Taxon: Dicksonia antarctica Labill. **Family:** Dicksoniaceae

Common Name(s): man fern
soft tree fern
Tasmanian tree fern

Synonym(s): Balantium antarcticum (Labill.) C.

Assessor: Assessor **Status:** Assessor Approved **End Date:** 19 Mar 2020

WRA Score: 13.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Naturalized, Environmental Weed, Fire-tolerant, Long-lived, 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)	Intermediate
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)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	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	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
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		
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		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Jones, D. L., & Clemesha, S. C. 1976. Australian ferns and fern allies, with notes on their cultivation. Reed, Sydney	No evidence

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

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	NA

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**Intermediate**
	Source(s)	**Notes**
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	"Temp.-S.Trop." [Indicates tree fern is native to and will grow in temperate to sub-tropical climates]. "It thrives in cool, moist conditions and, if given plenty of water, will tolerate a fair degree of exposure to sun." [Suggests this tree fern would probably be a potential threat to higher elevation wet forests of the Hawaiian Islands and other Pacific island ecosystems]

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	The Australian National University. 1988. Harvesting of Tree Ferns from Native Forests in South Eastern Australia. http://fennerschool-associated.anu.edu.au/fpt/nwfp/ferns/ferns.html. [Accessed 4 May 2014]	"Dicksonia antarctica's popularity as a garden ornamental in south eastern Australia is also related to it being very easy to grow in shady moist areas where many trees and shrubs will not survive and its hardiness. It thrives in cool moist conditions, can withstand frost, snow and very low temperatures, and is able to tolerate a fair degree of exposure to the sun. "
	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. Forest Ecology and Management, 375, 112-126	"The Australian D. Antarctica has a broad ecological niche and is capable of surviving in environments with a range of water supply conditions and evapotranspirational demands (Hunt et al., 2002)."

Qsn #	Question	Answer
	Hunt, M. A., Davidson, N. J., Unwin, G. L. and Close, D. C. 2002, Ecophysiology of the Soft Tree Fern, Dicksonia antarctica Labill. Austral Ecology, 27:360–368	"The Soft Tree Fern, Dicksonia Antarctica , is a characteristic understorey species of wet sclerophyll and rainforest communities on moist, fertile soils in south-eastern Australia and Tasmania within an altitudinal range from sea level to 1000 m a.s.l. (Neyland 1986)." ... "The effects of the various environmental variables studied on the photosynthesis and the water relations of D. antarctica also indicate a capacity of the species to inhabit an ecological niche characterized by a wide range of light, moisture and temperature conditions." [Adaptable to a variety of conditions, and grows at an elevation range of 1000 m] ... "In this way, during the lifetime of a single D. Antarctica sporophyte (to a maximum of 500–1000 years; Mueck et al. 1996), the rosette of fronds developed under particular environmental conditions has the capacity to function in either cool, humid and shaded conditions beneath a dense tree canopy or warm, dry and high PPFD conditions in a forest gap or following wildfire." ... "In conclusion, this study has reported a number of ecophysiological characteristics that may contribute to the success of D. antarctica in an environment highly variable in light, water supply and evapotranspirational demand, allowing the species to occupy a broad ecological niche."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Australian National Botanic Gardens. 2013. Growing Native Plants - Dicksonia Antarctica. http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html. [Accessed 4 May 2014]	"D. antarctica is wide-spread species growing from south-eastern Queensland, through the NSW and Victoria coast and in Tasmania. This species is endemic to Australia. In the wild this species likes to live in moist areas with high water content in wet sclerophyll forests, along creek beds, in gullies and occasionally at high altitudes in cloud forests. " [Ranges from temperate to sub-tropical climates in Australia]
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	"Temp.-S.Trop." [Indicates tree fern is native to and will grow in temperate to sub-tropical climates]. "It thrives in cool, moist conditions and, if given plenty of water, will tolerate a fair degree of exposure to sun."
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"This paper reports the invasion by the Australian tree fern Dicksonia antarctica to the eastern part of Sa˜o Miguel Island (Azores archipelago—Portugal)." ... "Sa˜o Miguel is the largest island of the Azores, an archipelago of volcanic origin located in the North Atlantic Ocean, about 1,500 km from mainland Europe (Fig. 1a). The climate is temperate oceanic with mean annual temperature of 17□C at sea level."

Qsn #	Question	Answer
	Ranil, R. H. G., Pushpakumara, D. K. N. G., Wijesundara, D. S. A., Bostock, P. D., Ebihara, A., & Fraser-Jenkins, C. R. (2017). Diversity and distributional ecology of tree ferns of Sri Lanka: A step towards conservation of a unique gene pool. Ceylon Journal of Science, 46(5): 127-135	"Well established naturalised populations of C. australis and D. antarctica were recorded from Pidurutalagala Mountain FR and an adjacent Eucalyptus plantation (Ranil et al., 2014). The species inventory of the Hakgala Botanic Gardens shows that these two species were introduced into Hakgala Botanic Garden at least 120 years ago. They have evidently now escaped from the garden and are well established in the adjacent forest. The cool montane micro-climate and high elevation (1,745 m) of Hakgala Botanic Garden evidently match the ecological requirements of D. antarctica. This may be the main reason why D. antarctica was able to be introduced successfully into the fernery at the garden during the colonial era, as a species of considerable ornamental appeal. A similar micro-climatic environment also occurs in Pidurutalagala Mountain FR and in an adjacent Eucalyptus plantation. Both the natural forest area and Eucalyptus plantation consist of nearly 40-50 % canopy cover and 20-30% steepness (Ranil et al., 2014). Both species appear to have similar micro-ecological requirements."

205	Does the species have a history of repeated introductions outside its natural range?	y
	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	"At least five species are grown in Hawai`i, but only two are likely to be seen in private gardens. Dicksonia antarctica ... Dicksonia squarrosa..."
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"It has been widely cultivated in European gardens, being mentioned in Flora Europaea (Tutin et al. 1993) as cultivated for ornament in southwestern England and south-western Ireland without being naturalized. Although D. antarctica is referred to as a potential ecological concern (Robinson 2009) it was rarely reported as an escaped ornamental, with records in Ireland and Madeira Island in Portugal (Reynolds 2002; Vieira 2002). In the Azores this species is only known on Sa˜o Miguel (Borges et al. 2010)."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Online Atlas of the British and Irish flora. 2014. Dicksonia antarctica (Australian Tree-fern). http://www.brc.ac.uk/plantatlas/index.php?q=node/963. [Accessed 4 May 2014]	"A potentially large trunk-forming, deciduous fern found naturalised in woods, road banks and other shady places. It also occurs as a relic of cultivation. Reproduction by spores is frequent. Lowland." ... "This dramatic species has been cultivated in Britain since 1786 and is widely and increasingly grown in gardens. It was not, however, recorded from the wild until 1960 when several large plants were found in woods on Valentia Island (S. Kerry)."
	Stace, C. 2010. New Flora of the British Isles. Third Edition. Cambridge University Press, Cambridge, UK	"D. antarctica ... Intrd-natd; gron in gardens in SW, natd in woods and shady places in S Kerry, Scilly and E & W Cornwall" [Introduced and naturalized]
	Crouch, N. R. (2012). Ferns of Southern Africa. Struik Nature, Cape Town, South Africa	"Despite its capacity for sexual reproduction, this introduced species has not spread widely around Cape Town where it has been in cultivation for many years at sites such as Kirstenbosch. It has nevertheless naturalised and clearly has the potential to further invade the moister temperate forests of the Western Cape."

Qsn #	Question	Answer
	Ranil, R. H. G., Pushpakumara, D. G., Premakantha, K. T., Bostock, P. D., & Ebihara, A. (2014). Naturalization of Dicksonia antarctica Labill. in Pidurutalagala Mountain Forest Reserve and Adjacent Eucalyptus Plantation in Sri Lanka. Bulletin of the National Museum of Nature and Science. Series B, Botany, 40(3), 107-112	"Dicksonia antartica Labill. is a species native to Australia. In Sri Lanka, until recently, the only known record of D. antarctica was at the Fernery in Hakgala Botanic Gardens, Nuwara Eliya, where the species was planted in 1863. An eco-geographic survey on Sri Lankan tree ferns conducted from 2006–2013 identified a substantial population from Pidurutalagala Mountain Forest Reserve and adjacent Eucalyptus plantation. The detailed observation of population in natural forest and forest plantation fringe revealed natural regeneration with substantial number of immature and mature individuals. Hence, it is proposed that D. antarctica is naturalized in some areas of Pidurutalagala Mountain Forest Reserve and adjacent Eucalyptus plantation after escaping from the Fernery in the Hakgala Botanic Gardens. The substantial amount of population was observed about 30 km away from the Fernery. Further studies on population and reproductive biology are continuing."
	Watson, L., and Dallwitz, M.J. 2004 onwards. British ferns (Filicopsida). Version: 4th January 2012. http://delta-intkey.com. [Accessed 4 May 2014]	"Distribution and habitat. In moist woods and shady situations. Naturalized. Native to S and SE Australia, naturalized in S Kerry, Cornwall and also in the Isles of Scilly, where a control program is in operation."
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"Sixty fern species are considered problematic worldwide because of their invasiveness, but only two of them are tree ferns. This paper reports the invasion by the Australian tree fern Dicksonia antarctica to the eastern part of Sa˜o Miguel Island (Azores archipelago—Portugal). It probably escaped from cultivation in the nineteenth century and has spread to an area of over 48 km2, mainly at high altitude ([500 m a.s.l.)." ... "We found the Australian tree fern D. antarctica in 48 study units (1 9 1 kmUTM) in several habitats of Sa˜o Miguel Island (Azores, Portugal). This is the first documented occurrence of D. antarctica as a naturalized species in Europe and the first invasion described for this fern species."
	Almeida, J.D.& Freitas, H. 2006. Exotic naturalized flora of continental Portugal – A reassessment. Botanica Complutensis 30: 117-130	"Table 2 Exotic vascular plant species (invasive, potentially invasive or more or less naturalized) in continental Portugal." ... [Dicksonia antarctica - (2) Year of first reported naturalization of exotic species = 1985]
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence in the Hawaiian Islands to date

Qsn #	Question	Answer
302	**Garden/amenity/disturbance weed**	**n**
	Source(s)	**Notes**
	Department of Primary Industries, Parks, Water and Environment (Tasmania). 2008. Dicksonia Antarctica Notesheet. Flora of Tasmania. http://dpipwe.tas.gov.au/Documents/Dicksonia-antarctica-Notesheet.pdf. [Accessed]	"As long as appropriate conditions exist and there is a source population within range, soft treeferns can rapidly colonise areas where gaps and some disturbance occur. This is one of a few ferns that are the first to recolonise areas disturbed by activities such as logging or road construction." [Disturbance adapted]
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"This paper reports the invasion by the Australian tree fern Dicksonia antarctica to the eastern part of Sa˜o Miguel Island (Azores archipelago—Portugal). It probably escaped from cultivation in the nineteenth century and has spread to an area of over 48 km2..." [An environmental weed. See 3.04]

303	**Agricultural/forestry/horticultural weed**	**n**
	Source(s)	**Notes**
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"The species has invaded forest plantations, exotic forests and two habitats of European conservation priority: native laurel forests and blanket bogs." [No evidence in this publication that Dicksonia causes economic losses or otherwise interferes with forestry operations]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[No evidence] "References: South Africa-AW-121, United Kingdom-C-314, United Kingdom-N-519, United Kingdom-CN-812, Ireland-N-894, United Kingdom-N-1006, Iceland-N-1006, Portugal-N-1006, Portugal-N-898, Europe- N-819, Global-I-1404, Global-CD-1611, Sri Lanka-GN-1929, Portugal-W-1977, United Kingdom-W-1977."

304	**Environmental weed**	**y**
	Source(s)	**Notes**
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"The species has invaded forest plantations, exotic forests and two habitats of European conservation priority: native laurel forests and blanket bogs. Dicksonia antarctica plantlets (individuals with no trunk) were predominant in exotic forests, D. antarctica 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."

305	**Congeneric weed**	**y**
	Source(s)	**Notes**
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"Of over 12,000 described fern species, about 60 are problematic due to their invasive nature, affecting resource use, human health and plant communities (Robinson et al. 2010). Of these 60 species, only two are tree ferns, Dicksonia squarrosa and Sphaeropteris cooperi."

Qsn #	Question	Answer
	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	"The spread and formation of Dicksonia groves is a slow process but the emergence of Dicksonia through either grass or Paesia is often observed (Silvester, 1964). Both native fern species create problems in productive grassland comprising exotic grass species ... This situation is different from the usual circumstances where invasive alien ferns threaten native species ... and illustrates the subjective decision of whether the invader is welcome or not." [Dicksonia squarrosa is an agricultural weed]

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Jones, D. L., & Clemesha, S. C. 1976. Australian ferns and fern allies, with notes on their cultivation. Reed, Sydney	"Trunks massive, to more than 2 m diam and to over 15 m tall, densely covered with brown, fibrous roots, often buttressed at the base; stipe bases persistent on the upper trunk, smooth, covered with brown hairs which are shed some time after uncoiling; fronds up to 4.5 m long, dark glossy green above, paler beneath, stiff in texture; sori about 1 mm across." [No evidence]

402	Allelopathic	
	Source(s)	**Notes**
	Australian National Botanic Gardens. 2013. Growing Native Plants - Dicksonia Antarctica. http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html. [Accessed 4 May 2014]	"It can also help with weed control in the garden as its dense crown can shade out many problem species of suburban gardens and has been suggested to have allelopathic abilities (Neyland 1986)." [Potentially allelopathic]

403	Parasitic	n
	Source(s)	**Notes**
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	No evidence. Dicksoniaceae

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Forsyth, D. M. and Davis, N. E. (2011, Diets of non-native deer in Australia estimated by macroscopic versus microhistological rumen analysis. The Journal of Wildlife Management, 75(6): 1488–1497	"Table 1. Percentage contribution and percent frequency occurrence of plant species in the rumen contents of 102 sambar deer harvested in Victoria, Australia, 2007–2009, estimated by macroscopic and microhistological techniques." [Includes Dicksonia Antarctica in small amounts]
	Department of Primary Industries, Parks, Water and Environment (Tasmania). 2008. Dicksonia Antarctica Notesheet. Flora of Tasmania. http://dpipwe.tas.gov.au/Documents/Dicksonia-antarctica-Notesheet.pdf. [Accessed]	"The tender, fleshy croziers (young, uncurling fronds) are an occasional food source for native animals such as possums and parrots." [Would likely also be palatable to rodents, pigs, and other introduced mammals of the Hawaiian Islands]

405	Toxic to animals	

Qsn #	Question	Answer
	Source(s)	**Notes**
	The Royal Botanic Gardens & Domain Trust. 2014. Dicksonia Antarctica. http://www.rbgsyd.nsw.gov.au/education/Resources/bush_foods/Dicksonia_antarctica. [Accessed 4 May 2014]	"Danger: Toxic fronds" ... "Uncoiled young fronds can be eaten after roasting or steaming to remove toxins." [Toxicity to animals unknown]
	Department of Primary Industries, Parks, Water and Environment (Tasmania). 2008. Dicksonia Antarctica Notesheet. Flora of Tasmania. http://dpipwe.tas.gov.au/Documents/Dicksonia-antarctica-Notesheet.pdf. [Accessed]	"The tender, fleshy croziers (young, uncurling fronds) are an occasional food source for native animals such as possums and parrots." [No evidence of toxicity to these animals]

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	The Royal Horticultural Society. 2014. Dicksonia antarctica. http://www.rhs.org.uk/plants/details?plantid=654. [Accessed 4 May 2014]	"Diseases: Generally disease free outdoors"
	Malumphy, C., & Halstead, A. J. 2012. First incursions in Europe of four Australasian species of armoured scale insect (Hemiptera: Diaspididae). British Journal of Entomology and Natural History, 2 (4), 193-197	"The first incursions in Britain (and Europe) of four species of Australasian armoured scale insect (Hemiptera: Diaspididae) are reported. Chionaspis xanthorrhoeae Fuller was found breeding indoors on two 100+ year old Xanthorrhoea sp. plants at private premises in Biddenham, Bedfordshire, England, in 2009. The plants had been bought from a commercial plant nursery in Wales in 2003, and the scales had been breeding in Britain for at least six years. Fusilaspis phymatodidis (Maskell) was found causing chlorosis and brown necrotic spotting to the foliage of Dicksonia antarctica and Woodwardia radicans, and to a lesser degree Blechnum sp. and Dryopteris sp., grown in polytunnels at Rosemoor, the Royal Horticultural Society's Garden near Great Torrington, North Devon, England, in 1994, and outdoors in 1995. Parlatoria pittospori Maskell was found causing chlorosis to the foliage of a mature Aloe glauca grown indoors at the Royal Botanic Gardens, Kew, Surrey, England, in 1995. Pseudaulacaspis brimblecombei Williams was found breeding indoors on two Telopea 'Golden Globe' plants at a commercial premises in Cambridge, Cambridgeshire, England, in September 2012. The infested plants had been imported from Italy six months earlier, although P. brimblecombei is not known to occur in Italy. The biology, host plants and geographical range for each of these scale insects are reviewed and their potential economic and environmental impact in Britain discussed."

Qsn #	Question	Answer
	Fountain-Jones, N. M., McQuillan, P. B., & Grove, S. 2012. Beetle communities associated with the tree fern Dicksonia antarctica Labill. in Tasmania. Australian Journal of Entomology, 51(3): 154-165	"Tree ferns are a conspicuous element of many wet forests in Australia, and in increasing demand in export markets, but little is known about their beetle fauna. The tree fern Dicksonia antarctica Labill. was sampled over four seasons at four sites in Tasmania. A total of 108 species of beetles, representing 35 families, were collected from three discrete microhabitats on 80 individual tree ferns. Beetle numbers were highest in the crown litter, then live fronds and least from the trunk. Curculionoids were the most diverse and abundant group of beetles and an anthribid genus, Xynotropis Blackburn, was most numerous. The crown litter was numerically dominated by species from four families, Anthribidae, Leiodidae, Ptiliidae and Staphylinidae. Two other families, Latridiidae and Coccinellidae, were most abundant on the live fronds, while Tenebrionidae, Staphylinidae and Anthribidae were common on the trunks. Predators, followed by fungivores contributed the highest proportion of species richness, however fungivores, spore feeders and detritivores were most abundant as individuals. Despite a large foliar biomass, herbivores were notably few in numbers and diversity. The beetle assemblage on each of the three microhabitats associated with tree ferns was distinctive and characterised by sets of species that displayed some degree of geographical variation. Indicator analysis revealed that 13 species were broadly characteristic of site-by-microhabitat combinations. For exported tree ferns, the beetle fauna appears to be low in pest potential."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**
	Australian National Botanic Gardens. 2013. Growing Native Plants - Dicksonia Antarctica. http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html. [Accessed 4 May 2014]	"Also, it can be used as a food source with the pith of the plant being eaten either cooked or raw and is a very good source of starch." [No evidence of toxicity]
	The Royal Botanic Gardens & Domain Trust. 2014. Dicksonia Antarctica. http://www.rbgsyd.nsw.gov.au/education/Resources/bush_foods/Dicksonia_antarctica. [Accessed 4 May 2014]	"Danger: Toxic fronds" ... "Uncoiled young fronds can be eaten after roasting or steaming to remove toxins." [Poisoning only occurs if consuming raw young fronds]
	Williams, C. 2012. Medicinal Plants in Australia Volume 3: Plants, Potions and Poisons. Rosenberg Publishing, Kenthurst NSW	[Possibly carcinogenic] "In addition, studies into the carcinogenic potential of fern spores determined that Osmunda regalis spores did not cause DNA damage in vitro – although a number of other species did: Anemia phyllitidis, Dicksonia antarctica, Pteris vittata and Sadleria pallida."

Qsn #	Question	Answer
408	**Creates a fire hazard in natural ecosystems**	
	Source(s)	**Notes**
	Australian Biological Resources Study. (1998). Flora of Australia Volume 48, Ferns, Gymnosperms and Allied Groups. CSIRO Publishing, Melbourne	"Common in high rainfall forests from sea-level to c. 1000 m; often dominates wet, shady gullies and frequently grows in extensive stands." [Unlikely to increase fire risk in wet habitats]
	Tasmania Fire Service. 2010. Fire resisting garden plants for the urban fringe and rural areas. http://www.fire.tas.gov.au. [Accessed]	"Moderate Flammability: These plants should be avoided in the Building Protection Zone. They should not be allowed to dominate your garden and should be well maintained, being especially careful to remove dead material before it accumulates." [Dicksonia Antarctica included in plants of Moderate Flammability]

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	**Notes**
	Hunt, M. A., Davidson, N. J., Unwin, G. L. and Close, D. C. 2002, Ecophysiology of the Soft Tree Fern, Dicksonia antarctica Labill. Austral Ecology, 27:360–368	"During its relatively long (compared with co-occurring tree species) lifetime, D. antarctica may be exposed to a wide range of light regimes, from shaded beneath a dense tree canopy, to high light intensities in a forest gap."
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"In Sa˜o Miguel, D. antarctica occupies shady understory of three forest habitats, where canopy cover is above 63% (Arosa et al. 2009), but also open areas of blanket bogs."
	Australian Biological Resources Study. (1998). Flora of Australia Volume 48, Ferns, Gymnosperms and Allied Groups. CSIRO Publishing, Melbourne	"often dominates wet, shady gullies and frequently grows in extensive stands."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	GardenWeb. 2013. Dicksonia antarctica 'Tree Fern'. http://www.uk.gardenweb.com/forums/load/ukgard/msg0407061219824.html. [Accessed 4 May 2014]	" Although Dicksonia antarctica will re-establish in just about any soil type - provided enough supplementary moisture is provided - the shrub and topsoil mix employed here is not especially generous in this respect." [Posted by stephenpope2000uk Brighton, UK (My Page) on Mon, May 9, 05 at 6:11]
	The Royal Horticultural Society. 2014. Dicksonia antarctica. http://www.rhs.org.uk/plants/details?plantid=654. [Accessed 4 May 2014]	"Moisture: Moist but well-drained Soil: Loam, Sand pH: Acid, Neutral"
	Australian National Botanic Gardens. 2013. Growing Native Plants - Dicksonia Antarctica. http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html. [Accessed 4 May 2014]	"The condition D. antarctica thrives in is in filtered sunlight, loose well drained soils with lots of organic matter and lots of water. However, this species can still withstand some drying out and can survive in drier conditions."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Jones, D. L., & Clemesha, S. C. 1976. Australian ferns and fern allies, with notes on their cultivation. Reed, Sydney	"Trunks massive, to more than 2 m diam and to over 15 m tall, densely covered with brown, fibrous roots, often buttressed at the base; stipe bases persistent on the upper trunk, smooth, covered with brown hairs which are shed some time after uncoiling; fronds up to 4.5 m long, dark glossy green above, paler beneath, stiff in texture; sori about 1 mm across."
	Ranil, R. H. G., Pushpakumara, D. G., Premakantha, K. T., Bostock, P. D., & Ebihara, A. (2014). Naturalization of Dicksonia antarctica Labill. in Pidurutalagala Mountain Forest Reserve and Adjacent Eucalyptus Plantation in Sri Lanka. Bulletin of the National Museum of Nature and Science. Series B, Botany, 40(3), 107-112	[Not climbing, but may be able to establish epiphytically] "Though D. antarctica is typically identified as a terrestrial species, out of the 27 of total immature individuals, 18 plants were observed on the base of Cyathea walkerae Hook. and one on another unidentified tree fern trunk (Fig. 1D). Further observations indicated that as they grew and developed, these plants formed a rhizome and connection with the soil surface."

412	Forms dense thickets	y
	Source(s)	**Notes**
	Volkova, L. V. 2009. Ecophysiology of the tree fern species Dicksonia antarctica Labill and Cyathea australis (R. Br.) Domin. PhD Dissertation, The University of Melbourne, Melbourne, Australia	"D. antarctica is common in wet forest and often dominates moist, shady gullies, where it frequently grows in extensive stands."
	Online Atlas of the British and Irish flora. 2014. Dicksonia antarctica (Australian Tree-fern). http://www.brc.ac.uk/plantatlas/index.php?q=node/963. [Accessed 4 May 2014]	"Native of S. & E. Australia, where it may form extensive stands in wet, shady gullies."
	Australian Biological Resources Study. (1998). Flora of Australia Volume 48, Ferns, Gymnosperms and Allied Groups. CSIRO Publishing, Melbourne	"often dominates wet, shady gullies and frequently grows in extensive stands."

501	Aquatic	n
	Source(s)	**Notes**
	Australian National Botanic Gardens. 2013. Growing Native Plants - Dicksonia Antarctica. http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html. [Accessed 4 May 2014]	"Dicksonia antarctica is part of the family Dicksoniaceae. Members of this family are the tree ferns. They are terrestrial ferns and have an erect rhizome forming a trunk, large spreading fronds and are very hairy at the bas of the stipe."

502	Grass	n
	Source(s)	**Notes**
	Jones, D. L., & Clemesha, S. C. 1976. Australian ferns and fern allies, with notes on their cultivation. Reed, Sydney	Dicksoniaceae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	Jones, D. L., & Clemesha, S. C. 1976. Australian ferns and fern allies, with notes on their cultivation. Reed, Sydney	Dicksoniaceae

Qsn #	Question	Answer
504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Australian National Botanic Gardens. 2013. Growing Native Plants - Dicksonia Antarctica. http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html. [Accessed 4 May 2014]	"They are terrestrial ferns and have an erect rhizome forming a trunk, large spreading fronds and are very hairy at the bas of the stipe."
	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	"This question relates to perennial plants with tubers, corms or bulbs. This question is specifically to deal with plants that have specialized organs and should not include plants merely with rhizomes/ stolons"

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Volkova, L. V. 2009. Ecophysiology of the tree fern species Dicksonia antarctica Labill and Cyathea australis (R. Br.) Domin. PhD Dissertation, The University of Melbourne, Melbourne, Australia	"D. antarctica is common in wet forest and often dominates moist, shady gullies, where it frequently grows in extensive stands." [No evidence]
	Australian Biological Resources Study. (1998). Flora of Australia Volume 48, Ferns, Gymnosperms and Allied Groups. CSIRO Publishing, Melbourne	"Occurs in south-eastern Qld, eastern N.S.W., A.C.T., southern Vic. and Tas. Common in high rainfall forests from sea-level to c. 1000 m; often dominates wet, shady gullies and frequently grows in extensive stands. The fibrous trunks provide a suitable substrate for other plants including bryophytes, ferns and orchids."
	Neyland, M. G., & Brown, M. J. 1993. Rainforest in eastern Tasmania-floristics and conservation. Papers and Proceedings of the Royal Society of Tasmania 127: 23-32	"Tree ferns (Dicksonia antarctica) are ubiquitous, forming galleries alongside streams and creeks and being more widely scattered elsewhere." ... "Dicksonia antarctica is widespread and common, particularly along drainage lines where the canopy is more open." [No evidence]

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"A single fertile leaf has been estimated to produce as many as 750 million viable airborne spores (Page 1979)."
	Australian National Botanic Gardens. 2013. Growing Native Plants - Dicksonia Antarctica. http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html. [Accessed 4 May 2014]	"Propagation is primarily from spores but it can also be grown from plantlets occurring around the base of the rhizome." [Viable spores]

Qsn #	Question	Answer
	Srivastava, R., & Uniyal, P. L. (2015). Gametophyte development and reproductive behavior in Dicksonia antarctica labill. BIOINFOLET-A Quarterly Journal of Life Sciences, 12(4b), 988-992	"The event of spore germination, gametophyte development, sex ontogeny and sporophyte development in Dicksonia antarctica was studied. Spore germination was of Cyathea-type, while prothallial development was observed to be of Adiantum-type. The species was found to be a good colonizer in nature, as considerable numbers of sporophytes were produced in culture medium through selfing. Frequency of sporophyte production was 60% in composite population, while no sporophyte was produced in isolated population. D. antarctica had poor capacity to form sporophyte through intragametophytic selfing. It reproduced by inter-gametophytic selfing and also possibly by crossing. Conservation of this taxon in the natural habitat is urgently required by introducing it in protected areas."

603	Hybridizes naturally	
	Source(s)	**Notes**
	Shepherd, L. D., Brownsey, P. J., Stowe, C., Newell, C., & Perrie, L. R. (2019). Genetic and morphological identification of a recurrent Dicksonia tree fern hybrid in New Zealand. PloS One, 14(5), e0216903	[Unknown. Natural hybrids form between D. fibrosa and D. lanata subsp. lanata] "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 Dicksonia tree ferns world-wide, and none are well documented. In this study we examine the relationship of a newly-discovered Dicksonia 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 D. fibrosa and D. lanata subsp. lanata. The Whirinaki plants have intermediate morphology between D. fibrosa and D. lanata subsp. lanata and their malformed spores are consistent with a hybrid origin. The Whirinaki plants - Dicksonia fibrosa × D. lanata subsp. lanata□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 D. lanata subsp. lanata always contributing the chloroplast genome."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Mehltreter, K., Walker, L.R. & Sharpe, J.M. 2010. Fern Ecology. Cambridge University Press, Cambridge, UK	"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
	Forest Practices Authority. 2012. Tree Fern Management Plan for the Sustainable Harvesting, Transporting or Trading of Dicksonia antarctica in Tasmania 2012. Forest Practices Authority, Hobart	"The tree fern life cycle for Dicksonia and the other species of Tasmanian tree ferns is well understood in terms of the sequence of four development stages. The sequence of developmental stages described below has been taken from Neyland (1986). In the first stage of tree fern development the spores germinate to produce a small structure called the prothallus. After a few weeks the prothallus produces male and female organs. In the presence of water the male organs (antheridia) release sperm cells that fertilise ova within the female organs (archegonia). Dehydration of the prothallus stops this process."
	Srivastava, R., & Uniyal, P. L. (2015). Gametophyte development and reproductive behavior in Dicksonia antarctica labill. BIOINFOLET-A Quarterly Journal of Life Sciences, 12(4b), 988-992	[Inter-gametophytic selfing possible] "The event of spore germination, gametophyte development, sex ontogeny and sporophyte development in Dicksonia antarctica was studied. Spore germination was of Cyathea-type, while prothallial development was observed to be of Adiantum-type. The species was found to be a good colonizer in nature, as considerable numbers of sporophytes were produced in culture medium through selfing. Frequency of sporophyte production was 60% in composite population, while no sporophyte was produced in isolated population. D. antarctica had poor capacity to form sporophyte through intragametophytic selfing. It reproduced by inter-gametophytic selfing and also possibly by crossing. Conservation of this taxon in the natural habitat is urgently required by introducing it in protected areas."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	[Requires water for fertilization] "In ferns, moisture availability may be critical to establishment of the gametophyte and to the fertilization of the female gametangia by motile sperms (e.g. Watkins et al. 2007). However, D. antarctica lives chiefly at high altitude in Sa˜o Miguel (mainly above 500 m), where the relative humidity is highest (annual mean 96%, Table 1) and annual precipitation (2,857 mm) triples that in its native range (Neyland 1986). These environmental data indicate that gametophyte development and sporophyte formation are not limited by water availability. In agreement, we found abundant plantlets throughout the study area, especially in exotic forest and native laurel forest (Fig. 2a) where shady areas under canopy can promote establishment and growth of D. antarctica sporophytes."

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	Australian National Botanic Gardens. 2013. Growing Native Plants - Dicksonia Antarctica. http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html. [Accessed 4 May 2014]	"Propagation is primarily from spores but it can also be grown from plantlets occurring around the base of the rhizome."

607	Minimum generative time (years)	>3

Qsn #	Question	Answer
	Source(s)	**Notes**
	The Australian National University. 1988. Harvesting of Tree Ferns from Native Forests in South Eastern Australia. http://fennerschool-associated.anu.edu.au/fpt/nwfp/ferns/ferns.html. [Accessed 4 May 2014]	"Dicksonia antarctica's slow growth rate of 30cm over 10 years and long age to reproductive maturity, approximately 23 years, make it sensitive to over harvesting (Forestry Commission, Tasmania 1988)," ... "Although relatively easy to propagate from spores Dicksonia antarctica's slow growth rates, taking up to 75 years to reach 6 feet, suggest that the large sizes that people seem want in their gardens will still have to come from native forests for many years to come..."
	Crouch, N. R. (2012). Ferns of Southern Africa. Struik Nature, Cape Town, South Africa	"Fortunately, this species grows slowly (± 4 cm per year) and only produces fertile fronds at the age of about 20 years."
	Department of Primary Industries, Parks, Water and Environment (Tasmania). 2008. Dicksonia Antarctica Notesheet. Flora of Tasmania. http://dpipwe.tas.gov.au/Documents/Dicksonia-antarctica-Notesheet.pdf. [Accessed]	"Soft treeferns do not reach reproductive maturity until they are 23 years old or approximately 95 cm in height (based on an average growth rate of 3.5–5 cm per year)."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	
	Source(s)	**Notes**
	Online Atlas of the British and Irish flora. 2014. Dicksonia antarctica (Australian Tree-fern). http://www.brc.ac.uk/plantatlas/index.php?q=node/963. [Accessed 4 May 2014]	"A potentially large trunk-forming, deciduous fern found naturalised in woods, road banks and other shady places. It also occurs as a relic of cultivation. Reproduction by spores is frequent. Lowland." [Unknown. Occurrence along road banks may facilitate movement of spores]

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	"A majestic fern which is popular in cultivation."
	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	"At least five species are grown in Hawai`i, but only two are likely to be seen in private gardens. Dicksonia antarctica ... Dicksonia squarrosa..."
	Rickard, M. 2005. Gardening With Ferns. Horticulture Publications, Boston, MA	"For those in cool temperate regions who have never grown a tree fern before, Dicksonia antarctica is the first choice. It is tough, relatively hardy and has been in cultivation long enough for a fair bit to be known about what it will or will not tolerate."

703	**Propagules likely to disperse as a produce contaminant**	
	Source(s)	**Notes**
	Forest Practices Authority. 2012. Tree Fern Management Plan for the Sustainable Harvesting, Transporting or Trading of Dicksonia antarctica in Tasmania 2012. Forest Practices Authority, Hobart	"Tree ferns produce copious amounts of spore that are widely distributed by wind and readily develop into sporophytes that colonise regenerating forests." [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**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"Many invasive fern species share two characteristics which contribute to their invasiveness (Robinson 2009). First, they can spread rapidly by means of spore dispersal, rhizome growth, fragmentation or a combination of these mechanisms. Second, they tend to occupy sun-exposed sites during their sporophyte stage. Dicksonia antarctica meets the first characteristic since it prefers shady environments beneath a forest canopy (Jones 1998). However, ecophysiological studies showed that D. antarctica can tolerate high light conditions and water deficit (Hunt et al. 2002; Volkova et al. 2009, 2010)."

705	Propagules water dispersed	y
	Source(s)	**Notes**
	Ranil, R. H. G., Pushpakumara, D. G., Premakantha, K. T., Bostock, P. D., & Ebihara, A. (2014). Naturalization of Dicksonia antarctica Labill. in Pidurutalagala Mountain Forest Reserve and Adjacent Eucalyptus Plantation in Sri Lanka. Bulletin of the National Museum of Nature and Science. Series B, Botany, 40(3), 107-112	"All individuals of D. antarctica are observed associated with the stream network." [Water is likely facilitating dispersal and establishment of this species]
	Neyland, M. G., & Brown, M. J. 1993. Rainforest in eastern Tasmania-floristics and conservation. Papers and Proceedings of the Royal Society of Tasmania 127: 23-32	"Tree ferns (Dicksonia antarctica) are ubiquitous, forming galleries alongside streams and creeks and being more widely scattered elsewhere." [Water likely helps spore germination & gametophyte fertilization, but likely also aids in movement of spores]

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Forest Practices Authority. 2012. Tree Fern Management Plan for the Sustainable Harvesting, Transporting or Trading of Dicksonia antarctica in Tasmania 2012. Forest Practices Authority, Hobart	"Tree ferns produce copious amounts of spore that are widely distributed by wind and readily develop into sporophytes that colonise regenerating forests." [Although spores may potentially adhere to bird feet or feathers, the primary vector of dispersal is wind]

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Possibly, but unlikely. Although spores may potentially adhere to animal fur or feet, the primary vector of dispersal is wind

708	Propagules survive passage through the gut	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Unknown if consumption of fern fronds results in passage of viable spores, but unlikely to be an important vector of dispersal

801	Prolific seed production (>1000/m2)	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"A single fertile leaf has been estimated to produce as many as 750 million viable airborne spores (Page 1979)."
	Crouch, N. R. (2012). Ferns of Southern Africa. Struik Nature, Cape Town, South Africa	"Dicksonia antarctica is a hardy species from a cold temperate zone, which can produce over 800 million spores per plant annually."
	Department of Primary Industries, Parks, Water and Environment (Tasmania). 2008. Dicksonia Antarctica Notesheet. Flora of Tasmania. http://dpipwe.tas.gov.au/Documents/Dicksonia-antarctica-Notesheet.pdf. [Accessed]	"When reproductively mature, spore production is prolific, occurring mainly in late summer. Over 750 million spores per frond are produced annually but ferns under stress do not produce spores. Spore release can occur at any time but most are released in late summer/early autumn." ... "Although the released spores have a short dispersal range, because of the huge number produced, the potential dispersal range is much greater. Distances of500–800 km appear to be no barrier to the dispersal of this species. Consequently, recruitment of this species at a site does not rely on the on-site presence of the species. As long as there is a source population within 500–800 km, soft treefern can potentially occupy suitable sites."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	"The author knows of many instances of tree ferns such as Cyathea australis and Dicksonia antarctica retaining viability for 10-15 years…" [Spores maintain viability in storage, but unknown from field conditions]
	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. Forest Ecology and Management, 375, 112-126	[22 year viability in lab conditions] "Spore viability ranges from two months (Cyathea delgadii) to 13 months (Cyathea caracasana, Dicksonia sellowiana), from species native to tropical regions of the Americas, compared to up to 22 years for the Australasian Dicksonia antarctica (Lloyd and Klekowski, 1970; Goller and Rybczynski, 2007) in a laboratory."
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	[Spore longevity unknown] "Our study shows an old and extensive invasion of Sa˜o Miguel Island by D. antarctica. Given the large area invaded, complete eradication is not feasible. Management strategies are constrained by two additional facts. First, many individuals grow in rough terrain or inaccessible areas. Second, high proportions of individuals are fertile and produce large amounts of spores which may be ubiquitous in soil spore banks (Dyer and Lindsay 1992). These soil spore banks can act as a reservoir for re-invasion of cleared areas"

Qsn #	Question	Answer
803	**Well controlled by herbicides**	
	Source(s)	**Notes**
	Arosa, M. L., Ceia, R. S., Quintanilla, L. G., & Ramos, J. A. 2012. The tree fern Dicksonia antarctica invades two habitats of European conservation priority in São Miguel Island, Azores. Biological Invasions, 14(7): 1317-1323	"As far as we know our study is the first to report invasive D. antarctica 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 S. cooperi (Motooka et al. 2003), another Australian tree fern."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	Forest Practices Authority. 2012. Tree Fern Management Plan for the Sustainable Harvesting, Transporting or Trading of Dicksonia antarctica in Tasmania 2012. Forest Practices Authority, Hobart	"Dicksonia is tolerant of fire and re-shoots readily following burning. When the top part of a plant is cut off, the lower part dies, but the top has a vigorous ability to produce adventitious roots and to resume growth, especially if the mature fronds are pruned."
	Rickard, M. 2005. Gardening With Ferns. Horticulture Publications, Boston, MA	"Horticulturally, Dicksonia Antarctica has many advantages over almost all the other tree fern species. It is nearly hardy in the cool temperate climates, such as that of the British Isles. It is incredibly easy to grow. It is able to live through being shipped from Australia, which takes seven weeks in a container. Most remarkable of all, it can survive being sawn of at ground level on a mature tree up to 6 m (20 ft) in height."
	Hunt, M. A., Davidson, N. J., Unwin, G. L. and Close, D. C. 2002, Ecophysiology of the Soft Tree Fern, Dicksonia antarctica Labill. Austral Ecology, 27:360–368	"The trunk and growing apex of D. Antarctica are very resistant to damage by fire and the apical rosette of fronds rapidly regenerates after intense wildfires (Hickey 1994)."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Thrives in temperate & sub-tropical cool climates
• Grows in a variety of habitats, & elevation range exceeds 1000 m, demonstrating some environmental versatility
• Naturalized in Britain, & the Azores
• Environmental weed
• Other Dicksonia species have become invasive
• Potentially allelopathic
• Young fronds may contain toxins
• Shade tolerant
• Grows on many soil types (provided adequate moisture)
• Forms extensive stands in native range
• Capable of inter-gametophytic selfing
• Produces 1000s of wind-dispersed spores
• Can reproduce vegetatively
• Tolerates & will resprout after cutting or fires

Low Risk Traits
• Would probably only threaten higher elevation ecosystems in tropical islands
• Unarmed (no spines, thorns or burrs)
• Palatable to ungulates & other browsing animals
• Ornamental
• Slow growth rate & reaches maturity after 20+ years