

<b>Taxon:</b> <i>Dicksonia fibrosa</i> Colenso	<b>Family:</b> Dicksoniaceae
<b>Common Name(s):</b> golden tree fern kurīpākā whekī-ponga	<b>Synonym(s):</b> <i>Balantium fibrosum</i> (Colenso) Fée, <i>Dicksonia fibrosa</i> var. <i>microcarpa</i> <i>Dicksonia microcarpa</i> Colenso <i>Dicksonia sparmanniana</i> Colenso

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 21 Oct 2019
<b>WRA Score:</b> 10.0	<b>Designation:</b> H(HPWRA)	<b>Rating:</b> High Risk

**Keywords:** Tree Fern, Naturalized, Shade-Tolerant, Wind-Dispersed, Frond Skirt

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	?
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		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	y

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	n
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	y=1, n=-1	y
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)		
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
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	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	n
801	Prolific seed production (>1000/m <sup>2</sup> )	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		
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
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[No evidence of domestication] "Dicksonia fibrosa occurs in lowland and montane areas of much of the North Island from Kaipara Harbour southwards, with an isolated record from Puketi Forest (WELT P018474) that may be an escape from cultivation (Brownsey et al. 2013). It extends from near sea level, to over 1100 m in the Kaweka and Ruahine ranges. In the South Island, it is found mainly in coastal and lowland areas from north-west Nelson to Lake Mapourika on the west coast, in scattered localities on the east coast from the Marlborough Sounds to the Catlins, and on the south coast as far west as Lake Poteriteri in Fiordland. It is virtually absent from the interior of the South Island. It is also present on Stewart Island where it is described as "rare and local" (Wilson 1982). It occurs from sea level, up to about 400 m around Nelson and in the headwaters of the Kēkerengū River, Marlborough. There is a single record from c. 900 m in the Jordan Stream Reserve, Marlborough."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	NA

Qsn #	Question	Answer
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
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	" <i>Dicksonia fibrosa</i> occurs in lowland and montane areas of much of the North Island from Kaipara Harbour southwards, with an isolated record from Puketi Forest (WELT P018474) that may be an escape from cultivation (Brownsey et al. 2013). It extends from near sea level, to over 1100 m in the Kaweka and Ruahine ranges. In the South Island, it is found mainly in coastal and lowland areas from north-west Nelson to Lake Mapourika on the west coast, in scattered localities on the east coast from the Marlborough Sounds to the Catlins, and on the south coast as far west as Lake Poteriteri in Fiordland. It is virtually absent from the interior of the South Island. It is also present on Stewart Island where it is described as "rare and local" (Wilson 1982). It occurs from sea level, up to about 400 m around Nelson and in the headwaters of the Kēkerengū River, Marlborough. There is a single record from c. 900 m in the Jordan Stream Reserve, Marlborough." [Range extends from subtropical to temperate climates]

202	Quality of climate match data	High
	Source(s)	Notes
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Brock, J. M., Perry, G. L., Lee, W. G., & Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i> , 375, 112-126	"Frost tolerance has been recorded for juvenile <i>D. fibrosa</i> (28 °C), which is considered one of the more hardy New Zealand species, and can tolerate temperatures lower than <i>C. smithii</i> (24.2 °C) (Warrington and Stanley, 1987; Wardle, 1991; Bannister, 2003). <i>D. fibrosa</i> will survive temperatures as low as 28 °C but not below 21 °C (Warrington and Stanley, 1987) and the species establishes and grows in edge habitat in elevated areas."

Qsn #	Question	Answer
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[Elevation range exceeds 1000 m. Distribution extends from subtropical to temperate climates] "Altitudinal range: 10–1100 m. <i>Dicksonia fibrosa</i> occurs in lowland and montane areas of much of the North Island from Kaipara Harbour southwards, with an isolated record from Puketi Forest (WELT P018474) that may be an escape from cultivation (Brownsey et al. 2013). It extends from near sea level, to over 1100 m in the Kaweka and Ruahine ranges. In the South Island, it is found mainly in coastal and lowland areas from north-west Nelson to Lake Mapourika on the west coast, in scattered localities on the east coast from the Marlborough Sounds to the Catlins, and on the south coast as far west as Lake Poteriteri in Fiordland. It is virtually absent from the interior of the South Island. It is also present on Stewart Island where it is described as "rare and local" (Wilson 1982). It occurs from sea level, up to about 400 m around Nelson and in the headwaters of the Kēkerengū River, Marlborough. There is a single record from c. 900 m in the Jordan Stream Reserve, Marlborough."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Lorence, D. H., & Flynn, T. (2006). New naturalized plant records for Kaua 'i and Hawai 'i. Bishop Museum Occasional Papers, 88, 1-5	[Naturalized at upper elevations of Hawaii] " <i>Dicksonia fibrosa</i> Col. New naturalized record A number of recently naturalized alien pteridophytes have been reported from Hawai'i (Palmer 2002; Wilson 2003). This is, however, the first record of the genus <i>Dicksonia</i> being naturalized in the Hawaiian Islands, although <i>D. antarctica</i> Labillard. and <i>D. squarrosa</i> (G. Forst.) Sw. are cultivated on the Big Island (data from specimens at BISH)." ... "Material examined. HAWAII: South Hilo Distr, Keolahou, remnant koa-ōhi'a forest with alien plantings, 1750 m. Terrestrial fern, caudex erect, 30 x 30 cm, fronds densely clustered, to 2 m long, pinnae 25–30 pairs, stipe hairs brown. Naturalized locally from several cultivated plants, about 12 seen. 19 Mar 2005, D. Lorence et al. 9445 (BISH, PTBG, US)."
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[Range extends from subtropical to temperate climates] " <i>Dicksonia fibrosa</i> occurs in lowland and montane areas of much of the North Island from Kaipara Harbour southwards, with an isolated record from Puketi Forest (WELT P018474) that may be an escape from cultivation (Brownsey et al. 2013). It extends from near sea level, to over 1100 m in the Kaweka and Ruahine ranges. In the South Island, it is found mainly in coastal and lowland areas from north-west Nelson to Lake Mapourika on the west coast, in scattered localities on the east coast from the Marlborough Sounds to the Catlins, and on the south coast as far west as Lake Poteriteri in Fiordland. It is virtually absent from the interior of the South Island. It is also present on Stewart Island where it is described as "rare and local" (Wilson 1982). It occurs from sea level, up to about 400 m around Nelson and in the headwaters of the Kēkerengū River, Marlborough. There is a single record from c. 900 m in the Jordan Stream Reserve, Marlborough."

Qsn #	Question	Answer
205	Does the species have a history of repeated introductions outside its natural range?	?
	Source(s)	Notes
	Lorence, D. H., & Flynn, T. (2006). New naturalized plant records for Kaua 'i and Hawai 'i. Bishop Museum Occasional Papers, 88, 1-5	"Native to New Zealand, it is occasionally cultivated in Hawai'i and has escaped from cultivation in one locality on the Big Island."
	Kells Bay Country House & Gardens. (2019). <i>Dicksonia fibrosa</i> . <a href="http://www.kellsbay.ie/nursery/dicksonia-fibrosa">http://www.kellsbay.ie/nursery/dicksonia-fibrosa</a> . [Accessed 18 Oct 2019]	"This is the next tree fern to try out if you already have some <i>Dicksonia antarctica</i> and would like to get another species." [Cultivated in Ireland. Extent of introduction unknown]
	The Royal Horticultural Society. (2019). <i>Dicksonia fibrosa</i> - golden tree fern. <a href="https://www.rhs.org.uk/plants/details%3Fplantid%3D4445">https://www.rhs.org.uk/plants/details %3Fplantid%3D4445</a> . [Accessed 18 Oct 2019]	[UK website promotes cultivation of this fern. Extent of introductions unknown] "Grow outdoors in a moist but well-drained humus-rich soil. In hot, dry summers water the stem but avoid watering the crown in winter. Will grow without winter protection only in milder areas"

301	Naturalized beyond native range	y
	Source(s)	Notes
	Benitez, D.M., R. Loh, T. Tunison, N.G. Zimmer, J. Makaikae, R. Mattos and M. Casali. (2012). The distribution of invasive plant species of concern in the Kilauea and Mauna Loa strip areas of Hawai'i Volcanoes National Park, 2000-2010. Tech. Report No. 179. HCSU & PCSU, University of Hawaii, Honolulu, HI	"New Zealand tree-fern ( <i>Dicksonia fibrosa</i> ) is native to New Zealand, apparently sparingly cultivated, but not reported naturalized in Hawai'i (Palmer 2003). New Zealand tree-fern has not been found in HAVO but occurs in a number of residential lots in Volcano Village. Mature plants have not been observed in these areas (Tunison pers. obsn.), except for one lot where in 2006, new recruits were found establishing abundantly in areas surrounding planted trees. Later that year, at the landowner's request, these plants were removed. During two revisits to the site, in June and December, 2006, 179 and 79 individuals were removed respectively. Mature plants were controlled by uprooting or cutting and during follow up visits newly established plants were foliar treated with herbicide. Both mechanical and chemical methods appeared to effectively control New Zealand tree-fern. Remaining control of this species was agreed to be undertaken by the landowner. A solution of 2% Roundup in water applied to the plant's foliage appears effective at controlling New Zealand tree fern."
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[A New Zealand native. Possibly naturalized outside natural range in New Zealand] "Brownsey et al. (2013) investigated the distribution of <i>D. fibrosa</i> in the wider Auckland area and concluded that it probably extends naturally to about 36°30' S, reaching the Kaipara region and Te Moehau, but is very uncommon north of a line from Raglan to the Bay of Plenty. Although there are numerous records of the species in the Auckland region, most of these are from populations of just one or two plants, and it is likely that they are naturalised plants that have originated from cultivated sources in urban areas. The frequency of naturalised plants, especially in Auckland City, may be masking the rarity of natural populations at the northern end of its range."

Qsn #	Question	Answer
	<p>Lorence, D. H., &amp; Flynn, T. (2006). New naturalized plant records for Kaua'i and Hawai'i. Bishop Museum Occasional Papers, 88, 1-5</p>	<p>[Hawaii Island] "Dicksonia fibrosa Col. New naturalized record A number of recently naturalized alien pteridophytes have been reported from Hawai'i (Palmer 2002; Wilson 2003). This is, however, the first record of the genus Dicksonia being naturalized in the Hawaiian Islands, although <i>D. antarctica</i> Labillard. and <i>D. squarrosa</i> (G. Forst.) Sw. are cultivated on the Big Island (data from specimens at BISH). The golden tree fern or wheki-ponga is a slow growing fern that may eventually reach 6 m tall. The stipe bases fall with the fronds and the stout caudex enlarges as it becomes covered with a dense mass of fibrous, brownish red aerial roots. The fronds are 1.5–4.0 m long with stipe and rachis light to yellowish brown and smooth or only faintly roughened by the scale bases. Native to New Zealand, it is occasionally cultivated in Hawai'i and has escaped from cultivation in one locality on the Big Island. Like our native <i>Cibotium</i> species (also Dicksoniaceae), <i>Dicksonia fibrosa</i> has a bivalvate indusium but differs in having the outer indusium valve not sharply differentiated from the lamina as in <i>Cibotium</i>. In the field <i>D. fibrosa</i> can be distinguished from other native (<i>Cibotium</i> spp.) and naturalized (<i>Cyathea cooperi</i>, syn. <i>Sphaeropteris cooperi</i>) tree ferns in Hawai'i by its massive trunk 30–60 cm dia., covered by a dense mass of fibrous roots, brown stipe hairs, and more numerous fronds (20–30 or more). Material examined. HAWAII: South Hilo Distr, Keolahou, remnant koa-ōhi'a forest with alien plantings, 1750 m. Terrestrial fern, caudex erect, 30 x 30 cm, fronds densely clustered, to 2 m long, pinnae 25–30 pairs, stipe hairs brown. Naturalized locally from several cultivated plants, about 12 seen. 19 Mar 2005, D. Lorence et al. 9445 (BISH, PTBG, US)."</p>

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

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	No evidence

304	Environmental weed	
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Page, C., &amp; Brownsey, P. (1986). Tree-Fern Skirts: A Defence Against Climbers and Large Epiphytes. <i>Journal of Ecology</i>, 74(3), 787-796</p>	<p>[Skirt of fallen fronds prevents epiphyte establishment. Native Hawaiian tree ferns support a variety of epiphytes. <i>D. fibrosa</i> could potentially impact Hawaiian epiphyte diversity and abundance if established more widely] "<i>Dicksonia fibrosa</i> Colenso of New Zealand is closely related to <i>D. antarctica</i> of Australia, and carries a thick skirt of entire dead fronds which almost totally obscures the trunk (Fig. 1)-see also illustrations in Salmon (1980) and Jones &amp; Goudey (1981). The trunk is relatively short (up to 7 m) and substantially strengthened by a massive outer fibrous layer that enables the tree to support the heavy crown of both living and persistent dead fronds. The skirt effectively shields the trunk, impeding the growth of climbers and preventing epiphytes from becoming established. Some climbers may grow over the skirt, but the continual addition of new dead fronds tends to smother them, while the dense mass of living fronds and closely inserted stipe bases make it difficult for climbers to penetrate the crown."</p>

305	Congeneric weed	y
	Source(s)	Notes
	<p>Arosa, M. L., Ceia, R. S., Quintanilla, L. G., &amp; Ramos, J. A. 2012. The tree fern <i>Dicksonia antarctica</i> invades two habitats of European conservation priority in São Miguel Island, Azores. <i>Biological Invasions</i>, 14(7): 1317-1323</p>	<p>[<i>Dicksonia antarctica</i> invasive] "The species has invaded forest plantations, exotic forests and two habitats of European conservation priority: native laurel forests and blanket bogs. <i>Dicksonia antarctica</i> plantlets (individuals with no trunk) were predominant in exotic forests, <i>D. antarctica</i> shrubs (trunk height\1 m) were most frequent in blanket bogs and forest plantations whereas trees (trunk height[1 m) in gardens. Blanket bogs had the maximum percentage (90%) of fertile individuals (i.e. with sporangia). The large size and poor access of invaded area makes full eradication from the island impossible. We recommend complete elimination in blanket bogs and to take control measures in native laurel forests as these are priority conservation habitats."</p>
	<p>Robinson, R.C., Sheffield, E, &amp; Sharpe, J.M. (2010). Problem ferns: their impact and management. Pp. 255–322 In: Mehlreter K., Walker L. R., &amp; Sharpe, J. M. (eds.). <i>Fern Ecology</i>. Cambridge University Press, New York</p>	<p>[<i>Dicksonia squarrosa</i> is a native agricultural weed] "In New Zealand, the herbaceous <i>Paesia scaberula</i> (ring fern) and the arborescent <i>Dicksonia squarrosa</i> sometimes have a strong association after forest clearance and occupy pastures where they represent successional changes back to woodland." ... "The spread and formation of <i>Dicksonia</i> groves is a slow process but the emergence of <i>Dicksonia</i> through either grass or <i>Paesia</i> is often observed (Silvester, 1964). Both native fern species create problems in productive grassland comprising exotic grass species (e.g., hybrids of <i>Lolium multiflorum</i> and <i>L. perenne</i> raised in New Zealand as "short rotation ryegrass", Hubbard, 1968). This situation is different from the usual circumstances where invasive alien ferns threaten native species (see Section 8.3) and illustrates the subjective decision of whether the invader is welcome or not."</p>

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



Qsn #	Question	Answer
	<p>Brownsey, P. J. &amp; Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln</p>	<p>[No evidence] "Rhizomes erect, forming a woody trunk 2–6 m tall, 150–600 mm diam., or rarely to 1000 mm on Chatham Islands, covered in a thick layer of reddish brown adventitious roots, lacking buds and underground stolons, bearing reddish brown multicellular hairs near the apex. Fronds 110–3000 mm long, held erect when young, persistent, forming a thick skirt completely obscuring the trunk when old; dead fronds pale brown. Stipes 50–500 mm long, red-brown at very base, becoming pale brown or yellow-brown distally, smooth, often bearing fine golden brown hairs at the junction with the trunk, densely covered in red-brown multicellular hairs up to 45 mm long proximally, and pale brown or red-brown hairs up to 3 mm long distally. Laminae 2-pinnate-pinnatisect, narrowly elliptic or narrowly obovate, 950–2800 mm long, 210–600 mm wide, dark green on adaxial surfaces, paler green on abaxial surfaces, coriaceous, harsh, abundantly hairy on abaxial surfaces of rachis, pinna midribs and costae; hairs fine, multicellular, colourless or pale or chestnut-brown, more or less straight, up to c. 1 mm long, uniformly distributed; rachis yellow-brown or pale brown. Primary pinnae in 25–45 pairs, narrowly ovate or narrowly triangular; the longest at or above the middle, 135–390 mm long, 40–115 mm wide, stalked; the basal pair 20–95 mm long. Secondary pinnae narrowly ovate or narrowly triangular, the longest 20–65 mm long, 5–15 mm wide, stalked or sessile. Longest tertiary pinnae 3–10 mm long, 2–3 mm wide, adnate, fertile ones divided less than halfway to midrib; ultimate segments sharply angled. Sori terminating veins at margins of lamina, ovate, c. 1 mm long, slightly elongated along the lamina margin."</p>

402	Allelopathic	
	Source(s)	Notes
	<p>Brock, J. M., Perry, G. L., Lee, W. G., &amp; Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i>, 375, 112-126</p>	<p>[Unknown. May contain chemicals that deter herbivores] "Cambie et al. (1961) tested for the presence of phytochemicals in New Zealand tree fern species (stem material and frond samples) focusing on compounds that affect herbivores, for example leucanthocyanins, which were recorded in <i>D. squarrosa</i> (frond and trunk), <i>D. fibrosa</i> (frond and trunk), <i>C. medullaris</i> (trunk, but not the frond) and <i>C. smithii</i> (frond and trunk). The trunks of <i>C. milneii</i> and <i>C. kermadecensis</i> were found to contain saponins, while samples of <i>D. lanata</i> (treated as a single species) and <i>C. colensoi</i> tested negative for alkaloids. Other phytochemicals that may have allelopathic effects, include secondary metabolites such as terpenoids and phenolics (Inderjit, 1996), but these were not considered by Cambie in his assays."</p>

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	Notes
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	No evidence. Dicksoniaceae

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Allen, R. B., Payton, I. J., & Knowlton, J. E. (1984). Effects of ungulates on structure and species composition in the Urewera forests as shown by exclosures. <i>New Zealand Journal of Ecology</i> , 7: 119-130	"Table 2: Mean number of stems (trunks) per .01 ha for tree ferns from the sites where they were found in the exclosure and/or control plots. For each species, the number of sites (Sites) where present is given." [More <i>Dicksonia fibrosa</i> trunks were found inside a fenced exclosure than in a control plot, suggesting ungulates may be affecting abundance. No information on palatability was provided]
	Nugent, G., & Challies, C. N. 1988. Diet and food preferences of white-tailed deer in north-eastern Stewart Island. <i>New Zealand Journal of Ecology</i> , 11: 61-71	"The diet and food preferences of white-tailed deer ( <i>Odocoileus virginianus</i> ) on north-eastern Stewart Island are described from the analysis of 160 samples of rumen contents collected between 1979 and 1985, and vegetation surveys in 1975 and 1976. Deer browsed all the hardwood trees, but few shrubs, ferns, or podocarps. Woody plants comprised 85.1 % (dry weight) of annual diet. Broadleaf ( <i>Griselinia littoralis</i> ; 34.6%) and supplejack ( <i>Ripogonum scandens</i> ; 18.6%) were the most important foods, all other species comprising less than 5%." ... "Appendix 1: A list of species comprising less than 0.1% DW of annual diet." [Includes <i>Dicksonia fibrosa</i> , suggesting possible low palatability]

405	Toxic to animals	n
	Source(s)	Notes
	Gardenersworld.com. (2019). <i>Dicksonia fibrosa</i> . <a href="https://www.gardenersworld.com/plants/dicksonia-fibrosa/">https://www.gardenersworld.com/plants/dicksonia-fibrosa/</a> . [Accessed 21 Oct 2019]	" <i>Dicksonia fibrosa</i> has no toxic effects reported. No reported toxicity to: No reported toxicity to Birds No reported toxicity to Cats No reported toxicity to Dogs No reported toxicity to Horses No reported toxicity to Livestock No reported toxicity to People"
	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

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	n
	Source(s)	Notes
	The Royal Horticultural Society. (2019). <i>Dicksonia fibrosa</i> - golden tree fern. <a href="https://www.rhs.org.uk/plants/details%3Fplantid%3D4445">https://www.rhs.org.uk/plants/details%3Fplantid%3D4445</a> . [Accessed 21 Oct 2019]	"Pests Generally pest free outdoors Diseases Generally disease free outdoors "

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Gardenersworld.com. (2019). <i>Dicksonia fibrosa</i> . <a href="https://www.gardenersworld.com/plants/dicksonia-fibrosa/">https://www.gardenersworld.com/plants/dicksonia-fibrosa/</a> . [Accessed 21 Oct 2019]	"Is <i>Dicksonia fibrosa</i> poisonous? <i>Dicksonia fibrosa</i> has no toxic effects reported. No reported toxicity to: No reported toxicity to Birds No reported toxicity to Cats No reported toxicity to Dogs No reported toxicity to Horses No reported toxicity to Livestock No reported toxicity to People"
	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

Qsn #	Question	Answer
408	Creates a fire hazard in natural ecosystems	y
	Source(s)	Notes
	Fogarty, L.G. 2001. A flammability guide for some common New Zealand native tree and shrub species. Forest Research Bulletin No. 197, Forest and Rural Fire Scientific and Technical Series, Report No. 6. New Zealand Fire Service Commission and National Rural Fire Authority, Wellington.	"tree ferns ( <i>Cyathea</i> and <i>Dicksonia</i> spp.) are Moderate/High flammability due to hanging dead fronds and accumulations of flammable litter." ... "Appendix 1. Flammability guide for 42 native New Zealand trees and shrubs – alphabetical list of species with flammability class." ... Species Name: <i>Cyathea</i> and <i>Dicksonia</i> spp. Relative ranking: 38 Flammability class: Moderate/High Comments: Carries elevated dead material that assists fire spread, and increases fire intensity."
	Brock, J. M., Perry, G. L., Lee, W. G., & Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i> , 375, 112-126	[General categorization of tree ferns. Flammability or general fire risk associated with <i>D. fibrosa</i> unspecified. Related <i>Dicksonia</i> species is highly flammable] "Tree ferns are fire-prone and are categorized as moderate-high flammability by the New Zealand Fire Service, indicating they will burn readily during moderate to high forest fire danger conditions and partially ignite during moderate conditions (Fogarty, 2001). This flammability is due to heavy accumulations of litter, elevated dead material and flammable green foliage on tree ferns (Fogarty, 2001). A physical assessment of frond material by Wyse et al. (2016) comparing plant trait flammability ranked <i>C. medullaris</i> as moderate, <i>C. dealbata</i> as moderate-high and <i>D. squarrosa</i> as having high flammability."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Gardenersworld.com. (2019). <i>Dicksonia fibrosa</i> . <a href="https://www.gardenersworld.com/plants/dicksonia-fibrosa/">https://www.gardenersworld.com/plants/dicksonia-fibrosa/</a> . [Accessed 21 Oct 2019]	"Grow <i>Dicksonia fibrosa</i> outside in in dappled or deep shade in neutral or slightly acidic soil." ... "Sun exposure: Dappled shade, partial shade, full shade "
	The Royal Horticultural Society. (2019). <i>Dicksonia fibrosa</i> - golden tree fern. <a href="https://www.rhs.org.uk/plants/details%3Fplantid%3D4445">https://www.rhs.org.uk/plants/details%3Fplantid%3D4445</a> . [Accessed 21 Oct 2019]	"Sunlight Full Shade Partial Shade"
	Brownsey, P. J. & Perrie, L. R. (2015). <i>Dicksoniaceae</i> . In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. <i>Flora of New Zealand — Ferns and Lycophytes</i> . Fascicle 11. Manaaki Whenua Press, Lincoln	[Occurs under forest and scrub, which are presumably shaded or with reduced light levels] "Occurs under tall mānuka and kānuka scrub, on forest margins, or in podocarp and broadleaved forest in the northern part of its range, and podocarp or beech forest in the southern part."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	New Zealand Plant Conservation Network. (2019). <i>Flora Details - Dicksonia fibrosa</i> . <a href="http://www.nzpcn.org.nz">http://www.nzpcn.org.nz</a> . [Accessed 21 Oct 2019]	"A beautiful but slow-growing species that does best in cooler climates, in a damp, humus enriched soil."

Qsn #	Question	Answer
	The Royal Horticultural Society. (2019). <i>Dicksonia fibrosa</i> - golden tree fern. <a href="https://www.rhs.org.uk/plants/details%3Fplantid%3D4445">https://www.rhs.org.uk/plants/details%3Fplantid%3D4445</a> . [Accessed 21 Oct 2019]	"Soil Sand, Loam pH Acid, Neutral"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	"Rhizomes erect, forming a woody trunk 2–6 m tall, 150–600 mm diam., or rarely to 1000 mm on Chatham Islands, covered in a thick layer of reddish brown adventitious roots, lacking buds and underground stolons, bearing reddish brown multicellular hairs near the apex."

412	Forms dense thickets	n
	Source(s)	Notes
	Forbes, A. S., Norton, D. A., & Carswell, F. E. (2016). Tree fern competition reduces indigenous forest tree seedling growth within exotic <i>Pinus radiata</i> plantations. <i>Forest Ecology and Management</i> , 359, 1-10	[Forms maximum densities of 7.24 ferns m <sup>2</sup> in this study. <i>D. squarrosa</i> forms much high densities] " <i>Dicksonia squarrosa</i> had the highest stem densities (1888.3 ± 201 stems ha <sup>-1</sup> ), with lesser densities of <i>D. fibrosa</i> (152.0 ± 39 stems ha <sup>-1</sup> ), <i>C. medullaris</i> (110 ± 16 stems ha <sup>-1</sup> ), <i>C. dealbata</i> (98.6 ± 39 stems ha <sup>-1</sup> ), and <i>C. smithii</i> (141 stems ha <sup>-1</sup> , n = 1)."
	Brock, J. M., Perry, G. L., Lee, W. G., & Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i> , 375, 112-126	[No evidence for <i>D. fibrosa</i> in this review] "The sheer depth of frond litter around tree fern stands, which can be up to 90 cm deep (Brock, Unpublished raw data), will suppress seedlings under tree fern canopies (Beveridge, 1973; Gillman et al., 2004); an absence of seedlings is particularly notable beneath <i>D. squarrosa</i> and <i>C. medullaris</i> , both of which can form dense stands or thickets (Fig. 2)."
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[No evidence in native range] "Habitat: Occurs under tall mānuka and kānuka scrub, on forest margins, or in podocarp and broadleaved forest in the northern part of its range, and podocarp or beech forest in the southern part. It grows on flood plains, riverbanks, streamsides, swamp margins and on hillsides, but can also tolerate forest margins, open pastures or scrubland."

501	Aquatic	n
	Source(s)	Notes
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[Terrestrial] "Habitat: Occurs under tall mānuka and kānuka scrub, on forest margins, or in podocarp and broadleaved forest in the northern part of its range, and podocarp or beech forest in the southern part. It grows on flood plains, riverbanks, streamsides, swamp margins and on hillsides, but can also tolerate forest margins, open pastures or scrubland."

502	Grass	n
	Source(s)	Notes

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 18 Oct 2019]	Family: Dicksoniaceae [The Dicksoniaceae is a family of tropical, subtropical and warm temperate ferns]

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 18 Oct 2019]	Family: Dicksoniaceae [The Dicksoniaceae is a family of tropical, subtropical and warm temperate ferns]

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	"Rhizomes erect, forming a woody trunk 2–6 m tall, 150–600 mm diam., or rarely to 1000 mm on Chatham Islands, covered in a thick layer of reddish brown adventitious roots, lacking buds and underground stolons, bearing reddish brown multicellular hairs near the apex."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	New Zealand Plant Conservation Network. (2019). Flora Details - <i>Dicksonia fibrosa</i> . <a href="http://www.nzpcn.org.nz">http://www.nzpcn.org.nz</a> . [Accessed 18 Oct 2019]	"Threats - Not Threatened"
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[No evidence] " <i>Dicksonia fibrosa</i> occurs in lowland and montane areas of much of the North Island from Kaipara Harbour southwards, with an isolated record from Puketi Forest (WELT P018474) that may be an escape from cultivation (Brownsey et al. 2013). It extends from near sea level, to over 1100 m in the Kaweka and Ruahine ranges. In the South Island, it is found mainly in coastal and lowland areas from north-west Nelson to Lake Mapourika on the west coast, in scattered localities on the east coast from the Marlborough Sounds to the Catlins, and on the south coast as far west as Lake Poteriteri in Fiordland. It is virtually absent from the interior of the South Island. It is also present on Stewart Island where it is described as "rare and local" (Wilson 1982). It occurs from sea level, up to about 400 m around Nelson and in the headwaters of the Kēkerengū River, Marlborough. There is a single record from c. 900 m in the Jordan Stream Reserve, Marlborough."

602	Produces viable seed	y
-----	----------------------	---

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	New Zealand Plant Conservation Network. (2019). Flora Details - <i>Dicksonia fibrosa</i> . <a href="http://www.nzpcn.org.nz">http://www.nzpcn.org.nz</a> . [Accessed 18 Oct 2019]	"Easily grown from fresh spores, and also by transplants of mature trunked specimens. A beautiful but slow-growing species that does best in cooler climates, in a damp, humus-enriched soil."
	The Royal Horticultural Society. (2019). <i>Dicksonia fibrosa</i> - golden tree fern. <a href="https://www.rhs.org.uk/plants/details/%3Fplantid%3D4445">https://www.rhs.org.uk/plants/details/%3Fplantid%3D4445</a> . [Accessed 18 Oct 2019]	"Propagate by sowing spores as soon as ripe"

603	Hybridizes naturally	y
	<b>Source(s)</b>	<b>Notes</b>
	Shepherd, L. D., Brownsey, P. J., Stowe, C., Newell, C., & Perrie, L. R. (2019). Genetic and morphological identification of a recurrent <i>Dicksonia</i> tree fern hybrid in New Zealand. <i>PLoS One</i> , 14(5), e0216903	[Natural hybrids form between <i>D. fibrosa</i> and <i>D. lanata</i> subsp. <i>lanata</i> ] "Hybridization is common in many ferns and has been a significant factor in fern evolution and speciation. However, hybrids are rare between the approximately 30 species of <i>Dicksonia</i> tree ferns world-wide, and none are well documented. In this study we examine the relationship of a newly-discovered <i>Dicksonia</i> tree fern from Whirinaki, New Zealand, which does not fit the current taxonomy of the three species currently recognized in New Zealand. Our microsatellite genotyping and ddRAD-seq data indicate these plants are F1 hybrids that have formed multiple times between <i>D. fibrosa</i> and <i>D. lanata</i> subsp. <i>lanata</i> . The Whirinaki plants have intermediate morphology between <i>D. fibrosa</i> and <i>D. lanata</i> subsp. <i>lanata</i> and their malformed spores are consistent with a hybrid origin. The Whirinaki plants— <i>Dicksonia fibrosa</i> × <i>D. lanata</i> subsp. <i>lanata</i> —are an example of hybridization between distantly related fern lineages, with the two parent species estimated to have diverged 55–25 mya. Our chloroplast sequencing indicates asymmetric chloroplast inheritance in the Whirinaki morphology with <i>D. lanata</i> subsp. <i>lanata</i> always contributing the chloroplast genome."

604	Self-compatible or apomictic	
	<b>Source(s)</b>	<b>Notes</b>
	Kramer, K.U. & Green, P.S. 1990. <i>The Families and Genera of Vascular Plants. Volume 1. Pteridophytes and Gymnosperms</i> . Springer-Verlag, Berlin, Heidelberg, New York	"Dicksoniaceae ... Gametophyte. This does not show any remarkable features, except for its primitive antheridia with several wall cells."
	Mehltreter, K., Walker, L.R. & Sharpe, J.M. 2010. <i>Fern Ecology</i> . Cambridge University Press, Cambridge, UK	[Unknown for <i>Dicksonia fibrosa</i> ] "Most fern species cross-fertilize (i.e., sperm fertilizes an egg cell from a different gametophyte), but the gametophytes are potentially bisexual. If the gametophyte has simultaneously functioning archegonia and antheridia it may self-fertilize (i.e., sperm fertilizes an egg cell from the same gametophyte), which is of advantage after long distance dispersal."

Qsn #	Question	Answer
605	Requires specialist pollinators	n
	Source(s)	Notes
	Mehltreter, K., Walker, L.R. & Sharpe, J.M. 2010. Fern Ecology. Cambridge University Press, Cambridge, UK	[Requires water] "Gametophytes may be male or female, or may produce both types of gametangia. For fertilization, the sperm cell must swim through water to an egg cell"
606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[No evidence. Lacks buds and stolons] "Rhizomes erect, forming a woody trunk 2–6 m tall, 150–600 mm diam., or rarely to 1000 mm on Chatham Islands, covered in a thick layer of reddish brown adventitious roots, lacking buds and underground stolons, bearing reddish brown multicellular hairs near the apex."
607	Minimum generative time (years)	
	Source(s)	Notes
	New Zealand Plant Conservation Network. (2019). Flora Details - <i>Dicksonia fibrosa</i> . <a href="http://www.nzpcn.org.nz">http://www.nzpcn.org.nz</a> . [Accessed 21 Oct 2019]	"A beautiful but slow-growing species that does best in cooler climates, in a damp, humus enriched soil."
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. Flora of New Zealand — Ferns and Lycophytes. Fascicle 11. Manaaki Whenua Press, Lincoln	[Unknown, but small spores could possibly be moved by human activity in soil] "Habitat: Occurs under tall mānuka and kānuka scrub, on forest margins, or in podocarp and broadleaved forest in the northern part of its range, and podocarp or beech forest in the southern part. It grows on flood plains, riverbanks, streamsides, swamp margins and on hillsides, but can also tolerate forest margins, open pastures or scrubland."



Qsn #	Question	Answer
702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	New Zealand Plant Conservation Network. (2019). Flora Details - <i>Dicksonia fibrosa</i> . <a href="http://www.nzpcn.org.nz">http://www.nzpcn.org.nz</a> . [Accessed 18 Oct 2019]	"Commonly available from most mainline and specialist native plant nurseries."
	Lawrence, D. H., & Flynn, T. (2006). New naturalized plant records for Kaua'i and Hawai'i. Bishop Museum Occasional Papers, 88, 1-5	"Native to New Zealand, it is occasionally cultivated in Hawai'i and has escaped from cultivation in one locality on the Big Island."
	Bezonsa, N., Rauch, F. D., & Iwata, R. Y. 1994. Tree ferns for Hawai'i gardens. Research Extension Series 144. CTAHR,, University of Hawaii, Honolulu, HI	[Promoted for cultivation in the Hawaiian Islands] " <i>Dicksonia fibrosa</i> (Golden Tree Fern) This tree fern has a stout trunk growing up to 20 feet high and covered with brown, fibrous, aerial rootlets. It has large, fresh green fronds up to 8 feet long that are fairly stiff. This fern prefers cool, moist conditions with filtered shade. Distribution : New Zealand."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown, but it may be possible that spores become contaminants of pots or other planting media

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Brock, J. M., Perry, G. L., Lee, W. G., & Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i> , 375, 112-126	"Tree fern sporophytes produce abundant small spores that are readily wind dispersed"

705	Propagules water dispersed	y
	Source(s)	Notes
	New Zealand Plant Conservation Network. (2019). Flora Details - <i>Dicksonia fibrosa</i> . <a href="http://www.nzpcn.org.nz">http://www.nzpcn.org.nz</a> . [Accessed 18 Oct 2019]	"Habitat - Coastal to montane, Usually in forested situations, often in riparian sites or at gully heads." [Presence in riparian sites suggests that water, in addition to wind, is likely responsible for dispersal of spores]
	Brownsey, P. J. & Perrie, L. R. (2015). Dicksoniaceae. In: Breitwieser, I.; Heenan, P. B.; Wilton, A. D. <i>Flora of New Zealand — Ferns and Lycophytes</i> . Fascicle 11. Manaaki Whenua Press, Lincoln	"It grows on flood plains, riverbanks, streamsides, swamp margins and on hillsides, but can also tolerate forest margins, open pastures or scrubland." [Presence in riparian habitats suggests that water, in addition to wind, is likely responsible for dispersal of spores]

706	Propagules bird dispersed	n
	Source(s)	Notes
	Brock, J. M., Perry, G. L., Lee, W. G., & Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i> , 375, 112-126	"Tree fern sporophytes produce abundant small spores that are readily wind dispersed" [Although spores may potentially adhere to bird feet or feathers, the primary vector of dispersal is wind]

Qsn #	Question	Answer
707	<b>Propagules dispersed by other animals (externally)</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Brock, J. M., Perry, G. L., Lee, W. G., & Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i> , 375, 112-126	"Tree fern sporophytes produce abundant small spores that are readily wind dispersed" [Possibly, but unlikely. Although spores may potentially adhere to animal fur or feet, the primary vector of dispersal is wind]

708	<b>Propagules survive passage through the gut</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Brock, J. M., Perry, G. L., Lee, W. G., & Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i> , 375, 112-126	"Tree fern sporophytes produce abundant small spores that are readily wind dispersed"

801	<b>Prolific seed production (&gt;1000/m2)</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	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	"Assume 'yes' for fern taxa unless contradictory evidence exists."

802	<b>Evidence that a persistent propagule bank is formed (&gt;1 yr)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Overdyck, E., & Clarkson, B. D. (2012). Seed rain and soil seed banks limit native regeneration within urban forest restoration plantings in Hamilton City, New Zealand. <i>New Zealand Journal of Ecology</i> , 36(2): 177-190	"Appendix 2. Species classified as persistent in soil seed banks for urban (planted and natural, n = 13) or rural (natural, n = 4) forest types: closed circle (●) persistent >10 seeds difference in soil seed bank than annual seed rain, at one or more sites; open circle (○) not persistent but occurred in soil seed banks <10 seeds" [Dicksonia fibrosa classified as persistent in urban spore bank and not persistent in rural spore bank. Longevity unspecified]
	Brock, J. M., Perry, G. L., Lee, W. G., & Burns, B. R. (2016). Tree fern ecology in New Zealand: A model for southern temperate rainforests. <i>Forest Ecology and Management</i> , 375, 112-126	[Unknown] "Spore viability ranges from two months ( <i>Cyathea delgadii</i> ) to 13 months ( <i>Cyathea caracasana</i> , <i>Dicksonia sellowiana</i> ), from species native to tropical regions of the Americas, compared to up to 22 years for the Australasian <i>Dicksonia antarctica</i> (Lloyd and Klekowski, 1970; Goller and Rybczynski, 2007) in a laboratory. No information is available on spore viability of the New Zealand tree ferns."

803	<b>Well controlled by herbicides</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Benitez, D.M., R. Loh, T. Tunison, N.G. Zimmer, J. Makaike, R. Mattos and M. Casali. (2012). The distribution of invasive plant species of concern in the Kīlauea and Mauna Loa strip areas of Hawai'i Volcanoes National Park, 2000-2010. Tech. Report No. 179. HCSU & PCSU, University of Hawaii, Honolulu, HI	[2% Roundup in water applied foliage appears effective] "New Zealand tree-fern ( <i>Dicksonia fibrosa</i> ) is native to New Zealand, apparently sparingly cultivated, but not reported naturalized in Hawai'i (Palmer 2003). New Zealand tree-fern has not been found in HAVO but occurs in a number of residential lots in Volcano Village. Mature plants have not been observed in these areas (Tunison pers. obsn.), except for one lot where in 2006, new recruits were found establishing abundantly in areas surrounding planted trees. Later that year, at the landowner's request, these plants were removed. During two revisits to the site, in June and December, 2006, 179 and 79 individuals were removed respectively. Mature plants were controlled by uprooting or cutting and during follow up visits newly established plants were foliar treated with herbicide. Both mechanical and chemical methods appeared to effectively control New Zealand tree-fern. Remaining control of this species was agreed to be undertaken by the landowner. A solution of 2% Roundup in water applied to the plant's foliage appears effective at controlling New Zealand tree fern."
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern <i>Dicksonia antarctica</i> invades two habitats of European conservation priority in São Miguel Island, Azores. <i>Biological Invasions</i> , 14(7): 1317-1323	[Chemical methods used on other tree fern species may be effective] "As far as we know our study is the first to report invasive <i>D. antarctica</i> and therefore control methods have not been tested. Next step could be to test on this species the physical and chemical methods successfully used for <i>S. cooperi</i> (Motooka et al. 2003), another Australian tree fern."
	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	[Methods to control <i>Sphaeropteris cooperi</i> may be effective on <i>D. squarrosa</i> ] "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(50)."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Benitez, D.M., R. Loh, T. Tunison, N.G. Zimmer, J. Makaike, R. Mattos and M. Casali. (2012). The distribution of invasive plant species of concern in the Kīlauea and Mauna Loa strip areas of Hawai'i Volcanoes National Park, 2000-2010. Tech. Report No. 179. HCSU & PCSU, University of Hawaii, Honolulu, HI	[Unknown, but mechanical control appears to be effective, with no regrowth documented in this report] "Mature plants were controlled by uprooting or cutting and during follow up visits newly established plants were foliar treated with herbicide. Both mechanical and chemical methods appeared to effectively control New Zealand tree-fern."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	The Royal Horticultural Society. (2019). <i>Dicksonia fibrosa</i> - golden tree fern. <a href="https://www.rhs.org.uk/plants/details/%3Fplantid%3D4445">https://www.rhs.org.uk/plants/details/%3Fplantid%3D4445</a> . [Accessed 18 Oct 2019]	"Pests - Generally pest free outdoors Diseases - Generally disease free outdoors "
	WRA Specialist. (2019). Personal Communication	Unknown

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Broad climate suitability and elevation range
- Grows in upper elevation tropical climates
- Naturalized on Hawaii island (Hawaiian Islands) and possibly outside natural range in New Zealand
- Skirt of fallen fronds prevents epiphyte establishment and could potentially impact Hawaiian epiphyte diversity and abundance if established more widely
- Other *Dicksonia* species are invasive
- Dead fronds moderately to highly flammable
- Shade tolerant
- Tolerates many soil types
- Reproduces by spores
- Hybridizes with other *Dicksonia* species
- Spores dispersed by wind and water; also intentionally planted
- Prolific spore production

## Low Risk Traits

- Unarmed (no spines, thorns, or burrs)
- Non-toxic
- Valued as an ornamental
- Not reported to spread vegetatively
- Slow growing
- Mechanical and chemical methods appear to provide effective control