plants. Of most concern are the coastal cliffs that have become increasingly important for plant conservation as native biota in the surrounding landscape are depleted—a world-wide phenomenon (Larson et al. 1999)."

501	Aquatic	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	[Terrestrial herb] "Stout herb up to 2 m tall... In the native range, Chilean rhubarb occurs in frost-free habitats with moderate to heavy rainfall, generally on leached soils."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 5 Oct 2018]	Family: Gunneraceae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Osborne, B., Doris, F., Cullen, A., McDonald, R., Campbell, G., & Steer, M. (1991). <i>Gunnera tinctoria</i> : an unusual nitrogen-fixing invader. <i>Bioscience</i> , 41(4), 224-234	[N-fixing giant herb] "Although the sheer size of <i>G. tinctoria</i> is in itself remarkable for a herbaceous plant, further unusual features can be found beneath the exterior surface of the large, swollen rhizome. A slice of this part of the plant reveals the presence of distinctive blue-green colonies of the cyanobacterium (bluegreen alga) <i>Nostoc punctiforme</i> (Figure 3), which forms a symbiotic relationship with all known <i>Gunnera</i> species. The cyanobacterium forms long chains of vegetative cells, which are interspersed with larger, thicker-walled cells called heterocysts, which have the capacity to fix nitrogen (Stewart et al. 1969). Although cyanobacterial symbiotic associations with lichens, cycads, and the water fern <i>Azolla</i> are well known, <i>Gunnera</i> is the only angiosperm genus that forms a symbiotic relationship with a nitrogen-fixing blue-green alga (Bonnett 1990, Smith and Douglas 1987, Sprent 1979)."

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. <i>Plant Protection Quarterly</i> , 25(2): 56-74	"A geophyte is defined as a perennial plant that bears its perennating buds below the surface of the soil."
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Massive over-wintering buds—up to 250 mm long—accumulate on the rhizomes and they are covered in pinkish, pinnatisect scales that extend to the broad leaf midribs."
	Weber, E. 2017. <i>Invasive Plant Species of the World</i> , 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Stout herb up to 2 m tall, with leaves emerging from a thick rhizome."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Chilean rhubarb is native to both sides of the Andes from Colombia to Chile." [No evidence from native range]

602	Produces viable seed	y
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Germination tests were conducted on seeds collected at Oeo in Egmont Ecological District in early March 2000. Seeds were picked individually off the heads of several plants. We also obtained some from dry bird faeces at the same site. The faeces were deposited at the junction of the lamina and the petiole, probably by blackbirds (<i>Turdus merula</i>), judging from their size." ... "Germination commenced after seven days for the 'faeces seed' and 14 days for fresh seed. Fifty percent germination was achieved within 14 days for the former, and within 15 days for the latter. Both groups achieved 100% germination within 30 days."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	" <i>Gunnera tinctoria</i> produces large numbers of seeds and also spreads clonally, by a horizontal rhizome system."

603	Hybridizes naturally	
	Source(s)	Notes
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	[Unknown. Hybrids documented in genus] "There are no records of <i>G. tinctoria</i> forming viable hybrids. Palkovic (1978) reported the occurrence of hybrids between two large <i>Gunnera</i> species, <i>G. insignis</i> and <i>G. talamancana</i> , in Costa Rica, indicating a potential for hybridization between the larger members of this genus."

Qsn #	Question	Answer
604	Self-compatible or apomictic	
	Source(s)	Notes
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	[Unknown if bisexual flowers are self-compatible] " <i>Gunnera tinctoria</i> is gynomonoeious, having both bisexual and female flowers (Webb, Sykes & Garnock-Jones 1988; Pena 1995; González & Bello 2009). Flowers are distributed along two to four large compound inflorescences (Williams et al. 2005; Gioria 2007; Gioria & Osborne 2009; Skeffington & Hall 2011)."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Chilean rhubarb produces small, greenish flowers that are either female or hermaphrodite on the same plant and are, therefore, gynomonoeious (Webb et al. 1988). Hymenopterous insects, particularly bees, are probably the main pollinators (PAW pers. obs.)."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"The species is mostly or exclusively wind pollinated (Carlquist 1974; Wanntorp et al. 2001; Wilkinson & Wanntorp 2007), although Williams et al. (2005) reported that individual flowers can be insect pollinated, probably by bees (Hymenoptera)."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Chilean rhubarb also grows readily from stem fragments, and such fragments are common where bits of established plants break off and tumble down steep slopes or where floods carry fragments down streams."
	Weber, E. 2017. <i>Invasive Plant Species of the World</i> , 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Vegetative spread occurs if rhizome or stem pieces are carried by floods or by soil movement. Stem fragments easily resprout."

Qsn #	Question	Answer
607	Minimum generative time (years)	>3
	Source(s)	Notes
	Skeffington, M. S., & Hall, K. (2011). The ecology, distribution and invasiveness of <i>Gunnera</i> L. species in Connemara, Western Ireland. <i>Biology and Environment: Proceedings of the Royal Irish Academy</i> 111B(3) 17-19	"A mature <i>G. tinctoria</i> plant flowers after 4-5 years, seed production is high and an individual plant may produce up to 700g of dried seed or potentially 700,000 individual seedlings (Osborne et al. 1991)."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"Mature plants generally flower after approximately 5 years, although this is dependent upon the environmental conditions (Osborne et al. 1991)."
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Plants in the cool, moist climate of Pukeiti Rhododendron Trust gardens (4000 mm of rainfall per annum and 360 m a.s.l.) took three years to reach tall stature and appeared to flower only after four or five years (G. Smith, Pukeiti Rhododendron Trust, pers. comm. 2003)."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Skeffington, M. S., & Hall, K. (2011). The ecology, distribution and invasiveness of <i>Gunnera</i> L. species in Connemara, Western Ireland. <i>Biology and Environment: Proceedings of the Royal Irish Academy</i> 111B(3) 17-19	"In Connemara it has colonised quarries and roadsides, spreading out from these, though rarely onto bog. Gravel spread from infested quarries has been an important dispersal factor."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"Vehicular traffic and disposal of contaminated soil play a major role in propagule dispersal for this species. Skeffington & Hall (2011) reported its presence in the Connemara National Park, Co. Galway, probably as a consequence of the use of gravel in the park originating from the nearby Guy's quarry. They also reported the spread of this species along roadways constructed using contaminated material from this and other quarries."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Chilean rhubarb is a popular horticultural plant in much of New Zealand. It was listed by Gaddum (1999) as available at 13 wholesale nurseries in New Zealand. It has been widely grown as a waterside plant in parks, botanic gardens, and in large public and private gardens throughout New Zealand."
	CABI. 2018. Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>G. tinctoria</i> is a popular ornamental species, particularly for larger gardens and landscaping by streams, ponds and other water features. It has therefore become widely available through the horticultural trade since being introduced to cultivation during the 1800s."

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"In a suitable habitat and climate it can be spread accidentally beyond gardens in garden waste or contaminated soil."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Our tests suggest that seeds are not damaged by passage through at least one species of bird—rather, that germination is more rapid. Blackbird and white-eye (<i>Zosterops lateralis</i>) have been observed eating the fruit. Both are common in the Egmont Ecological District and are probably the main agents of dispersal (Cotton & Molloy 1986; Miller 1996)."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"Seeds are likely to be predominantly water and/or bird dispersed."

705	Propagules water dispersed	y
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Chilean rhubarb also grows readily from stem fragments, and such fragments are common where bits of established plants break off and tumble down steep slopes or where floods carry fragments down streams. The stream-side distribution of Chilean rhubarb suggests seeds are probably dispersed by water as well."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"Seeds are likely to be predominantly water and/or bird dispersed." ... "Long-distance dispersal is believed to be predominantly hydrochorous, occurring naturally along rivers, stream and ditches, and zoochorous (Silva, Tavares & Pena 1996; Hickey 2002; Figueroa 2003; Williams et al. 2005; Gioria 2007)."

706	Propagules bird dispersed	y
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Fruits are 3 mm × 2 mm, weigh 4 mg, and have a flesh dry weight of 0.6 mg and a seed dry weight of 0.7 mg (48% flesh, dry weight). The flesh is 74% water, which is typical of fleshy-fruited adventive species in New Zealand (Williams & Karl 1996)." ... "Our tests suggest that seeds are not damaged by passage through at least one species of bird—rather, that germination is more rapid. Blackbird and white-eye (<i>Zosterops lateralis</i>) have been observed eating the fruit. Both are common in the Egmont Ecological District and are probably the main agents of dispersal (Cotton & Molloy 1986; Miller 1996)."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"On the Outer Hebrides, birds are thought to be responsible for most of the seed dispersal in autumn (see IX.A). Birds have also been found to spread seeds on Achill Island (Hickey 2002), São Miguel Island (Silva, Tavares & Pena 1996) and in New Zealand (Williams et al. 2005; IX A)."

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Blackbird and white-eye (<i>Zosterops lateralis</i>) have been observed eating the fruit. Both are common in the Egmont Ecological District and are probably the main agents of dispersal (Cotton & Molloy 1986; Miller 1996)."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"Seeds are likely to be predominantly water and/or bird dispersed." [No evidence & no means of external attachment]

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Germination tests were conducted on seeds collected at Oeo in Egmont Ecological District in early March 2000. Seeds were picked individually off the heads of several plants. We also obtained some from dry bird faeces at the same site. The faeces were deposited at the junction of the lamina and the petiole, probably by blackbirds (<i>Turdus merula</i>), judging from their size." ... "Germination commenced after seven days for the 'faeces seed' and 14 days for fresh seed. Fifty percent germination was achieved within 14 days for the former, and within 15 days for the latter. Both groups achieved 100% germination within 30 days." ... "Our tests suggest that seeds are not damaged by passage through at least one species of bird—rather, that germination is more rapid. Blackbird and white-eye (<i>Zosterops lateralis</i>) have been observed eating the fruit. Both are common in the Egmont Ecological District and are probably the main agents of dispersal (Cotton & Molloy 1986; Miller 1996)."

801	Prolific seed production (>1000/m2)	y
	Source(s)	Notes
	Weber, E. 2017. <i>Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds</i> . CABI Publishing, Wallingford, UK	"Fruit production is copious, and a single plant may bear 250,000 fruits."
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	" <i>Gunnera tinctoria</i> produces a large number of seeds, although estimates vary substantially. Osborne et al. (1991) estimated c. 750 000 seeds per plant in an Irish population, while Williams et al. (2005) estimated up to 250 000 fruits per plant, based on seed collected from 1-m-long inflorescences on the coast west of Mount Taranaki (c. 12 000–83 000 per inflorescence). The mean number of seeds per panicle estimated by Silva, Tavares & Pena (1996) at four locations in São Miguel Island was c. 30 000–130 000. Clearly, the actual numbers could vary considerably, depending on plant and inflorescence size, stage of development and environmental conditions, particularly water availability (see VI.E)."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
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Qsn #	Question	Answer
	Source(s)	Notes
	Gioria, M., & Osborne, B. A. (2013). Biological flora of the British Isles: <i>Gunnera tinctoria</i> . <i>Journal of Ecology</i> , 101(1), 243-264	"A large study of the seed bank of this species at three invaded sites in Ireland, in May (after the germination of the majority of seeds in the field) and October (soon after seed dispersal), showed a capacity for <i>G. tinctoria</i> to form a persistent seed bank (sensu Thompson, Bakker & Bekker 1997), of the order of hundreds of thousands of germinated seedlings m ⁻² (Gioria 2007; Gioria & Osborne 2009, 2010)." ... "The persistent character of the <i>G. tinctoria</i> seed bank can be inferred from the proportion of seeds that germinated from deep soil layers, with 20% of seedlings emerging from the 5- to 10-cm soil layer and 10% from the deepest soil layer (10–15 cm), and by the large number of seedlings emerging from samples collected in May. Williams et al. (2005) suggested that this species only formed a minimal seed bank in New Zealand due to the high percentage germination observed in situ. They reported that in the Pukeiti Rhododendron Trust gardens, on the lower slopes of Mount Taranaki, no seedlings emerged after 2 years of removal of the flower heads to prevent seeds being produced. These conclusions were, however, not based on direct estimates of the size and type of seed bank. Climatic differences between Ireland and New Zealand might also contribute to these differences (Gioria & Osborne 2009)."
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"Germination commenced after seven days for the 'faeces seed' and 14 days for fresh seed. Fifty percent germination was achieved within 14 days for the former, and within 15 days for the latter. Both groups achieved 100% germination within 30 days. This suggests a very high germination percentage from fresh seed, which probably have no dormancy mechanism after the flesh is removed (and, thus, less ability to form seed banks). Further evidence for a minimal seed bank comes from Pukeiti Rhododendron Trust gardens on the lower slopes of Mt Taranaki. They used to remove the flower heads from Chilean rhubarb before seed was set. Once this practice was started, it took just two years before no new seedlings came up (G. Smith, pers. comm. 2003)."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Seeds germinate readily after gut passage or after removal of the fruit pulp, and the seeds do not appear to form a soil seed bank (Williams et al., 2005). In contrast, Gioria and Osborne (2009) argue that the plant accumulates a persistent soil seed bank in Ireland because soils collected from invaded sites yielded c. 30,000 seedlings/m ² ."

803	Well controlled by herbicides	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc</p>	<p>"Use of herbicides is recommended in New Zealand, particularly in areas where access for mechanical control operations is difficult and potentially dangerous, such as on unstable wet cliffs. Horizons District Council recommends applying a broadcast application of triclopyr 600 EC with organo-silicone spreader, or metsulfuron-methyl (Horizons, 2006). Law (2003) reported that Taranaki Regional Council found use of picloram to be a useful treatment. A 1.5-2% solution of glyphosate with a suitable wetter has also been applied by knapsack sprayer. On steep cliffs, abseilers cut the leaves off plants and immediately treat the cut surface with 25% glyphosate. The growing tips are not cut off to avoid them dropping and re growing. Results to date have been promising; however, some native seedlings have come up in the cleared areas and there was some re-growth on about 4.5% of the treated <i>G. tinctoria</i> plants. After spraying, some rhizomes take up to 18 months to rot."</p>
	<p>Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington</p>	<p>"Young Chilean rhubarb can readily be killed with chemicals. Mature plants can be harder to kill because it is difficult to apply sufficient chemical to kill the stout rhizome. Results from trials in the Taranaki Region (2000–2004) are given in Appendix 2, and summarised below. Several forms and concentrations of glyphosate (as 'Roundup G2' or 'Roundup Renew Xtra'), alone or with 'Escort' (metsulfuron), plus the surfactant 'Pulse', have given a wide range of kill rates when applied as a spray. Higher application rates give better results than lower rates, especially for plants with large rhizomes. Where it has been possible to reach Chilean rhubarb on foot, cutting the leaves and flower stalks against the rhizomes, and then applying 25% glyphosate by hand, has been the most effective method (Fig. 4). A trial of helicopter spraying has also been carried out (Fig. 5). Highest kill rates for spraying are achieved when spraying is done early in the growing season, i.e. before December, and certainly before seeds mature in February to March. It is essential to check all treated plants within a year; any surviving plants must be re-treated and all seedlings removed or sprayed."</p>

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	<p>Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington</p>	<p>"Chilean rhubarb can be controlled by mechanical means, but it is imperative to remove the entire rhizome because small pieces of live rhizome can re-sprout."</p>

Qsn #	Question	Answer
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Williams, P. A., Ogle, C. C., Timmins, S. M., La Cock, G. D., & Clarkson, J. (2005). Chilean rhubarb (<i>Gunnera tinctoria</i>): biology, ecology and conservation impacts in New Zealand. DOC Research & Development Series 210. Department of Conservation, Wellington	"In New Zealand, Chilean rhubarb's relative lack of insect pests and diseases made the species attractive to horticulturalists."
	WRA Specialist. 2018. Personal Communication	Unknown. No records of introduction or cultivation in the Hawaiian Islands to date

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Native to and naturalized in regions with a temperate & Mediterranean climate (could threaten upper elevations of tropical & subtropical islands)
- Naturalized in the Azores, New Zealand, Ireland, the UK, France, & California (but no evidence in the Hawaiian Islands to date)
- An environmental weed in New Zealand & Ireland, reducing native biodiversity
- *Gunnera manicata* is also invasive
- Leaves covered with stiff prickles
- Shade tolerant
- Tolerates many soil types
- Forms dense stands that exclude other vegetation
- N-fixing (can alter soil chemistry)
- Reproduces by seeds & vegetatively by rhizomes (able to spread by rhizome fragments)
- Seeds dispersed by birds, water, as a soil contaminant & intentionally by people
- Rhizome fragments also moved by water
- Prolific seed production
- Seeds may form a persistent seed bank (reports from New Zealand suggest no seed bank is formed, but UK evidence suggests yes)
- Able to resprout after cutting

Low Risk Traits

- Climate preferences may limit invasiveness to upper elevations of tropical islands
- Palatable to browsing & grazing animals (does not spread into pastures with livestock)
- Reaches maturity in 4-5 years (but may be able to spread vegetatively at an earlier age)
- Herbicides may provide effective control