Taxon: Sphaeropteris cooperi (Hook. ex F. Muell.) R. M. Tryon

Family: Cyatheaceae

Common Name(s): Australian tree fern
highland lace
straw tree fern

Synonym(s): Alsophila cooperi F. Muell.
Cyathea cooperi (Hook. ex F. Muell.)

Assessor: Chuck Chimera

Status: Assessor Approved

End Date: 8 Apr 2021

WRA Score: 17.0

Designation: H(Hawai'i)

Rating: High Risk

Keywords: Naturalized, Environmental Weed, Tropical Tree Fern, Ornamental, Wind-Dispersed

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

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed		
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Australian National Botanic Gardens. (2021). Growing Native Plants - Cyathea australis, Cyathea cooperi. http://www.anbg.gov.au/. [Accessed 7 Apr 2021]	[No evidence. Assessment pertains to wild type] "C. cooperi is quite distinctive from C. australis in that it has a more slender trunk with distinctive "coin spots" where old fronds have broken off the trunk. C. cooperi fronds are bright green and lacy and tend to be very fast growing. There are several major horticultural varieties of this fern including Cyathea 'Brentwood' which has paler fronds and scales and C. 'Robusta' which tends to be darker in both characters. C. cooperi is the one of the most popular tree ferns, along with Dicksonia antarctica due to its rapid growth form, hardiness and aesthetic appeal."
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[No evidence] "Misidentified as Cvathea australis in older checklists of Hawaiian fems, Sphaeropteris cooperi. native to northeastern Australia and very popular in gardens and commercial landscaping, was reported escaping from cultivation as early as 1950 in upper Minoa Valley."

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**
	Australian National Botanic Gardens. (2021). Growing Native Plants - Cyathea australis, Cyathea cooperi. http://www.anbg.gov.au/. [Accessed 7 Apr 2021]	"C. cooperi is naturally found in tropical lowlands, along the coast of Queensland and New South Wales."
	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 7 Apr 2021]	"Native Australasia AUSTRALIA: Australia [New South Wales (e.), Queensland (e.), Victoria]"

Qsn #	Question	Answer
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 7 Apr 2021]	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Robinson, R.C., Sheffield, E, & Sharpe, J.M. (2010). Problem ferns: their impact and management. Pp. 255–322 In: Mehltreter K., Walker L. R., & Sharpe, J. M. (eds.). Fern Ecology. Cambridge University Press, New York	"Cyathea cooperi is one of the most hardy tree-ferns, tolerant of snow in its upland native environment in Australia and can grow to some 5 m tall and can become invasive in warmer areas."
	Bezona, N., Rauch, F. D., & Iwata, R. Y. (1994). Tree ferns for Hawai'i gardens. Research Extension Series 144. CTAHR,, Univiersity of Hawaii, Honolulu, HI	[Elevation range exceeds 1000 m, demonstrating environmental versatility] "Cyathea cooperi, the most commonly available tree fern in Hawaiian nurseries. May be grown from sea level to 4000 foot elevations."
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	[In tropical climates, elevation range exceeds 1000 m, demonstrating environmental versatility] "Tropical and subtropical rain forest to montane forest in open sites, near streams, and in mountain gullies from sea level to 1400 m or higher"

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Australian National Botanic Gardens. (2021). Growing Native Plants - Cyathea australis, Cyathea cooperi. http://www.anbg.gov.au/. [Accessed 7 Apr 2021]	"C. cooperi is naturally found in tropical lowlands, along the coast of Queensland and New South Wales."
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	"Cyathea cooperi is native to Queensland in northeastern Australia where its native habitat is in gullies in rain forests (Jones & Clemesha, 1978)."
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	[Grows in tropical to warm temperate climates] "It is recognized as a weed species in many of the tropical to warm temperate regions of the world where it has been introduced. Plants do best in rich, well-drained humus and will tolerate frost though the fronds may be damaged. Once established, this fern is also tolerant of dry spells."

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

Qsn #	Question	Answer
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	"Cyathea cooperi and Dicksonia antarctica, both from Australia, are among the most common garden tree ferns. Cultivars of C. cooperi are available; 'Brentwood' and 'Robusta' are the most frequently planted in the United States. This tree fern, a rain forest species native to Queensland and New South Wales, has become naturalized in Mauritius, northern New Zealand, South Africa, and Hawaii, where it arrived sometime before 1960. In Hawaii (Plate 36), it has since been recommended for classification as a noxious weed. Its potential to become a weed must be kept in mind when its cultivation is considered."
	Riffle, R.L. (1998). The Tropical Look - An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR	"It is probably the most commonly planted tree fern, at least in the Western world, and is one of the most beautiful and tropical subjects for the warm-climate garden."
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Native to northeastern Australia, Australian tree fern is the most frequently available tree fern in Hawaiian nurseries, popularly grown in gardens and in containers."
	Howell, C. J., & Sawyer, J. W. (2006). New Zealand naturalised vascular plant checklist. New Zealand Plant Conservation Network, Wellington, NZ	[New Zealand] "Cyathea cooperi" ... "Fully naturalized"

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	"Cyathea cooperi and Dicksonia antarctica, both from Australia, are among the most common garden tree ferns. Cultivars of C. cooperi are available; 'Brentwood' and 'Robusta' are the most frequently planted in the United States. This tree fern, a rain forest species native to Queensland and New South Wales, has become naturalized in Mauritius, northern New Zealand, South Africa, and Hawaii, where it arrived sometime before 1960." … "Distribution: Northeastern Queensland to New South Wales and naturalized in Western Australia, in tropical and subtropical rain forest to montane forest in open sites, near streams, and in mountain gullies from sea level to 1400 m or higher."
	Howell, C. J., & Sawyer, J. W. (2006). New Zealand naturalised vascular plant checklist. New Zealand Plant Conservation Network, Wellington, NZ	"Cyathea cooperi" ... "Fully naturalized"

Qsn #	Question	Answer
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	"It has become naturalized in southeastern Australia in the Sydney region since 1942 (P. Hind, pers. comm.) and in western Australia at Bedfordale (Jones & Clemesha, 1978). Elsewhere, C. cooperi is naturalized on Mauritius Island in the South Indian Ocean where it has, especially in the last decade, invaded relatively undisturbed low stature rain forest and disturbed native heathlands (C. Chambers and D. H. Lorence, pers. comm.) and is replacing two native species of Cyathea, C. excelsa and C. bourbonica Desv. (Lorence, 1978; Lorence & Sussman, 1988; D.H. Lorence, pers. comm.)" ... "Cyathea cooperi is now naturalized in Hawai'i on the islands of Kaua'i, O'ahu, and Maui. On Kaua'i, the species is broadly distributed at 550-1130 m elevation in the Hanalei district at Halele'a Forest Reserve (T Flynn et al. 3546, PTBG), and Limahuli Valley (D.H. Lorence et al. 5721, PTBG), on Kumuwela ridge (T Flynn 1587, PTBG), in the Koloa district along Wahiawa stream (T. Flynn et al. 4593, PTBG), and in the Waimea district in the Koke'e area along Mohihi road (T Flynn et al. 3794, PTBG)"
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"It is now naturalized on Kauai, Oahu, Maui and Hawaii."
	Wood, W. (2008). Subtropical Australian tree fern, Sphaeropteris cooperi (Hook. ex F. Muell.) RM Tryon, found modestly established in Oregon. American Fern Journal, 98(2): 113-115	"The exotic Australian Tree Fern, Sphaeropteris cooperi (Hook. ex F. Muell.) R. M. Tryon, synonym Cyathea cooperi (Hook. ex F. Muell.) Domin, has been discovered in an easily accessed canyon on the southern Oregon coast, approximately 11 miles north of Brookings, Oregon (Fig. 1)." ... "While it is unknown how these plants may have first been introduced to this location, ferns can establish miles away from any fertile parent plant with their small, easily dispersible wind-borne spores."
	Oppenheimer, H. (2008). New Hawaiian plant records for 2007. Bishop Museum Occasional Papers 100: 22-38	[Lanai] "Popular in the local horticultural trade, Australian tree fern is also a serious weed species, yet it is still sold at many nurseries. It has been documented outside of cultivation on Kauaʻi, Oʻahu, Maui, and Hawaiʻi (Palmer 2003: 245). On Länaʻi it is common in yards in Länaʻi City, and the wind-dispersed spores could have blown over Länaʻihale to the collection site. Alternately, the spores could have come in on the tradewinds across the channel from West Maui, where it is common in resort, commercial, and residential landscaping. All wild plants observed were destroyed."

302	Garden/amenity/disturbance weed	n
	Source(s)	**Notes**
	Walker, L.R. & Shiels. A. B. (2013). Landslide Ecology. Cambridge University Press, Cambridge, UK	"On Hawaiian landslides, a non-native tree fern (Spaeropteris cooperi) from Australia out-competes native tree ferns (Cibotium glaucum; Fig. 5.10)." [An environmental weed that can establish in disturbed sites]
	CABI. (2021). Cyathea cooperi in: Invasive Species Compendium. http://www.cabi.org/isc. [Accessed 7 Apr 2021]	[A disturbance adapted environmental weed] "As a pioneer species, it establishes especially well after disturbances."

Qsn #	Question	Answer
303	**Agricultural/forestry/horticultural weed**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	An environmental weed

304	**Environmental weed**	**y**
	Source(s)	**Notes**
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Aggressively spreading in a variety of habitats, this fast-growing fern is a serious threat to Hawaiian ecosystems and is considered to be among the word alien plant invaders in Kipahulu Valley of Haleakala National Park on East Maui."
	Chau, M. M., Walker, L. R., & Mehltreter, K. (2013). An invasive tree fern alters soil and plant nutrient dynamics in Hawaii. Biological Invasions, 15(2): 355-370	"Our results show that S. cooperi can alter nutrient cycling in Hawaiian plants, sometimes with positive effects on growth. However, under natural conditions, native plants must compete for these additional nutrients with S. cooperi and other invasive species. This study contributes to invasion biology as the first to examine the impact of leaf litter of an invasive fern on native species"
	Spencer, R. (1995). Horticultural Flora of South-eastern Australia: Ferns, conifers & their allies. UNSW Press, Sydney, AU	"Probably the most popular tree fern in cultivation in Australia. Near Sydney it has shown the potential to become a busland weed in some gully areas."
	Medeiros, A.C., Loope, L.L., & Anderson, S. (1993). Differential colonization by epiphytes on native (Cibotium spp.) and alien (Cyathea cooperi) tree ferns in a Hawaiian rain forest. Selbyana 14: 71–74	"S. cooperi supports fewer epiphytic species than C. glaucum, which hosts at least 17 species of native epiphytes in Hawaii"
	Durand, L. Z., & Goldstein, G. (2001). Growth, leaf characteristics, and spore production in native and invasive tree ferns in Hawaii. American Fern Journal, 91 (1), 25-35	"Sphaeropteris cooperi is now naturalized on the islands of Oahu, Maui, Kauai, and Hawaii (Wagner 1995) and is listed as among the worst alien plant invaders of Haleakala National Park (Loope et al. 1992)."
	Tassin, J., Triolo, J., & Lavergne, C. (2007). Ornamental plant invasions in mountain forests of Réunion (Mascarene Archipelago): a status review and management directions. African Journal of Ecology, 45(3): 444-447	"Table 1 List of the ornamental species threatening mountain forests on Reunion. Invasiveness status is evaluated as highly invasive (+++)," ... "Cyathea cooperi - Invasiveness status = +++"
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	"The densest stands of Cyathea in the Kipahulu Valley population were conspicuously lacking in understory species diversity and biomass. This may be due to the thick layer of fibrous roots at the soil surface that surrounds individuals of Cyathea cooperi, extending up to 5 m from a large individual." ... "Cyathea cooperi does not support the dense growth of epiphytic native species that typically occupies the trunks of native tree ferns in wet forests. Medeiros et al. (submitted) found more than ten times as many epiphyte individuals growing on trunks of native tree ferns (Cibotium spp.) as on trunks of Cyathea cooperi." ... "The greatest threat posed by C. cooperi to Hawaiian forests is displacement of native species where the fern achieves high densities. Cyathea cooperi is a fast-growing species, once established, capable in its native habitat of growing up to one meter in height a year (A. Irvine, pers. comm.) and in Hawai'i up to one third meter per year (G. Westcott, pers. comm.)."

Qsn #	Question	Answer
	Allison, S. D., & Vitousek, P. M. (2004). Rapid nutrient cycling in leaf litter from invasive plants in Hawai'i. Oecologia, 141(4): 612-619	[Modifies nutrient cycles] "many invasive species in Hawai'i, including the Melastomes and Sphaeropteris, have high photosynthetic and growth rates compared to native species (Baruch and Goldstein 1999; Baruch et al. 2000; Durand and Goldstein 2001a). We speculate that these traits in combination with the clear dominance of our invaders would cause their litter inputs to meet or exceed those of displaced natives. For example, Sphaeropteris ferns growing on O'ahu were found to produce ten times as many fronds (of similar size) as adjacent Cibotium tree ferns (Durand and Goldstein 2001b). Therefore, a transition from Cibotium to Sphaeropteris dominance would increase ecosystem nutrient cycling rates many-fold because invader litter inputs would be much higher, contain more nutrients, and decay five times faster. Under these conditions, Sphaeropteris and other invaders are likely to persist or increase because decaying, nutrient rich litter could meet the high nutrient demands of invasive plants."

305	Congeneric weed	n
	Source(s)	**Notes**
	Akomolafe, G. F., & Rahmad, Z. B. (2018). A review on global ferns invasions: mechanisms, management and control. Journal of Research in Forestry, Wildlife and Environment, 10(3), 42-54	[No evidence] "There has been paucity of information and inadequate studies on the invasive potentials of ferns as most invasive ecological studies have so far focused on higher plants across the continents. This paper therefore, reviews ferns invasions, mechanisms of invasions and management of invasive ferns that have been reported in literatures. We searched four databases including Jstor, Science direct, Willey online library and Scopus for relevant literature between 1990 – 2018. A total of seventy articles reporting ferns invasions in various countries in six continents were harvested. Eighteen ferns reported to be invasive across the world include Lygodium microphyllum, Lygodium japonicum, Azolla pinnata, Pteridium arachnoideum, Dennstaedtia punctilobula, Thelypteris noveboracensis, Pityrogramma calomelanos, Azolla filiculoides, Acrostichum spp, Asplenium adiantum-nigrum, Dryopteris carthusiana, Dryopteris intermedia, Polystichum acrostichoides, Cyclosorus afer, Sphaeropteris cooperi, Angiopteris evecta, Salvinia molesta and Pteridium aquilinum. Most of these ferns were reported to have invaded parts of North America than other continents. Prevalent mechanisms of invasion for these ferns include their polyploidy nature, ability to disperse spores for long distance, allelopathy, adaptation to disturbed areas and unfavourable environmental conditions. It was suggested that using biological approaches which enable ecological succession and ecosystem restoration is preferable to other methods of controlling these invasive ferns."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Other species of Cyathea are reported to have become naturalized, and Sphaeropteris lepifera is reported as naturalized, but no other species of Sphaeropteris or Cyathea are reported as serious weeds elsewhere

401	Produces spines, thorns or burrs	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Not truly spiny, but small spines on scales can be a skin and eye irritant] "Plants tall, slender, treelike, scaly. Caudices slender, erect, 1-2 (-4+) m tall, 7-12 cm diameter. Fronds to 4+ m long, leaving oval scars on caudices after falling. Stipes with scattered tubercles, scales at base, soon deciduous, often leaving older stipes naked, of 2 types: larger, to 40 x 2 mm, white, papery, with small dark red marginal spines; and narrow, about 10 x 0.1 mm, dark red or brown with minutely spiny margins..."

402	Allelopathic	
	Source(s)	**Notes**
	Chau, M. M., Walker, L. R., & Mehltreter, K. (2013). An invasive tree fern alters soil and plant nutrient dynamics in Hawaii. Biological Invasions, 15(2): 355-370	[Unknown] "Our experiment controlled for potential physical effects of litter (smothering or change in microclimate), and while allelopathic chemicals cannot be ruled out (uncommon in ferns, but see Gliessman 1976; Hanson and Dixon 1987), initial inhibition by litter was likely due to immobilization of nutrients by microbes (Attiwill and Adams 1993)."

403	Parasitic	n
	Source(s)	**Notes**
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants tall, slender, treelike, scaly. Caudices slender, erect, 1-2 (-4+) m tall, 7-12 cm diameter." [Cyatheaceae. No evidence]

404	Unpalatable to grazing animals	y
	Source(s)	**Notes**
	Anderson, S. J., Stone, C. P., & Higashino, P. K. (1992). Distribution and spread of alien plants in Kipahulu Valley, Haleakala National Park, above 2,300 ft. elevation. Pp. 300 338.in Stone et al. (eds.). Alien Plant Invasions in Native Ecosystems of Hawaii: Management and Research, Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, HI	[Lack of palatability to feral pigs contributes to competitive advantage] "We saw no evidence that the alien tree terns were eaten by feral pigs, whereas native tree ferns (Cibotium spp.) are frequently devoured. This competitive advantage, in addition to a faster growth rate than native ferns, could lead to replacement of native tree ferns in the Valley."

405	Toxic to animals	n
	Source(s)	**Notes**
	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
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Loope, L.L., Nagata, R.J. & Medeiros, A.C. (1992). Alien plants in Haleakala National Park Pp. 551-576 in Stone et al (eds) Alien plant invasions in native ecosystems of Hawaii. Coop. Nat. Park Resources Studies Unit, University of Hawaii, Honolulu, HI	"The Australian tree fern also acts as a host for an alien herbivorous beetle, the Australian fern weevil (Syagrius fulvitarsus), which occurred in epidemic numbers in Hawai`i Volcanoes National Park in the 1950s, defoliating endemic `ama`u ferns (Sadleria cyatheoides). It is quite possible that as Australian tree fern increases, this alien insect may begin to seriously impact nearby native ferns."

407	**Causes allergies or is otherwise toxic to humans**	
	Source(s)	**Notes**
	Dave's Garden. (2021). Sphaeropteris Species, Australian Tree Fern, Giant Scaly Tree Fern - Sphaeropteris cooperi. https://davesgarden.com/guides/pf/go/55695/. [Accessed 7 Apr 2021]	"Danger: Parts of plant are poisonous if ingested Handling plant may cause skin irritation or allergic reaction" [Toxic properties unknown and not corroborated with other references]
	Learn 2 Grow. (2021). Cyathea cooperi. http://www.learn2grow.com/plants/cyathea-cooperi/. [Accessed 7 Apr 2021]	"Take care to avoid getting any of the hairs of the trunk or frond stems on your skin or under your shirt, as they can lead to an unpleasant rash or at least an annoying and persistent need for itching."
	MacCubbin, T., Tasker, G.B., Bowden, R. & Lamp'l, J. (2012). Florida Gardener's Handbook: All You Need to Know to Plan, Plant & Maintain a Florida Garden. Cool Springs Press,	"The hair on the trunk and undersides of fronds can be irritating; handle with gloves."
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No documented cases of toxicity in Cyathea or Sphaeropteris
	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

408	**Creates a fire hazard in natural ecosystems**	**n**
	Source(s)	**Notes**
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	[No evidence. Inhabits wet forests] "Tropical and subtropical rain forest to montane forest in open sites, near streams, and in mountain gullies from sea level to 1400 m or higher"

Qsn #	Question	Answer
409	**Is a shade tolerant plant at some stage of its life cycle**	**y**
	Source(s)	**Notes**
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. (2003). Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Suited to shade, fast growing, displaces understory vegetation"
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	"They grow in the understory and establish prolifically on road cuts."

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**
	Source(s)	**Notes**
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	"Plants do best in rich, well-drained humus and will tolerate frost though the fronds may be damaged. Once established, this fern is also tolerant of dry spells."
	Learn 2 Grow. (2021). Cyathea cooperi. http://www.learn2grow.com/plants/cyathea-cooperi/. [Accessed 7 Apr 2021]	"Soil pH - Acidic, Neutral Soil Drainage - Average Soil type - Clay, Loam"
	Gilman, E. F. et al. (2019). Sphaeropteris cooperi: Australian Tree Fern. FPS-557. Revised. University of Florida, IFAS, Gainesville, FL	"Soil tolerances: acidic; sand; loam; clay"

411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants tall, slender, treelike, scaly. Caudices slender, erect, 1-2 (-4+) m tall, 7-12 cm diameter."

412	**Forms dense thickets**	**y**
	Source(s)	**Notes**
	Anderson, S. J., Stone, C. P., & Higashino, P. K. (1992). Distribution and spread of alien plants in Kipahulu Valley, Haleakala National Park, above 2,300 ft. elevation. Pp. 300 338.in Stone et al. (eds.). Alien Plant Invasions in Native Ecosystems of Hawaii: Management and Research, Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, HI	"Cyathea cooperi (Australian tree fern) was discovered in the Dogleg area at the base of the Central Pali in 1987 (L.W. Cuddihy, pers. comm.)." ... "Countless individuals forming a nearly monotypic stand were discovered between 2,400 and 2,600 ft (732-793 m) elevation along Palikea Gulch."
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	"The densest stands of Cyathea in the Kipahulu Valley population were conspicuously lacking in understory species diversity and biomass. This may be due to the thick layer of fibrous roots at the soil surface that surrounds individuals of Cyathea cooperi, extending up to 5 m from a large individual. The open understory of the areas with substantial infestations of C. cooperi can be seen in the cover of ground that lacked living vegetation, either mineral soil or covered with leaf litter, stones, fallen wood and smaller branches."

Qsn #	Question	Answer
501	**Aquatic**	**n**
	Source(s)	**Notes**
	Andrews, S.B. (1990). Ferns of Queensland. Queensland Department of Primary Industries, Brisbane, AU	"Terrestrial along creeks..."

502	**Grass**	**n**
	Source(s)	**Notes**
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Cyatheaceae

503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Cyatheaceae

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants tall, slender, treelike, scaly. Caudices slender, erect, 1-2 (-4+) m tall, 7-12 cm diameter. Fronds to 4+ m long, leaving oval scars on caudices after falling. Stipes with scattered tubercles, scales at base, soon deciduous, often leaving older stipes naked, of 2 types: larger, to 40 x 2 mm, white, papery, with small dark red marginal spines; and narrow, about 10 x 0.1 mm, dark red or brown with minutely spiny margins, interrupted white line of aerophores along both sides of stipes. Blades 2-pinnate-pinnatifid to 3-pinnate at base, green or light green above, paler below; rachises with dark brown, obtuse tubercles. Pinnae up to 65 x 26 cm. Pinnules stalked, tips acuminate. Ultimate segments deeply pinnatifid to 1-pinnate, segment lobes falcate, margins irregularly toothed or rarely deeply lobed. Veins 1-forked. Sori medial, round, 2-10 per segment, paraphyses abundant, long hairs. Indusia lacking"

Qsn #	Question	Answer
601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	"Cyathea cooperi and Dicksonia antarctica, both from Australia, are among the most common garden tree ferns. Cultivars of C. cooperi are available; 'Brentwood' and 'Robusta' are the most frequently planted in the United States. This tree fern, a rain forest species native to Queensland and New South Wales, has become naturalized in Mauritius, northern New Zealand, South Africa, and Hawaii, where it arrived sometime before 1960. In Hawaii (Plate 36), it has since been recommended for classification as a noxious weed. Its potential to become a weed must be kept in mind when its cultivation is considered."
	Jones, D. L., & Clemesha, S. C. (1976). Australian ferns and fern allies, with notes on their cultivation. Reed, Sydney	"Very easily grown and very hardy; heavy frosts may kill the fronds, but plants recover quickly."

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Lane, B. C. (1980). A procedure for propagating ferns from spores using a nutrient-agar solution. Combined Proceedings, International Plant Propagators' Society 30, 94-97	"Abstract : Sterile nutrient-agar solution was tested as a germination and growth medium for preventing plantlet overcrowding and fungal, algal and moss contamination. Cyrtomium falcatum cv. Rockfordianum, Dicksonia antartica, Nephrolepis exaltata, Polystichum setosum, Rumohra adiantiformis and Sphaeropteris cooperi were successfully propagated from spores by this method."
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	"Cyathea cooperi produces abundant spores, in comparison with other Australian species of Cyathea (C. Chambers, pers. comm.)."

603	**Hybridizes naturally**	
	Source(s)	**Notes**
	Spencer, R. (1995). Horticultural Flora of South-eastern Australia: Ferns, conifers & their allies. UNSW Press, Sydney, AU	[Suspected hybridization] "Cyathea brownie ... differs in generally being a more robust, wider-trunked fern with more leathery fronds ... This distinction between these closely related island and mainland species does not appear to stand up clearly in cultivated material and intermediates (possibly hybrids) may be found, as, for examples, at the Royal Botanic Gardens, Melbourne."

604	**Self-compatible or apomictic**	
	Source(s)	**Notes**
	Khare, P. B., Behera, S. K., Srivastava, R., & Shukla, S. P. (2005). Studies on reproductive biology of a threatened tree fern, Cyathea spinulosa Wall. ex Hook. Current science, 89(1), 173-177	[Unknown for S. cooperi. Members of Cyatheaceae capable of intragametophytic selfing] "The reproductive behaviour revealed considerable success in sporophyte production through intragametophytic selfing. This shows that the species is of lesser genetic diversity and the gene pool is charged with lesser amount of genetic load, and is a good colonizer."

Qsn #	Question	Answer
605	**Requires specialist pollinators**	**n**
	Source(s)	**Notes**
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	[Requires water for fertilization] "A spore germinates and grows into a new green plant that is normally small (a few millimeters in diameter), thin, and heart-shaped. This is called the gametophyte (Plate 1), and it produces sex organs, each of which develops eggs or sperm amid fine hair-like rhizoids on its underside. All cells of the gametophyte are haploid, including the sperm and the eggs. Sperm cells are motile and require water to swim to the eggs. Hence, the gametophyte must live in a moist situation. At fertilization the egg and sperm join together to produce a zygote, which is now diploid. This zygote develops into a new sporophyte that, for a short time, is partially parasitic on the gametophyte."
	WRA Specialist. (2021). Personal Communication	A pteridophyte - no flowers present

606	**Reproduction by vegetative fragmentation**	**n**
	Source(s)	**Notes**
	Australian National Botanic Gardens. (2021). Growing Native Plants - Cyathea australis, Cyathea cooperi. http://www.anbg.gov.au/. [Accessed 7 Apr 2021]	"These two species cannot be propagated vegetatively (unlike some other tree-ferns) as they do not produce offsets from the trunk or roots. Propagation from spores must therefore be employed"

607	**Minimum generative time (years)**	**2**
	Source(s)	**Notes**
	CABI. (2021). Cyathea cooperi in: Invasive Species Compendium. http://www.cabi.org/isc. [Accessed 7 Apr 2021]	[Plants >1 m height can become fertile, which occurs after 1-2 years of growth] "C. cooperi is fast growing, with reported annual growth rates ranging from 0.15–1.0 m/y (Medeiros et al., 1992; Durand and Goldstein, 2001a; Schäfer, 2002)." ... "On Maui, Hawaii, population structure of a naturalized and invasive C. cooperi population was described by Medeiros et al. (1992). This population consisted of 747 individuals within an area of 4800 m². Of these 59% were less than 0.25 m in height, 13% were 0.25-1.0 m in height, 25% were 1.0-3.0 m in height, and 3% were over 3.0 m in height. Two individuals succeeded 4 m height and were estimated to be 6-15 years old. The proportion of fertile plants was determined for 167 randomly chosen plants. Plants less than 0.25 m height were not fertile, and 86% of all plants taller than 1 m were fertile."
	Durand, L. Z., & Goldstein, G. (2001). Growth, leaf characteristics, and spore production in native and invasive tree ferns in Hawaii. American Fern Journal, 91 (1), 25-35	[Rapid growth rate] "Sphaeropteris cooperi had a significantly higher growth rate, both in terms of height increase and frond production, and maintained four times more fronds than the native Cibotium species. The mean annual height increase of the invasive tree fern was 15 cm compared to 2 to 3 cm for the native tree ferns. The leaf mass per area of S. cooperi was significantly lower than that of the native Cibotium species, and the leaf life span was significantly shorter, suggesting that the cost of construction of the invasive species' fronds was relatively low. Sphaeropteris cooperi also produced significantly more fertile fronds per month than the native tree ferns. These differences in life history characteristics may help explain the rapid spread and success of S. cooperi in Hawaii."

Qsn #	Question	Answer
	Durand, L. Z., & Goldstein, G. (2001). Photosynthesis, photoinhibition, and nitrogen use efficiency in native and invasive tree ferns in Hawaii. Oecologia, 126(3): 345-354	[Rapid growth rate] "The results of this study suggest that the sporophytes of the invasive tree fern, S. cooperi, have higher growth rates than the native tree ferns in the genus Cibotium as a consequence of higher photosynthetic capacity and higher total leaf surface area per plant. The invasive tree fern achieved higher photosynthetic rates at a lower leaf carbon cost (lower LMA and lower dark respiration rates), and with comparable return on the investment in leaf nitrogen (similar integrated PNUE). In addition, S. cooperi recovered more rapidly from photoinhibition resulting from high light levels than the native tree fern species. The invasive tree fern appears to be more suited than the native Cibotium species for capturing and utilizing light resources, particularly in environments with changing light levels, such as those characterized by relatively high levels of disturbance."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	
	Source(s)	**Notes**
	CABI. (2021). Cyathea cooperi in: Invasive Species Compendium. http://www.cabi.org/isc. [Accessed 7 Apr 2021]	[Prolific spore production, and widespread cultivation could possibly result in accidental dispersal through attachment to clothing, or equipment] "Vector Transmission (Biotic): Spores may become attached to mammals and birds, carrying them to new places. Accidental Introduction: Spores from individuals planted in gardens and along streets are carried by wind into the surrounding vegetation and, after germination, may initialize new populations."

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Large, M.F. & Braggins, J.E. (2004). Tree Ferns. Timber Press, Portland, OR	"Cyathea cooperi and Dicksonia antarctica, both from Australia, are among the most common garden tree ferns. Cultivars of C. cooperi are available; 'Brentwood' and 'Robusta' are the most frequently planted in the United States."
	Riffle, R.L. (1998). The Tropical Look - An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR	"It is probably the most commonly planted tree fern, at least in the Western world, and is one of the most beautiful and tropical subjects for the warm-climate garden."
	Bezona, N., Rauch, F. D., & Iwata, R. Y. (1994). Tree ferns for Hawai'i gardens. Research Extension Series 144. CTAHR,, Univiersity of Hawaii, Honolulu, HI	"This handsome, fast-growing species is popular in cultivation." ... "Cyathea cooperi, the most commonly available tree fern in Hawaiian nurseries. May be grown from sea level to 4000foot elevations."

Qsn #	Question	Answer
703	**Propagules likely to disperse as a produce contaminant**	
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Native to northeastern Australia, Australian tree fern is the most frequently available tree fern in Hawaiian nurseries, popularly grown in gardens and in containers." [Spores could potentially contaminate soil or potting media of any plants growing in the vicinity of reproductive age individuals]

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	"Another factor indicative of the invasive potential of Cyathea cooperi is the ability to disperse and establish across long distances into montane forest. The study site in Kipahulu Valley is remote enough that the most likely scenario for establishment of C. cooperi is windblown dispersal of spores from plant nurseries 12 km distant."
	CABI. (2021). Cyathea cooperi in: Invasive Species Compendium. http://www.cabi.org/isc. [Accessed 7 Apr 2021]	"Spores are carried by wind and water."

705	Propagules water dispersed	y
	Source(s)	**Notes**
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. (2003). Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Spreads by spores carried by wind and water."
	Andrews, S.B. (1990). Ferns of Queensland. Queensland Department of Primary Industries, Brisbane, AU	[Distribution suggests water aids movement of spores] "Terrestrial along creeks, often in high mountain gullies."
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	[Water may move spores] "Cyathea cooperi is native to Queensland in northeastern Australia where its native habitat is in gullies in rain forests (Jones & Clemesha, 1978). In its native habitat, C. cooperi acts as a pioneer, occurring along edges and in light gaps as well as along road cuts and streamcourses above permanent waterline (A. Irvine, pers. comm.)."

706	Propagules bird dispersed	
	Source(s)	**Notes**
	CABI. (2021). Cyathea cooperi in: Invasive Species Compendium. http://www.cabi.org/isc. [Accessed 7 Apr 2021]	[Possibly] "Spores may become attached to mammals and birds, carrying them to new places."

Qsn #	Question	Answer
707	**Propagules dispersed by other animals (externally)**	
	Source(s)	**Notes**
	CABI. (2021). Cyathea cooperi in: Invasive Species Compendium. http://www.cabi.org/isc. [Accessed 7 Apr 2021]	[Possibly] "Spores may become attached to mammals and birds, carrying them to new places."

708	**Propagules survive passage through the gut**	**n**
	Source(s)	**Notes**
	CABI. (2021). Cyathea cooperi in: Invasive Species Compendium. http://www.cabi.org/isc. [Accessed 7 Apr 2021]	[No evidence] "Natural dispersal (Non-Biotic): Spores are carried by wind and water. Wind may transport spores 12 km or more (Medeiros et al., 1992). Pig digging creates favourable establishment sites for this disturbance adapted fern (Medeiros et al., 1992). Vector Transmission (Biotic): Spores may become attached to mammals and birds, carrying them to new places."

801	**Prolific seed production (>1000/m2)**	**y**
	Source(s)	**Notes**
	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. Plant Protection Quarterly, 25(2): 56-74	"Assume 'yes' for fern taxa unless contradictory evidence exists."
	Medeiros, A. C., Loope, L. L., Flynn, T., Anderson, S. J., Cuddihy, L. W., & Wilson, K. A. (1992). Notes on the status on an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal, 82(1): 27-33	"Cyathea cooperi produces abundant spores, in comparison with other Australian species of Cyathea (C. Chambers, pers. comm.)."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	CABI. (2021). Cyathea cooperi in: Invasive Species Compendium. http://www.cabi.org/isc. [Accessed 7 Apr 2021]	"Little is known on the longevity of the spores and under what conditions they germinate."

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. (2003). Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Australian tree fern was susceptible to sprays of concentrates of dicamba and of 2,4-D directly on the stem terminals. Triclopyr was not as effective"

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Chambers Wildlife Rainforest Lodges. (2021). Scaly Tree Fern: Cyanthea cooperi. http://rainforest-australia.com/Scaly_Tree_Fern.html. [Accessed 7 Apr 2021]	"If the tree fern is knocked over these can grow into the ground and develop as normal roots."
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. (2003). Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	[Possibly resprouts] "Initial control of the Australian tree fern has been mechanical, wherein the trees are felled and the apical meristem removed and chopped up or set above ground to avoid contact with the soil so it cannot resprout, although it is not certain if it is capable of resrouting, as can some other tree ferns. At Kökeÿe, felled tree ferns apparently do not resprout (Galen Kawakami, DOFAW). However, it is not certain if resprouting is possible in higher-rainfall sites."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	**n**
	Source(s)	**Notes**
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Aggressively spreading in a variety of habitats, this fast-growing fern is a serious threat to Hawaiian ecosystems and is considered to be among the word alien plant invaders in Kipahulu Valley of Haleakala National Park on East Maui." [No natural enemies are effective at preventing this species from spreading in the Hawaiian Islands]

Summary of Risk Traits:

High Risk / Undesirable Traits
• Thrives in tropical climates
• Elevation range exceeds 1000 m
• Naturalized in the Hawaiian Islands, New Zealand, parts of Australia outside its native range, and possibly elsewhere
• An environmental weed (threatens biodiversity)
• Unpalatable to feral pigs (giving it a competitive advantage over Hawaiian tree ferns in the genus Cibotium)
• Alternate host of the Australian fern weevil, a pest of native ferns
• Small spines on scales can be a skin and eye irritant
• Shade tolerant
• Tolerates many soil types
• Can from dense monocultures that exclude other vegetation
• Produces 1000s of wind-dispersed & water-dispersed spores
• Prolific spore production may result in inadvertent dispersal through soil contamination or through attachment to animals, clothing, or machinery
• Rapid growth rate & can reach maturity after 1 year
• Can regrow if cut down without damage to the apical meristem

Low Risk Traits
• Not known to spread vegetatively
• Valued as an ornamental
• Herbicides have provided effective control