

**Taxon:** *Selaginella willdenowii* (Desv.) Baker

**Family:** Selaginellaceae

**Common Name(s):** peacock fern  
vine spike-moss  
Willdenow's spikemoss

**Synonym(s):** *Lycopodium willdenowii* Desv.

**Assessor:** Chuck Chimera

**Status:** Assessor Approved

**End Date:** 25 Aug 2020

**WRA Score:** 11.0

**Designation:** H(HPWRA)

**Rating:** High Risk

**Keywords:** Widely Naturalized, Climbing, Dense Thickets, Shade-Tolerant, 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	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		
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		
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	y
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
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		
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 <sup>2</sup> )	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
	De Winter, W.P. and Amoroso, V.B. (eds.). (2003). Plant Resources of South-East Asia No 15(2). Cryptogams: Ferns and fern allies. Backhuys Publishers, Leiden, The Netherlands	[Edible and medicinal uses, but no evidence of domestication] "S. willdenowii occurs in Indo-China, Peninsular Malaysia and Indonesia (Sumatra, Java). Young leaves of S. willdenowii are eaten as a vegetable in Java but are also used as a depurative or stomachic. S. willdenowii is used in decoction as a protective medicine after childbirth and as an ingredient of tonics. It is also used to treat skin diseases such as itches and ringworm by pounding the plant finely with <i>Alyxia reinwardtii</i> Blume and <i>Foeniculum vulgare</i> Miller ('adas pulasari') and made into an ointment."

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"	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). 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 23 Aug 2020]	"Native Asia-Tropical INDO-CHINA: Cambodia, Laos, Myanmar, Thailand, Vietnam MALESIA: Indonesia [Jawa, Sumatera], Malaysia, Philippines"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). 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 23 Aug 2020]	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	"Hammocks; 0--50 m; introduced; Fla"
	Dave's Garden. (2020). Selaginella Species, Peacock Fern, Willdenow's Spikemoss - Selaginella willdenowii. <a href="https://davesgarden.com/guides/pf/go/157170/">https://davesgarden.com/guides/pf/go/157170/</a> . [Accessed 23 Aug 2020]	"Hardiness: USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)"

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	"Hammocks; 0-50 m; introduced; Fla.; West Indies; Central America; Asia, native to Burma, Malaysia, Indonesia, and the Philippines. Selaginella willdenowii is cultivated principally as a garden plant; it escapes and becomes naturalized in southern Florida. It is now widely distributed and naturalized in many regions in tropical and subtropical America."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). 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 23 Aug 2020]	"Native Asia-Tropical INDO-CHINA: Cambodia, Laos, Myanmar, Thailand, Vietnam MALESIA: Indonesia [Jawa, Sumatera], Malaysia, Philippines Cultivated (also cult.) Naturalized (natzd. elsewhere)"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). 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 23 Aug 2020]	"Cultivated (also cult.) Naturalized (natzd. elsewhere)"
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. <a href="http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/">http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/</a> . [Accessed 23 Aug 2020]	"Locations: Harold L. Lyon Arboretum (Confirmed) Wahiawa Botanical Garden"
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	"Selaginella willdenowii is cultivated principally as a garden plant; it escapes and becomes naturalized in southern Florida. It is now widely distributed and naturalized in many regions in tropical and subtropical America."

301	Naturalized beyond native range	y
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). 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 23 Aug 2020]	"Cultivated (also cult.) Naturalized (natzd. elsewhere)"

Qsn #	Question	Answer
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	"Hammocks; 0-50 m; introduced; Fla.; West Indies; Central America; Asia, native to Burma, Malaysia, Indonesia, and the Philippines. <i>Selaginella willdenowii</i> is cultivated principally as a garden plant; it escapes and becomes naturalized in southern Florida. It is now widely distributed and naturalized in many regions in tropical and subtropical America."
	Valdespino, I. A. (1993). Notes on neotropical <i>Selaginella</i> (Selaginellaceae), including new species from Panama. <i>Brittonia</i> , 45(4), 315-327	" <i>Selaginella willdenowii</i> is native to Burma, Malaysia, Indonesia, and the Philippines and is naturalized in U.S.A., Jamaica, and Puerto Rico. <i>Selaginella willdenowii</i> is now known to be naturalized also in Panama and at least to occur in Colombia."
	Parsons, R. & Parker, J. (2020). BIISC Early Detection Botanists. Pers. Comm. 25 August	[Hawaii Island] "We have found <i>Selaginella willdenowii</i> on a couple of our ED surveys in Puna and Hilo districts. When our paths cross, it usually can be found smothering the understory and climbing up into Ohia trees. The iridescent color displayed makes it easy to spot while conducting surveys."
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Queensland Government. (2020). Weeds of Australia. <i>Selaginella willdenovii</i> (Desv. ex Poir.) Baker. <a href="https://keyserver.lucidcentral.org.">https://keyserver.lucidcentral.org.</a> [Accessed 25 Aug 2020]	"Peacock fern ( <i>Selaginella willdenovii</i> ) is regarded as an environmental weed in far north Queensland."

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	Tjitrosemito, S. (1995). Weed management on a rubber plantation with special reference to minimum tillage cultivation. JIRCAS International Symposium Series No. 4: 65-75	"Table 2 List of common weeds in rubber plantation (Modified from Sri S. Tjitrosoedirdjo, 1993)" [ <i>Selaginella willdenowii</i> included in classes of weeds designated as B. Harmless annual vegetation, in a normal situation no special effort to control these plants is necessary. C. Perennial vegetation, usually tolerated as "soft grasses", but when excessive will require a particular control.]
	Srithi, K., Balslev, H., Tanming, W., & Trisonthi, C. (2017). Weed diversity and uses: a case study from tea plantations in northern Thailand. <i>Economic Botany</i> , 71(2), 147-159	"Table 3. Widespread and Common Weeds in Thai Tea Plantations Under Agroforestry, Organic, and Gap System." [ <i>Selaginella willdenowii</i> designated as a useful weed in this paper, and gives no further indication of uses or impacts to tea cultivation]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Orchards & Plantations" [Unable to corroborate negative impacts]

304	Environmental weed	
	Source(s)	Notes

Qsn #	Question	Answer
	Queensland Government. (2020). Weeds of Australia. <i>Selaginella willdenovii</i> (Desv. ex Poir.) Baker. <a href="https://keyserver.lucidcentral.org.">https://keyserver.lucidcentral.org.</a> [Accessed 25 Aug 2020]	"Peacock fern ( <i>Selaginella willdenovii</i> ) is regarded as an environmental weed in far north Queensland. This species was introduced as a garden ornamental because of its beautiful foliage and has become established near Kuranda in north-eastern Queensland. It prefers moist shady sites and forms dense thickets in the understorey of tropical rainforests. It is also listed as an undesirable plant in the Wet Tropics World Heritage Area."
	University of Florida, IFAS. (2020). Assessment of Non-Native Plants in Florida's Natural Areas. <a href="https://assessment.ifas.ufl.edu/">https://assessment.ifas.ufl.edu/.</a> [Accessed 25 Aug 2020]	[Not considered a problem species in Florida] "South Not a problem species (documented) Assessment Status: Incomplete North, Central Not a problem species (un-documented) Assessment Status: Complete"
	WRA Specialist. (2020). Personal Communication	Possibly an environmental weed in Queensland, Australia. No other evidence or reports of impacts from Australia were found, despite relatively widespread cultivation of this species

305	Congeneric weed	y
	Source(s)	Notes
	Palmer, D.D. 2003. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"The most popular <i>Selaginella</i> in cultivation, <i>S. kraussiana</i> is native to tropical and southern Africa and has escaped to become an established weed in many places throughout the world."
	Timmins, S.M. & Braithwaite, H. (2002). Early detection of invasive weeds on islands. Pp 311-318 in Veitch and Clout (eds). Turning the tide: the eradication of invasive species, IUCN, Gland, CH - Cambridge, UK	[ <i>Selaginella kraussiana</i> ] "In 1998, a sharp-eyed weeder on Raoul Island found <i>selaginella</i> ( <i>Selaginella kraussiana</i> ) (West 2002). It was sprayed soon after it was positively identified, but it keeps emerging at the same site. The site now has a sign alerting the presence of <i>selaginella</i> and any visitors are required to clean their boots in hot soapy water after visiting the site to prevent further spread of <i>selaginella</i> on Raoul (A. Warren pers. comm.)." ... "When a reserve manager found <i>selaginella</i> , not previously known on Stewart Island, the first step was an advertising campaign, including talking to the next local Garden Group meeting. This identified several more infestations, also all on private property. One site was treated the following summer but more control, and a full survey, is needed to meet the aim of eradicating <i>selaginella</i> from Stewart Island (C. Wickes pers. comm.)."

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

Qsn #	Question	Answer
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	[No evidence] "Plants terrestrial, vinelike or shrublike. Stems high-climbing, many times branched, branches 4--5-forked, flat, not articulate, glabrous. Rhizophores borne on upperside or underside of stems throughout stem length, 2--3 mm diam. Leaves delicate, papery. Lateral leaves distant, iridescent, blue-green, ovate to oblong, (2.5--)3--4 X (1--)1.5--2 mm (leaves on tertiary stems $\pm$ 1/3 smaller); basicopic base rounded, acroscopic base with whitish, long, downward-curving auricle; margins transparent (whitish and shiny when dry), entire; apex rounded or obtuse. Median leaves falcate-lanceolate or oblique-ovate, 2.4--2.7 X 0.9--1.3 mm; base auriculate, outer auricle larger than inner; margins transparent, entire; apex obtuse. Strobili solitary, 0.5--2 cm; sporophylls monomorphic, cordate to ovate-deltate, base glabrous, margins green, entire, apex slightly cuspidate. 2 n = 20."

402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	Notes
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	"Plants terrestrial, vinelike or shrublike. Stems high-climbing, many times branched, branches 4--5 forked, flat, not articulate, glabrous." [Selaginellaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	De Winter, W.P. and Amoroso, V.B. (eds.). (2003). Plant Resources of South-East Asia No 15(2). Cryptogams: Ferns and fern allies. Backhuys Publishers, Leiden, The Netherlands	"In general, <i>Selaginella</i> is mainly damaged by grazing pests such as snails and insects."
	Dave's Garden. (2020). <i>Selaginella</i> Species, Peacock Fern, Willdenow's Spikemoss - <i>Selaginella willdenowii</i> . <a href="https://davesgarden.com/guides/pf/go/157170/">https://davesgarden.com/guides/pf/go/157170/</a> . [Accessed 23 Aug 2020]	"This plant is resistant to deer" [Possibly unpalatable]

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

Qsn #	Question	Answer
406	<b>Host for recognized pests and pathogens</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	" Pests. Selaginellas are not subject to many pests but can be damaged by slugs, snails and earwigs."

407	Causes allergies or is otherwise toxic to humans	n
	<b>Source(s)</b>	<b>Notes</b>
	De Winter, W.P. and Amoroso, V.B. (eds.). (2003). Plant Resources of South-East Asia No 15(2). Cryptogams: Ferns and fern allies. Backhuys Publishers, Leiden, The Netherlands	"Young leaves of <i>S. willdenowii</i> are eaten as a vegetable in Java but are also used as a depurative or stomachic. <i>S. willdenowii</i> is used in decoction as a protective medicine after childbirth and as an ingredient of tonics. It is also used to treat skin diseases such as itches and ringworm by pounding the plant finely with <i>Alyxia reinwardtii</i> Blume and <i>Foeniculum vulgare</i> Miller ('adas pulasari') and made into an ointment."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[ <i>Selaginella willdenowii</i> ] "(Febrifuge, drink plant infusion with leaves of <i>Pericampylus glaucus</i> .)"

408	Creates a fire hazard in natural ecosystems	n
	<b>Source(s)</b>	<b>Notes</b>
	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	"It requires moist, shaded conditions." [No evidence. Unlikely given habit and habitat]

409	Is a shade tolerant plant at some stage of its life cycle	y
	<b>Source(s)</b>	<b>Notes</b>
	Setyawan, A. D., Supriatna, J., Darnaedi, D., Rokhmatuloh, R., Sutarno, S., & Sugiyarto, S. (2016). Diversity of <i>Selaginella</i> across altitudinal gradient of the tropical region. <i>Biodiversitas</i> ,17(1): 384-400	"Habitat and ecology: Shady slope of gorge among brushwood. Locally not rare. 450 m. asl."
	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	" <i>Selaginella willdenowii</i> is native to tropical Southeast Asia. The vining habit and iridescent blue-green, frondlike branches borne on elongated climbing stems make it a dramatic plant in gardens. It requires moist, shaded conditions."
	Rindita, R., Rahmaesa, E., Devi, R. K., & Alawiyah, L. F. (2020). Exploration, phenolic content determination, and antioxidant activity of dominant pteridophytes in Gunung Malang Village, Mount Halimun Salak National Park, Indonesia. <i>Biodiversitas</i> , 21(8): 3676-3682.	" <i>Selaginella willdenowii</i> grows both in shaded and open forest areas in Gunung Malang Village, Gunung Halimun Salak National Park. However, basically, most of <i>Selaginella</i> grow under the forest canopy and is protected from direct sunlight, spreads well in tropical forest areas and thrives on the forest surface. In terms of morphology, the leaves of <i>S. willdenowii</i> that grow in shaded areas have a bright blue color, while those that grow in open areas are brownish-yellow"

410	<b>Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)</b>	
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Dave's Garden. (2020). <i>Selaginella</i> Species, Peacock Fern, Willdenow's Spikemoss - <i>Selaginella willdenowii</i> . <a href="https://davesgarden.com/guides/pf/go/157170/">https://davesgarden.com/guides/pf/go/157170/</a> . [Accessed 25 Aug 2020]	"Requires consistently moist soil; do not let dry out between waterings" "Soil pH requirements: 5.6 to 6.0 (acidic) 6.1 to 6.5 (mildly acidic) 6.6 to 7.5 (neutral)"
	De Winter, W.P. and Amoroso, V.B. (eds.). (2003). Plant Resources of South-East Asia No 15(2). Cryptogams: Ferns and fern allies. Backhuys Publishers, Leiden, The Netherlands	"The potting mix or garden soil to cultivate <i>Selaginella</i> should be well drained and with a fairly high organic component such as loam with added bark or fern fibre, or a very fibrous non-soil mix as for epiphytic orchids."
	Flora Fauna Web. (2020). <i>Selaginella willdenowii</i> . <a href="https://www.nparks.gov.sg/florafaunaweb/flora/1/5/1578">https://www.nparks.gov.sg/florafaunaweb/flora/1/5/1578</a> . [Accessed 25 Aug 2020]	"Waterlogged Soils (Drains Site), Fertile Loamy Soils, Well-Drained Soils, Acidic (low pH) Soil"

411	Climbing or smothering growth habit	y
	<b>Source(s)</b>	<b>Notes</b>
	Flora of North America Editorial Committee. 1993. <i>Flora of North America: Volume 2: Pteridophytes and Gymnosperms</i> . Oxford University Press, Oxford, UK	"Plants terrestrial, vinelike or shrublike. Stems high-climbing, many times branched, branches 4--5 forked, flat, not articulate, glabrous."
	Parsons, R. & Parker, J. (2020). BIISC Early Detection Botanists. Pers. Comm. 25 August	[Hawaii Island] "We have found <i>Selaginella willdenowii</i> on a couple of our ED surveys in Puna and Hilo districts. When our paths cross, it usually can be found smothering the understory and climbing up into Ohia trees. The iridescent color displayed makes it easy to spot while conducting surveys."

412	Forms dense thickets	y
	<b>Source(s)</b>	<b>Notes</b>
	Queensland Government. (2020). Weeds of Australia. <i>Selaginella willdenovii</i> (Desv. ex Poir.) Baker. <a href="https://keyserver.lucidcentral.org">https://keyserver.lucidcentral.org</a> . [Accessed ]	[Forms dense thickets in Australia. Also climbing and smothering] "Peacock fern ( <i>Selaginella willdenovii</i> ) is regarded as an environmental weed in far north Queensland. This species was introduced as a garden ornamental because of its beautiful foliage and has become established near Kuranda in north-eastern Queensland. It prefers moist shady sites and forms dense thickets in the understory of tropical rainforests. It is also listed as an undesirable plant in the Wet Tropics World Heritage Area."

501	Aquatic	n
	<b>Source(s)</b>	<b>Notes</b>
	Flora of North America Editorial Committee. 1993. <i>Flora of North America: Volume 2: Pteridophytes and Gymnosperms</i> . Oxford University Press, Oxford, UK	"Plants terrestrial, vinelike or shrublike. Stems high-climbing, many times branched, branches 4--5 forked, flat, not articulate, glabrous."

502	Grass	n
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). 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 23 Aug 2020]	Selaginellaceae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). 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 23 Aug 2020]	Selaginellaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	"Plants terrestrial, vinelike or shrublike. Stems high-climbing, many times branched, branches 4--5 forked, flat, not articulate, glabrous. Rhizophores borne on upperside or underside of stems throughout stem length, 2--3 mm diam. Leaves delicate, papery."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	[No evidence] "Hammocks; 0--50 m; introduced; Fla.; West Indies; Central America; Asia, native to Burma, Malaysia, Indonesia, and the Philippines. <i>Selaginella willdenowii</i> is cultivated principally as a garden plant; it escapes and becomes naturalized in southern Florida. It is now widely distributed and naturalized in many regions in tropical and subtropical America."

602	Produces viable seed	y
	Source(s)	Notes
	De Winter, W.P. and Amoroso, V.B. (eds.). (2003). Plant Resources of South-East Asia No 15(2). Cryptogams: Ferns and fern allies. Backhuys Publishers, Leiden, The Netherlands	"Propagation <i>Selaginella</i> can be raised from spores, but vegetative propagation from sections of the stem is easier and faster."

Qsn #	Question	Answer
603	Hybridizes naturally	
	Source(s)	Notes
	Graustein, J. (1930). Evidences of Hybridism in Selaginella. Botanical Gazette, 90(1), 46-74	[Unknown for <i>S. willdenowii</i> ] "Natural hybridization among plants as a source of species formation is proving to be of general occurrence. To the long list of groups in which it has been found to be widespread, the Selaginellaceae must apparently now be added."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	[Unknown] "Some ferns ... and fern allies (species of <i>Selaginella</i> and <i>Isoetes</i> ), produce two types of spore and are said to be heterosporous. The smaller spores (termed microspores) bear only archegonia and thus the two types of spore must fall in proximity for fertilization to occur. If they are close together the sperm can swim to the archegonia in a film of water. Fertilization is achieved in the same way as that described for the general life cycle."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Jones, D. L. 1987. Encyclopedia of Ferns. Timber Press, Portland, OR	"Some ferns ... and fern allies (species of <i>Selaginella</i> and <i>Isoetes</i> ), produce two types of spore and are said to be heterosporous. The smaller spores (termed microspores) bear only archegonia and thus the two types of spore must fall in proximity for fertilization to occur. If they are close together the sperm can swim to the archegonia in a film of water. Fertilization is achieved in the same way as that described for the general life cycle."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	De Winter, W.P. and Amoroso, V.B. (eds.). (2003). Plant Resources of South-East Asia No 15(2). Cryptogams: Ferns and fern allies. Backhuys Publishers, Leiden, The Netherlands	" <i>Selaginella</i> can be raised from spores, but vegetative propagation from sections of the stem is easier and faster."

607	Minimum generative time (years)	
	Source(s)	Notes
	Flora Fauna Web. (2020). <i>Selaginella willdenowii</i> . <a href="https://www.nparks.gov.sg/florafaunaweb/flora/1/5/1578">https://www.nparks.gov.sg/florafaunaweb/flora/1/5/1578</a> . [Accessed 25 Aug 2020]	"Plant Growth Rate Moderate" [Unknown]

Qsn #	Question	Answer
701	<b>Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2020). Personal Communication	Unknown. Small size of spores may allow for inadvertent dispersal, but direct evidence has not been found

702	<b>Propagules dispersed intentionally by people</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. <a href="http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/">http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/</a> . [Accessed 23 Aug 2020]	"Locations: Harold L. Lyon Arboretum (Confirmed) Wahiawa Botanical Garden"
	Flora of North America Editorial Committee. 1993. Flora of North America: Volume 2: Pteridophytes and Gymnosperms. Oxford University Press, Oxford, UK	"Selaginella willdenowii is cultivated principally as a garden plant; it escapes and becomes naturalized in southern Florida. It is now widely distributed and naturalized in many regions in tropical and subtropical America."

703	<b>Propagules likely to disperse as a produce contaminant</b>	
	<b>Source(s)</b>	<b>Notes</b>
	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	"Selaginellas are often grown beneath the benches in greenhouses, where they thrive in the damp, dimly lit spaces. They are easily propagated by division, and the stems of many species can be cut into small pieces and rooted; spores can also be sown." [Possibly. Cultivation in greenhouses may allow for spread of spores into other potted plants]

704	<b>Propagules adapted to wind dispersal</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. Plant Protection Quarterly, 25(2): 56-74	"This group includes tumbling plants and fern spores."
	Kramer, K.U. & Green, P.S. 1990. The Families and Genera of Vascular Plants. Volume 1. Pteridophytes and Gymnosperms. Springer-Verlag, Berlin, Heidelberg, New York	[Selaginellaceae family description] "There is no special mechanism for spore dispersal, spores of both kinds frequently remaining in the dehisced sporangia until the surrounding plant tissue decays. In open habitats, strong winds may help to disperse spores, but ultimately most of the spores will fall around the parent plant."

705	<b>Propagules water dispersed</b>	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2020). Personal Communication	Possibly. Small size of spores may allow for movement by water

706	<b>Propagules bird dispersed</b>	<b>n</b>
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Kramer, K.U. & Green, P.S. 1990. The Families and Genera of Vascular Plants. Volume 1. Pteridophytes and Gymnosperms. Springer-Verlag, Berlin, Heidelberg, New York	"In open habitats, strong winds may help to disperse spores, but ultimately most of the spores will fall around the parent plant."
<b>707</b>	<b>Propagules dispersed by other animals (externally)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2020). Personal Communication	Unknown. Small size of spores may allow for external dispersal, but direct evidence has not been found
<b>708</b>	<b>Propagules survive passage through the gut</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2020). Personal Communication	Unlikely. No evidence of consumption or internal dispersal
<b>801</b>	<b>Prolific seed production (&gt;1000/m<sup>2</sup>)</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. Plant Protection Quarterly, 25(2): 56-74	"Assume 'yes' for fern taxa unless contradictory evidence exists."
<b>802</b>	<b>Evidence that a persistent propagule bank is formed (&gt;1 yr)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Cousens, M. I. (1988). Reproductive strategies of pteridophytes. Pp. 307-328 in Plant Reproductive Ecology: Patterns and Strategies. Oxford University Press, New York	[Unknown for <i>Selaginella willdenowii</i> ] "It is now clear that several mechanisms may operate to form a "spore bank" in nature. Spores stored in soil and on dead erect or prostrate fertile leaves have retained viability for at least a year."
<b>803</b>	<b>Well controlled by herbicides</b>	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2020). Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species
<b>804</b>	<b>Tolerates, or benefits from, mutilation, cultivation, or fire</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Flora Fauna Web. (2020). <i>Selaginella willdenowii</i> . <a href="https://www.nparks.gov.sg/florafaunaweb/flora/1/5/1578">https://www.nparks.gov.sg/florafaunaweb/flora/1/5/1578</a> . [Accessed 25 Aug 2020]	"Propagation Method Stem Cutting, Division" [Unknown. Possibly]

Qsn #	Question	Answer
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	<b>Source(s)</b>	<b>Notes</b>
	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	[Unknown] "Twenty species are recorded in cultivation in Hawai'i, three of which are commonly grown." [Includes <i>Selaginella willdenowii</i> . No natural enemies reported from Hawaii]

**Summary of Risk Traits:**

High Risk / Undesirable Traits

- Thrives in tropical climates
- Naturalized in many regions in tropical and subtropical America
- Naturalized on Hawaii Island
- Potential agricultural and environmental weed
- Other *Selaginella* species are invasive
- Shade-tolerant
- Climbing and smother habit
- Forms dense stands in forest understory
- Reproduces by wind-dispersed spores
- Prolific spore production

Low Risk Traits

- Despite widespread cultivation and naturalization, negative impacts are rarely documented
- Unarmed (no spines, thorns, or burrs)
- Non-toxic