

Taxon: <i>Lindsaea ensifolia</i> Sw.	Family: Lindsaeaceae
Common Name(s): graceful necklace fern	Synonym(s): <i>Adiantum ensifolium</i> (Sw.) Poir. <i>Schizolegnia ensifolia</i> (Sw.) Alston <i>Schizoloma ensifolium</i> (Sw.) J. Sm.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 17 May 2021
WRA Score: 5.0	Designation: L	Rating: Low Risk

Keywords: Tropical Fern, Naturalized, Shade-Tolerant, Hybridizes, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
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	n
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)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
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)		
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		
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	n
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	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)		
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m ²)	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		
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
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2013. Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence of domestication] "Terrestrial, roadsides, forests; 100-700 m. Fujian, Guangdong, Guangxi, Guizhou (Wangmo), Hainan, Taiwan, Yunnan [Bangladesh, India, Japan, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Africa, SW Asia, Australia, Pacific islands]."

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

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

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Lindsaea ensifolia is native to Zimbabwe, Mozambique, Reunion: Madagascar, India. the Philippines. New Guinea. and the western Pacific."
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2013. Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Terrestrial, roadsides, forests; 100-700 m. Fujian, Guangdong, Guangxi, Guizhou (Wangmo), Hainan, Taiwan, Yunnan [Bangladesh, India, Japan, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Africa, SW Asia, Australia, Pacific islands]."

202	Quality of climate match data	High
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Crouch, N. R. (2012). Ferns of Southern Africa. Struik Nature, Cape Town, South Africa	"A seldom encountered fern confined to low-altitude forest, usually in coastal swamp forest, growing on boggy ground or next to small streams in light shade. Under ideal conditions it sometimes forms large clumps. Altitude range is from sea level to 380 m."

Qsn #	Question	Answer
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2013. Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Terrestrial, roadsides, forests; 100-700 m."
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[>1000 m elevation range in the Hawaiian Islands] "First collected in Hawai'i in 1969 near a fumarole in Hawai'i Volcanoes National Parle. Now found in mesic areas in extensive localized plots in scattered localities, 15-1,220 m, Kaua'i, O'ahu, Maui. and Hawai'i."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"First collected in Hawai'i in 1969 near a fumarole in Hawai'i Volcanoes National Parle. Now found in mesic areas in extensive localized plots in scattered localities, 15-1,220 m, Kaua'i, O'ahu, Maui. and Hawai'i. <i>Lindsaea ensifolia</i> is native to Zimbabwe, Mozambique, Reunion: Madagascar, India. the Philippines. New Guinea. and the western Pacific."

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	Notes
	Wagner, W. (1971). <i>Lindsaea</i> (<i>Schizoloma</i>) <i>ensifolia</i> Swartz in Hawaii. <i>American Fern Journal</i> , 61(2), 49-58	"Unlike various naturalized ferns of Hawaii (cf. Wagner, 1948), <i>L. ensifolia</i> is a relatively unattractive fern and is not grown at all in horticulture, to my knowledge."
	Staples, G.W. & Herbst, D.R. (2005). <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	No evidence of cultivation in the Hawaiian Islands

301	Naturalized beyond native range	y
	Source(s)	Notes
	Oppenheimer, H. (2008). New Hawaiian plant records for 2007. <i>Bishop Museum Occasional Papers</i> 100: 22-38	"First collected in Hawai'i in 1969, and naturalized on Kaua'i, O'ahu, Maui, and Hawai'i (Palmer 2003: 174), on Moloka'i this alien fern was found growing in a pasture. Although the indigenous <i>Sphenomeris chinensis</i> (L.) Maxon was also noted to occur nearby, the interesting intergeneric hybrid x <i>Lindsaeosoria flynnii</i> W.H. Wagner (W.H. Wagner 1993: 72-3) was not found. Material examined. MOLOKA'I: S of Pöhakupili Gulch, naturalized in pasture but localized, 385 m, 25 Nov 2007, Oppenheimer H110737."
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"First collected in Hawai'i in 1969 near a fumarole in Hawai'i Volcanoes National Parle. Now found in mesic areas in extensive localized plots in scattered localities, 15-1,220 m, Kaua'i, O'ahu, Maui. and Hawai'i. <i>Lindsaea ensifolia</i> is native to Zimbabwe, Mozambique, Reunion: Madagascar, India. the Philippines. New Guinea. and the western Pacific."

Qsn #	Question	Answer
	Wilson, K.A. (1996). Alien Ferns in Hawaii. Pacific Science 50(2): 127-141	"Lindsaea ensifolia Swartz var. ensifolia was first found growing in the wild around steam vents near Puhimau Crater along Chain-of-Craters Road, Volcanoes National Park, Hawaii, in 1969 (Wagner 1971). Originally, because of the unusual habitat in which it was found, it was thought to be native. Since its appearance, L. ensifolia has been found well established in widely scattered areas on Kaua'i (Hume 325, BISH), O'ahu (Wilson 1706, BISH), Maui (Hobdy 1746, BISH), and Hawai'i (Takeuchi 3584, BISH). Current characteristics of its growth and distribution in the Islands indicate that L. ensifolia var. ensifolia is, in fact, a recent immigrant. On Kaua'i, Tim Flynn (pers. comm.) informed me that it is persisting and spreading around recently abandoned homesites and may not yet have escaped from cultivation."

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	n
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Scattered in wet mossy forests. 180-765 m all major islands. This beautiful, delicate-appearing fern, which Hillebrand considered rather common in 1888, is now rather uncommon, although scattered healthy local populations are still found." [No evidence, although it does hybridize with the native fern Sphenomeris chinensis. No evidence that the Sphenomeris chinensis has become rare to date due to intergeneric hybridization]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

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

Qsn #	Question	Answer
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2013. Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence] "Rhizomes long creeping, densely scaly; scales appressed, reddish brown, 2-6 cells wide at base and acicular at apex. Fronds approximate or distant, 0.5-1 cm apart; stipe castaneous, 10-30 cm, quadrangular; lamina oblong, 15-40 × 10-25 cm, herbaceous to papery, 1-pinnate; pinnae 1-8 pairs, subopposite at base, alternate apically, narrowly lanceolate, shortly stalked or sessile, base broadly cuneate, margin entire or serrate in sterile pinnae, apex acuminate; terminal pinnae similar to lateral ones; veins anastomosing, veins uniting to 2 rows of areoles along each side of costae, other veins free, visible on both surfaces. Sori marginal, terminal on veinlets; indusia linear, continuous."

402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants small to medium-sized, epiphytic or terrestrial." [Lindsaea genus description. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown

405	Toxic to animals	n
	Source(s)	Notes
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes

Qsn #	Question	Answer
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"First collected in Hawai'i in 1969 near a fumarole in Hawai 'i Volcanoes National Parle. Now found in mesic areas in extensive localized plots in scattered localities, 15-1,220 m, Kaua'i, O'ahu, Maui. and Hawai'i." [No evidence]
	Western Australian Herbarium (1998–2021). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 17 May 2021]	"Sheltered wet areas, rock walls or ledges." [No evidence. Unlikely given habitat]

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Crouch, N. R. (2012). Ferns of Southern Africa. Struik Nature, Cape Town, South Africa	"A seldom encountered fern confined to low-altitude forest, usually in coastal swamp forest, growing on boggy ground or next to small streams in light shade."
	Wagner, W. (1971). <i>Lindsaea</i> (<i>Schizoloma</i>) <i>ensifolia</i> Swartz in Hawaii. <i>American Fern Journal</i> , 61(2), 49-58	"Physically the habitat in which we found <i>Lindsaea ensifolia</i> in Hawaii is peculiar. However, <i>L. ensifolia</i> in other parts of its range is very commonly a sun fern, growing in open, lateritic savannas, and capable of withstanding the heat of direct sunlight. Holttum (1954, p. 243) states that it "has the power to live in poor soil, in exposed as well as shaded places."
	Western Australian Herbarium (1998–2021). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 17 May 2021]	"Sheltered wet areas, rock walls or ledges."
	Brownlie, G. (1973). The Genus <i>Lindsaea</i> in Fiji. <i>American Fern Journal</i> , 63(3), 91-98	[<i>Lindsaea ensifolia</i> subsp. <i>agatii</i> . Can grow in direct sunlight] "Widespread throughout the dry zones of the main islands of Fiji, being one of the most common ferns of the talasiga soils. It also occurs on well-drained ridges in high-rainfall areas where the vegetation has been cleared and the ground exposed to continuous direct sunlight."
	Roux, J. P. (2001). Conspectus of southern African Pteridophyta. Southern African Botanical Diversity Network Report No. 13. SABONET, Pretoria	[<i>Lindsaea ensifolia</i> subsp. <i>ensifolia</i>] "Terrestrial, in deep shade in permanently moist coastal lagoon forests and streams in kloofs, 20–100 m."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	

Qsn #	Question	Answer
	Source(s)	Notes
	Western Australian Herbarium (1998–2021). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 17 May 2021]	"Peaty mud, sand, loam, sandstone. Sheltered wet areas, rock walls or ledges."
	Tryon, R. M., & Tryon, A. F. (1982). <i>Ferns and Allied Plants: With Special Reference to Tropical America</i> . Springer-Verlag, New York	"The genus grows on a great variety of soil and rock types."
	Brownlie, G. (1973). The Genus <i>Lindsaea</i> in Fiji. <i>American Fern Journal</i> , 63(3), 91-98	[<i>Lindsaea ensifolia</i> subsp. <i>agatii</i>] "Widespread throughout the dry zones of the main islands of Fiji, being one of the most common ferns of the talasiga soils. It also occurs on well-drained ridges in high-rainfall areas where the vegetation has been cleared and the ground exposed to continuous direct sunlight."
	Palmer, D.D. (2003). <i>Hawaii's Ferns and Fern Allies</i> . University of Hawaii Press, Honolulu, HI	[Soil requirements unknown] "Scattered in wet mossy forests. 180-765 m all major islands."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Palmer, D.D. (2003). <i>Hawaii's Ferns and Fern Allies</i> . University of Hawaii Press, Honolulu, HI	"Plants terrestrial. Rhizomes short-creeping."

412	Forms dense thickets	n
	Source(s)	Notes
	Oppenheimer, H. (2008). New Hawaiian plant records for 2007. <i>Bishop Museum Occasional Papers</i> 100: 22-38	"Material examined. MOLOKA'I: S of Pöhakupili Gulch, naturalized in pasture but localized, 385 m, 25 Nov 2007, Oppenheimer H110737." [No evidence]
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2013. <i>Flora of China</i> . Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Terrestrial, roadsides, forests; 100-700 m." [No evidence]
	Crouch, N. R. (2012). <i>Ferns of Southern Africa</i> . Struik Nature, Cape Town, South Africa	[May form large clumps, but no indication that it will dominate large areas to the exclusion of other vegetation] "A seldom encountered fern confined to low-altitude forest, usually in coastal swamp forest, growing on boggy ground or next to small streams in light shade. Under ideal conditions it sometimes forms large clumps. Altitude range is from sea level to 380 m."
	Palmer, D.D. (2003). <i>Hawaii's Ferns and Fern Allies</i> . University of Hawaii Press, Honolulu, HI	[No evidence in Hawaiian Islands] "Scattered in wet mossy forests. 180-765 m all major islands. This beautiful, delicate-appearing fern, which Hillebrand considered rather common in 1888, is now rather uncommon, although scattered healthy local populations are still found."
	Cambie, R. C. & Ash, J. (1994). <i>Fijian Medicinal Plants</i> . CSIRO Publishing, Clayton, Australia	[No evidence] "A common fern which is found on open grassy hills in dry regions and open sites in wetter regions. It has a creeping rhizome, slender stipes up to 40 cm long, and bipinnate fronds."

501	Aquatic	n
-----	---------	---

Qsn #	Question	Answer
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants terrestrial. Rhizomes short-creeping."
502	Grass	n
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Lindsaeaceae
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Lindsaeaceae
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2013. Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Rhizomes long creeping, densely scaly; scales appressed, reddish brown, 2-6 cells wide at base and acicular at apex."
601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2013. Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Terrestrial, roadsides, forests; 100-700 m. Fujian, Guangdong, Guangxi, Guizhou (Wangmo), Hainan, Taiwan, Yunnan [Bangladesh, India, Japan, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Africa, SW Asia, Australia, Pacific islands]."
	Foden, W. & Potter, L. (2005). <i>Lindsaea ensifolia</i> Sw. National Assessment: Red List of South African Plants version 2020.1. http://redlist.sanbi.org . [Accessed 17 May 2021]	"This taxon was not selected in any one of four screening processes for highlighting potential taxa of conservation concern for detailed assessment and was hence given an automated status of Least Concern."
602	Produces viable seed	y
	Source(s)	Notes
	Australian Biological Resources Study. (1998). Flora of Australia Volume 48, Ferns, Gymnosperms and Allied Groups. CSIRO Publishing, Melbourne	"Indusium 0.3–0.5 mm wide. Spores trilete, pale brown."
	Jones, E. J. (2019). Terrestrial alien ferns (Polypodiophyta): A global assessment of traits associated with invasiveness and their distribution and status in South Africa. MSc Thesis. Nelson Mandela University, Gqeberha, South Africa	"Supplementary 1 Global inventory of terrestrial alien true ferns (Polypodiophyta)." [<i>Lindsaea ensifolia</i> - Mode of regeneration = Sexual]

Qsn #	Question	Answer
	Lin, S. J., Kato, M., & Iwatsuki, K. (1990). Sporogenesis, reproductive mode, and cytotaxonomy of some species of <i>Sphenomeris</i> , <i>Lindsaea</i> , and <i>Tapeinidium</i> (Lindsaeaceae). <i>American Fern Journal</i> , 80(3), 97-109	[Spores produced] "Different spore numbers were observed in only a few species of Lindsaeaceae: one 16-spored plant of <i>Sphenomeris clavata</i> and two such of <i>S. deltoidea</i> , and one 8-spored plant of <i>Lindsaea ensifolia</i> and <i>L. heterophylla</i> . Their sporogenetic process is unknown, so that it is uncertain if they are sexual, with fewer premeiotic cell divisions, or are agamosporous."

603	Hybridizes naturally	Y
	Source(s)	Notes
	Wilson, K.A. (1996). Alien Ferns in Hawaii. <i>Pacific Science</i> 50(2): 127-141	"A large population of <i>L. ensifolia</i> is growing in an abandoned orchard on the northeastern side of Kahili Mountain Park, Koloa District, Kaua'i, together with the indigenous <i>Odontosoria chinensis</i> (L.) J. Smith. There several individual plants of a hybrid between the two species, which has been described as <i>x Lindsaeosoria flynnii</i> W. H. Wagner (Wagner 1993), can be found. This is one of several hybrids between native and naturalized species found on the Islands."
	Vernon, A., & Ranker, T. (2013). Current Status of the Ferns and Lycophytes of the Hawaiian Islands. <i>American Fern Journal</i> , 103(2), 59-111	"Several naturalized fern species hybridize with native Hawaiian species. For example, the naturalized fern <i>Cyclosorus dentatus</i> has crossed with the endemic species <i>Cyclosorus cyatheoides</i> (<i>Cyclosorus Xpalmeri</i> (W. H. Wagner) W. H. Wagner) on Kaua'i and O'ahu (W. H. Wagner et al., 1999). Another example is of an intergeneric hybrid (<i>XLindsaeosoria flynnii</i> W. H. Wagner), the naturalized <i>Lindsaea ensifolia</i> (Lindsaeaceae) crossing with the indigenous <i>Sphenomeris chinensis</i> (Lindsaeaceae) (W. H. Wagner, 1993). The effects of naturalized species crossing with native species are not entirely known, although these hybrids have the potential to threaten native biodiversity due to the effects of outbreeding depression and introgression (Bleeker et al., 2007)."
	Palmer, D.D. (2003). <i>Hawaii's Ferns and Fern Allies</i> . University of Hawaii Press, Honolulu, HI	[<i>x Lindsaeosoria flynnii</i> W. H. Wagner] "Generic name from the parent genera <i>Lindsaea</i> . and <i>Odontosoria</i> (treated as <i>Sphenomeris</i> in this book). Specific name honors Tim Flynn (1958-), collections manager of the herbarium at the National Tropical Botanical Garden, discoverer of new ferns on Kaua 'i, and the first to point out this plant. This extraordinary intergeneric hybrid between a naturalized species and an indigenous species is limited to fewer than a dozen plants. Its bizarre fronds {see illustration} display a morphology intermediate between the very different genera and species. It has been found in the midst of large populations of both parent species only in an area southeast of Kahill (peak). southeastern Kaua 'i."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Wagner, W. (1971). <i>Lindsaea</i> (<i>Schizoloma</i>) <i>ensifolia</i> Swartz in Hawaii. <i>American Fern Journal</i> , 61(2), 49-58	[Possibly] "Fern spores are capable of long-distance dispersal because of their extremely small size. Current research suggests that a single spore has the potentiality of initiating a new colony of ferns by gametophytic self-fertilization. Fern gametophytes tend to be self-compatible according to the recent studies of Klekowski and Baker (1966)."

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 for fertilization] "For fertilization, the sperm cell must swim through water to an egg cell (Fig. 1.2). 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."

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants terrestrial. Rhizomes short-creeping." [Possibly spreads vegetatively via rhizomes, although Jones (2019) reports that the mode of regeneration is exclusively sexual]
	Jones, E. J. (2019). Terrestrial alien ferns (Polypodiophyta): A global assessment of traits associated with invasiveness and their distribution and status in South Africa.MSc Thesis. Nelson Mandela University, Gqeberha, South Africa	"Supplementary 1 Global inventory of terrestrial alien true ferns (Polypodiophyta)." [Lindsaea ensifolia - Mode of regeneration = Sexual]

607	Minimum generative time (years)	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2013. Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Terrestrial, roadsides, forests; 100-700 m." [Unknown. Occurrence along roadside suggests some dispersal may be facilitated by spore attachment in mud on tires, equipment, or footwear. Fern may also be adapted to disturbed, roadside habitats]

702	Propagules dispersed intentionally by people	n
	Source(s)	Notes
	Wagner, W. (1971). Lindsaea (Schizoloma) ensifolia Swartz in Hawaii. American Fern Journal, 61(2), 49-58	"As Lindsaea ensifolia was not encountered in Hawaii until December, 1969, one might argue that it had been introduced by man, either intentionally or unintentionally. I am, however, hesitant to accept this argument. This is not a plant likely to be carried by man. Unlike various naturalized ferns of Hawaii (cf. Wagner, 1948), L. ensifolia is a relatively unattractive fern and is not grown at all in horticulture, to my knowledge."
	Hoshizaki, B. J., & Moran, R. C. (2001). Fern Grower's Manual: Revised and Expanded Edition. Timber Press, Portland, Oregon	"Lindsaea -These attractive ferns are often seen in the tropics and sometimes in temperate areas, but they are difficult to grow and rarely cultivated in the United States."

Qsn #	Question	Answer
	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	No evidence of cultivation in the Hawaiian Islands

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Hoshizaki, B. J., & Moran, R. C. (2001). Fern Grower's Manual: Revised and Expanded Edition. Timber Press, Portland, Oregon	"Lindsaea -These attractive ferns are often seen in the tropics and sometimes in temperate areas, but they are difficult to grow and rarely cultivated in the United States." [No evidence]

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Wagner, W. (1971). <i>Lindsaea</i> (<i>Schizoloma</i>) <i>ensifolia</i> Swartz in Hawaii. <i>American Fern Journal</i> , 61(2), 49-58	"Fern spores are capable of long-distance dispersal because of their extremely small size. Current research suggests that a single spore has the potentiality of initiating a new colony of ferns by gametophytic self-fertilization."
	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	"This group includes tumbling plants and fern spores."

705	Propagules water dispersed	y
	Source(s)	Notes
	Roux, J. P. (2001). <i>Conspectus of southern African Pteridophyta</i> . Southern African Botanical Diversity Network Report No. 13. SABONET, Pretoria	[<i>Lindsaea ensifolia</i> subsp. <i>ensifolia</i>] "Terrestrial, in deep shade in permanently moist coastal lagoon forests and streams in kloofs, 20-100 m." [Occurrence near streams suggests water facilitates dispersal]
	Crouch, N. R. (2012). <i>Ferns of Southern Africa</i> . Struik Nature, Cape Town, South Africa	[Riparian distribution suggests water facilitates dispersal of spores and possibly fern fragments] "A seldom encountered fern confined to low-altitude forest, usually in coastal swamp forest, growing on boggy ground or next to small streams in light shade."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. <i>Plant Protection Quarterly</i> , 25(2): 56-74	"Taxa known not to be dispersed by birds, that have seeds/spores known to always be digested, or with propagules too large for such dispersal should receive a 'no' answer."

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown. Small spores could attach to animals in mud. Direct evidence lacking

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unlikely to be consumed, and not adapted for internal dispersal

801	Prolific seed production (>1000/m2)	y
	Source(s)	Notes
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. Plant Protection Quarterly, 25(2): 56-74	"Assume 'yes' for fern taxa unless contradictory evidence exists."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown

803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown. No information on herbicide efficacy, or evidence that this species has been chemically controlled using herbicides

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Jones, E. J. (2019). Terrestrial alien ferns (Polypodiophyta): A global assessment of traits associated with invasiveness and their distribution and status in South Africa.MSc Thesis. Nelson Mandela University, Gqeberha, South Africa	[Unknown] "Supplementary 1 Global inventory of terrestrial alien true ferns (Polypodiophyta)." [Lindsaea ensifolia - Mode of regeneration = Sexual]

Qsn #	Question	Answer
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	<p style="text-align: center;">Source(s)</p> <p>Palmer, D.D. (2003). Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI</p>	<p style="text-align: center;">Notes</p> <p>[Unknown, but this information suggests plants are not affected by biotic limiting factors] "Scattered in wet mossy forests. 180-765 m all major islands. This beautiful, delicate-appearing fern, which Hillebrand considered rather common in 1888, is now rather uncommon, although scattered healthy local populations are still found."</p>

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m in the Hawaiian Islands
- Thrives in tropical climates
- Naturalized on Kauai, Oahu, Maui, Molokai and Hawaii (Hawaiian Islands)
- Shade-tolerant
- Reproduces by prolific spore production
- Hybridizes with native fern *Sphenomeris chinensis*
- Spores dispersed by wind and water (based on general fern biology and inferred from fern's distribution along streams)
- Gaps in biological and ecological information reduce accuracy of risk prediction

Low Risk Traits

- Despite naturalization and hybridization, generally regarded as an innocuous fern with no specific detrimental impacts reported
- Unarmed (no spines, thorns, or burrs)
- Non-toxic

Second Screening Results for Herbs or Low Stature Shrubby Life Forms

(A) Reported as a weed of cultivated lands? No
Outcome = Accept (Low Risk)