

**Family:** *Blechnaceae*

**Taxon:** *Blechnum appendiculatum*

**Synonym:** *Blechnum occidentale* var. *minor* Hook. **Common Name:** palm fern  
*Blechnum occidentale* var. *pubirhachis* Rosen hammock fern

Questionnaire Status:	current 20090513 Assessor Approved	Assessor:	Chuck Chimera	Designation:	H(Hawai'i)
Data Entry Person:		Data Entry Person:	Chuck Chimera	WRA Score	17
101	Is the species highly domesticated?		y=-3, n=0		n
102	Has the species become naturalized where grown?		y=1, n=-1		
103	Does the species have weedy races?		y=1, n=-1		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"		(0-low; 1-intermediate; 2-high) (See Appendix 2)		High
202	Quality of climate match data		(0-low; 1-intermediate; 2-high) (See Appendix 2)		High
203	Broad climate suitability (environmental versatility)		y=1, n=0		y
204	Native or naturalized in regions with tropical or subtropical climates		y=1, n=0		y
205	Does the species have a history of repeated introductions outside its natural range?		y=-2, ?=-1, n=0		?
301	Naturalized beyond native range		y = 1*multiplier (see Appendix 2), n= question 205		y
302	Garden/amenity/disturbance weed		n=0, y = 1*multiplier (see Appendix 2)		n
303	Agricultural/forestry/horticultural weed		n=0, y = 2*multiplier (see Appendix 2)		n
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)		y
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)		
401	Produces spines, thorns or burrs		y=1, n=0		n
402	Allelopathic		y=1, n=0		
403	Parasitic		y=1, n=0		n
404	Unpalatable to grazing animals		y=1, n=-1		
405	Toxic to animals		y=1, n=0		n
406	Host for recognized pests and pathogens		y=1, n=0		
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
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	y=1, n=-1	
604	Self-compatible or apomictic	y=1, n=-1	
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	
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	
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	
708	Propagules survive passage through the gut	y=1, n=-1	
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)	y=1, n=-1	
803	Well controlled by herbicides	y=-1, n=1	
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n
<b>Designation:</b> H(Hawai'i)		<b>WRA Score</b>	<b>17</b>

## Supporting Data:

101	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Is the species highly domesticated? No evidence] "This fern has uniformly been called <i>Blechnum occidentale</i> L. since it was first reported in Hawaii; however, the rachises of <i>B. occidentale</i> are entirely glabrous but those of <i>B. appendiculatum</i> Willd. are minutely pubescent and glandular, as is the naturalized Hawaiian species. <i>Blechnum appendiculatum</i> Willd., from the American Tropics, is part of the taxonomically difficult <i>B. occidentale</i> complex. A. R. Smith, who is working on regional floras of the Central and South America area, has found that the name <i>B. glandulosum</i> Link, which has been used for this fern, must be replaced by the legitimate, older name that has priority, <i>B. appendiculatum</i> Willd.
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Species suited to tropical or subtropical climate(s) - 2-High] "Represented in Hawaii by a single widespread naturalized species from Mexico and tropical Central and South America."
202	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Quality of climate match data 2-High]
203	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Broad climate suitability (environmental versatility)? Yes. Environmentally versatile. Elevation range exceeds 1000 m] "Common as clones forming large colonies in closed-canopy mesic forests, especially on rock or rocky substrates, and occurring in all but the most extreme habitats, 30-1,560 m, all major islands."
204	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Represented in Hawaii by a single widespread naturalized species from Mexico and tropical Central and South America."
205	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Does the species have a history of repeated introductions outside its natural range? Hawaiian Islands] "This tropical American fern, first collected in Hawaii in 1918, has escaped from gardens and spread extensively."
205	2012. Dave's Gardern. PlantFiles: Hammock Fern - <i>Blechnum appendiculatum</i> . <a href="http://davesgarden.com/guides/pf/go/57620/">http://davesgarden.com/guides/pf/go/57620/</a> [Accessed 15 Nov 2012]	[Does the species have a history of repeated introductions outside its natural range? California] "This is a spreading groundcover fern that is great for shady Southern California gardens... sorry, can't comment on the rest of the country. It is particularly nice in the spring when all the new reddish fronds shoot up around the garden. It does swarm and can become invasive, but stays low and is easy to pull up. It is NOT easy to completely eradicate, though I have never felt I had to. Some growers just 'mow' it down in the fall and by late spring it's all back and then some (tends to get a bit ratty over a cold, wet winter). It was just renamed recently, and before was known as <i>B occidentalis</i> ."
301	2002. Wilson, K.A.. Continued Pteridophyte Invasion of Hawaii. <i>American Fern Journal</i> . 92(2): 179-183.	[Naturalized beyond native range? Yes] " <i>Blechnum appendiculatum</i> Willd.—The <i>Blechnum</i> species that grows in Hawaii has been known as <i>B. occidentale</i> L. since its occurrence was first reported. Recent studies, however, have shown that the rachises of <i>B. occidentale</i> are glabrous on the abaxial surface, whereas those of <i>B. appendiculatum</i> are pubescent and glandular. <i>Blechnum appendiculatum</i> also differs in having more pinnae and darker rhizome scales than does <i>B. occidentale</i> (A. R. Smith, pers. comm.; see also Hoshizaki & Moran, 2001, p. 216). The species naturalized in Hawaii is <i>B. appendiculatum</i> (syn. <i>B. glandulosum</i> Kaulf. ex Link). Both species are natives of tropical America." ... "TABLE 1. Naturalized ferns and fern allies in Hawai'i arranged by year of their first collection." [ <i>Blechnum appendiculatum</i> recorded on Kaua'i, O'ahu, Molokai, Maui, Hawai'i]
302	1996. Wilson, K.A.. Alien Ferns in Hawaii. <i>Pacific Science</i> . 50 (2): 127-141.	[Garden/amenity/disturbance weed? A disturbance adapted weed with environmental impacts] "It is now a common weedy fern along trail sides, stream banks, forested slopes, and gulches on all islands, often growing in solid stands."
303	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Agricultural/forestry/horticultural weed? Environmental Weed]
304	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Environmental weed? Yes] "This tropical American fern, first collected in Hawai'i in 1918, has escaped from gardens and spread extensively. It is a serious weed that competes with many native fern species and is especially threatening to species of the rare endemic genus <i>Diellia</i> ."

304	2004. Aguraujuja, R./Moora, M./Zobel, M.. Population stage structure of Hawaiian endemic fern taxa of <i>Diellia</i> (Aspleniaceae): implications for monitoring and regional dynamics. <i>Canadian Journal of Botany</i> . 82: 1438-1445.	[Environmental weed? Yes. Competes with native <i>Diellia</i> spp.] "From 36 investigated sites on four islands, <i>Diellia</i> ferns were found growing in 24 sites (Table 1, Fig. 1). Among sites without recorded finds, the habitat of Puu Ka Pele on Kauai ( <i>D. pallida</i> ) was significantly degraded. The site at Makaha on Kauai ( <i>D. pallida</i> ) was completely overgrown by <i>Erigeron karvinskianus</i> DC and <i>Blechnum appendiculatum</i> Willd."
304	2008. Aguraujuja, R./Zobel, M./Zobel, K./Moora, M.. Conservation of the Endemic Fern Lineage <i>Diellia</i> (Aspleniaceae) on the Hawaiian Islands: Can Population Structure Indicate Regional Dynamics and Endangering Factors?. <i>Folia Geobotanica</i> . 43: 3-18.	[Environmental weed? Yes. Competes with native <i>Diellia</i> spp.] " <i>Diellia</i> species grow in mesic forests, usually on steep leeward and north-facing slopes. We studied potential habitats for <i>Diellia</i> species on five islands where they had been recorded earlier: Kauai, Oahu, Molokai, Maui, Hawaii." ... "Most of the sites suffer due to the expansion of invasive ferns ( <i>Blechnum appendiculatum</i> , <i>Christella parasitica</i> , <i>Adiantum hispidulum</i> , <i>Phlebodium aureum</i> ), herbs ( <i>Erigeron karvinskianus</i> , <i>Kalanchoe pinnata</i> ), grasses ( <i>Ehrharta stipoides</i> , <i>Melinis minutiflora</i> , <i>Oplismenus hirtellus</i> ), vines ( <i>Passiflora mollissima</i> , <i>P. suberosa</i> ), shrubs and trees ( <i>Clidemia hirta</i> , <i>Psidium cattleianum</i> , <i>Schinus terebinthifolius</i> , <i>Casuarina equisetifolia</i> ), as well as due to the trampling and browsing of feral pigs, goats and deer (Aguraujuja et al. 2004)."
304	2011. Weller, S.G./Cabin, R.J./Lorence, D.H./Perlman, S./Wood, K./Flynn, T./Sakai, A. K.. Alien Plant Invasions, Introduced Ungulates, and Alternative States in a Mesic Forest in Hawaii. <i>Restoration Ecology</i> . 19: 671-680.	[Environmental weed? Yes] "Four alien species appeared to respond differently to drought, based on changes in percent cover." ... "Potentially, the most significant responses occurred in two widespread alien fern species, <i>Adiantum hispidulum</i> and <i>Blechnum appendiculatum</i> . Both of these species increased in percent cover during a drought period when native ferns decreased substantially. <i>Blechnum appendiculatum</i> also responded positively to fencing, suggesting that removal of ungulates favored this fern species. <i>Blechnum appendiculatum</i> forms thick mats that prevent establishment of seeds and spores (Wilson 1996). An alien species that prevents establishment of natives and thrives under drought conditions that result in mortality of native species, represents an obvious threat to the integrity of these mesic forests."
304	2012. Havran, J.C./Oppenheimer, H./Keaton, J./Piotrowski, K.. Interisland Range Expansion of <i>Viola lanaiensis</i> (Violaceae: Malpighiales), an Endangered Hawaiian Violet. <i>Pacific Science</i> . 66(4): 447-456.	[Environmental weed? Yes. Threatens rare native violet] "Six individuals of <i>V. lanaiensis</i> with a small number of seedlings are known from Lānaʻi. A second population with 12 plants recently was extirpated, probably due to one or a combination of the following factors: extreme drought, axis deer ( <i>Axis axis</i> ), and alien plant invasion by <i>Psidium cattleianum</i> , <i>Morella faya</i> , <i>Leptospermum scoparium</i> , <i>Blechnum appendiculatum</i> , and <i>Rubus rosifolius</i> ."
305	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Congeneric weed?] Several <i>Blechnum</i> species are listed as naturalized and/or weeds, the evidence of detrimental impacts is uncertain or unverified.
401	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Produces spines, thorns or burrs? No] " <i>Blechnum appendiculatum</i> , a colony-forming fern, may be recognized by its 1-pinnate fronds with pinnae having two long sori close to and parallel with the midribs, and stolon-bearing rhizomes."
402	1996. Wilson, K.A.. Alien Ferns in Hawaii. <i>Pacific Science</i> . 50 (2): 127-141.	[Allelopathic? Unknown if allelopathy contributes to the suppression of other species] "This aggressive, fast-growing fern is now widely naturalized in Hawai'i, often in large populations, effectively preventing the germination and growth of native species where it occurs."
403	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Parasitic? No] " <i>Blechnum appendiculatum</i> , a colony-forming fern..." [Blechnaceae]
404	2003. Coomes, D.A./Allen, R.B./Forsyth, D.M./Lee, W.G.. Factors Preventing the Recovery of New Zealand Forests Following Control of Invasive Deer. <i>Conservation Biology</i> . 17: 450-459.	[Unpalatable to grazing animals? Possibly Yes. Other <i>Blechnum</i> species are unpalatable] "For example, there is evidence that browsing of woody saplings has promoted the spread of the unpalatable ground ferns <i>Blechnum discolor</i> and <i>Blechnum procerum</i> (Wardle 1984; Wardle et al. 2001), which provide an effective barrier against further regeneration of woody species (Wardle 1984)."
404	2010. Mehlreter, K./Walker, L.R./Sharpe, J.M.. Fern Ecology. Cambridge University Press, Cambridge, UK	[Unpalatable to grazing animals? Possibly Yes] "Young leaves are white or red, supposedly an adaptation against herbivory or fungal attack..."
405	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Toxic to animals? No evidence. Although may be unpalatable]
406	2012. WRA Specialist. Personal Communication.	[Host for recognized pests and pathogens? Unknown]
407	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Causes allergies or is otherwise toxic to humans? No evidence]
408	1996. Wilson, K.A.. Alien Ferns in Hawaii. <i>Pacific Science</i> . 50 (2): 127-141.	[Creates a fire hazard in natural ecosystems? No evidence] "It is now a common weedy fern along trail sides, stream banks, forested slopes, and gulches on all islands, often growing in solid stands."

409	1987. Jones, D. L.. Encyclopedia of Ferns. Timber Press, Portland, OR.	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Most ferns of this group will grow in shady conditions and a few are easily damaged by sun..." [Blechnum included in this group]
409	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Is a shade tolerant plant at some stage of its life cycle? Yes. Occurs in closed-canopy forests] "Common as clones forming large colonies in closed-canopy mesic forests, especially on rock or rocky substrates, and occurring in all but the most extreme habitats, 30-1,560 m, all major islands."
410	1987. Jones, D. L.. Encyclopedia of Ferns. Timber Press, Portland, OR.	[Tolerates a wide range of soil conditions? Yes] "Ferns of this group are not fussy regarding soil type and will grow in almost any well-drained garden loam."
410	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Tolerates a wide range of soil conditions ? Broad distribution suggests tolerance of a wide range of soil conditions] "Common as clones forming large colonies in closed-canopy mesic forests, especially on rock or rocky substrates, and occurring in all but the most extreme habitats, 30-1,560 m, all major islands."
411	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Climbing or smothering growth habit? No. Carpet forming on forest understory] "Common as clones forming large colonies in closed-canopy mesic forests, especially on rock or rocky substrates..."
412	1996. Wilson, K.A.. Alien Ferns in Hawaii. Pacific Science. 50 (2): 127-141.	[Forms dense thickets? Yes] "It is now a common weedy fern along trail sides, stream banks, forested slopes, and gulches on all islands, often growing in solid stands." ... "This aggressive, fast-growing fern is now widely naturalized in Hawai'i, often in large populations, effectively preventing the germination and growth of native species where it occurs."
501	1996. Wilson, K.A.. Alien Ferns in Hawaii. Pacific Science. 50 (2): 127-141.	[Aquatic? No. Terrestrial] "...a common weedy fern along trail sides, stream banks, forested slopes, and gulches on all islands..."
502	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Grass? No] "Blechnum appendiculatum, a colony-forming fern..." [Blechnaceae]
503	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Nitrogen fixing woody plant? No] "Blechnum appendiculatum, a colony-forming fern..." [Blechnaceae]
504	2010. Gordon, D.R./Mitterdorfer, B./Pheloung, P.C. et al.. Guidance for addressing the Australian Weed Risk Assessment questions. Plant Protection Quarterly. 25(2): 56-74.	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "This question addresses taxa that have specialized organs and should not include plants with just rhizomes/ stolons"
601	2012. Tropicos.org. Tropicos [Online Database]. Missouri Botanical Garden, <a href="http://www.tropicos.org/">http://www.tropicos.org/</a>	[Evidence of substantial reproductive failure in native habitat? No evidence]
602	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Produces viable seed? Produces viable spores] "Propagation is by spores or rhizome division."
603	1990. Kramer, K.U./Green, P.S.. The Families and genera of vascular plants. Volume 1. Pteridophytes and gymnosperms. Springer-Verlag, Berlin, Heidelberg, New York	[Hybridizes naturally? Possibly] "A hybrid was reported in Doodia (Parris 1972). The variability of many species in the Blechnum occidentale complex is largely due to hybridization..."
604	1992. Soltis, D.E./Soltis, P.S.. The Distribution of Selfing Rates in Homosporous Ferns. American Journal of Botany. 79(1): 97-100.	[Self-compatible or apomictic? Unknown. Self-compatibility present in other Blechnum species] "The distribution of intragametophytic selfing rates among species of homosporous ferns is clearly uneven. Most species of homosporous ferns would be classified as extreme outcrossers. In contrast, a few species are nearly exclusively inbreeding. In only a few populations of Dryopteris expansa and Hemionitis palmata and a single population of Blechnum spicant do we see convincing evidence of a mixed mating system. The uneven distribution of selfing rates we observed for homosporous ferns, coupled with a corresponding bimodality of the magnitude of genetic load, strongly supports the model."
605	2012. WRA Specialist. Personal Communication.	[Requires specialist pollinators? No pollinators required in pteridophytes]
606	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Reproduction by vegetative fragmentation? Yes] "Plants medium-sized. Rhizomes erect, stoloniferous, stolons subterranean, long-creeping. Fronds 20-60 cm long, clustered at tips of rhizomes," ... "Blechnum appendiculatum, a colony-forming fern, may be recognized by its 1- pinnate fronds with pinnae having two long sori close to and parallel with the midribs, and stolon-bearing rhizomes."
607	1996. Wilson, K.A.. Alien Ferns in Hawaii. Pacific Science. 50 (2): 127-141.	[Minimum generative time (years)? Unknown] "This aggressive, fast-growing fern is now widely naturalized in Hawaii" [Probably capable of spreading vegetatively by rhizomes within 1 year]

701	1996. Wilson, K.A.. Alien Ferns in Hawaii. Pacific Science. 50 (2): 127-141.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Possibly Yes, or adapted to disturbance conditions along trails] "It is now a common weedy fern along trail sides, stream banks, forested slopes, and gulches on all islands, often growing in solid stands."
702	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Propagules dispersed intentionally by people? Formerly Yes] "This tropical American fern, first collected in Hawaii in 1918, has escaped from gardens and spread extensively."
702	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules dispersed intentionally by people? The reddish young leaves make it an attractive bedding plant, and it can also be grown in containers." [Ornamental]
703	2012. WRA Specialist. Personal Communication.	[Propagules likely to disperse as a produce contaminant? Unlikely, but may be possible if grown with other ornamental plants]
704	2010. Gordon, D.R./Mitterdorfer, B./Pheloung, P.C. et al.. Guidance for addressing the Australian Weed Risk Assessment questions. Plant Protection Quarterly. 25(2): 56-74.	[Propagules adapted to wind dispersal? Yes] "This group includes tumbling plants and fern spores."
705	1996. Wilson, K.A.. Alien Ferns in Hawaii. Pacific Science. 50 (2): 127-141.	[Propagules water dispersed? Yes. Distribution suggests spores are probably moved by water] "It is now a common weedy fern along trail sides, stream banks, forested slopes, and gulches on all islands, often growing in solid stands."
706	2012. WRA Specialist. Personal Communication.	[Propagules bird dispersed? No] Although spores may adhere to birds, the likely vectors of dispersal for spores are wind, and possible water, and locally by vegetative spread from the rhizomes.
707	2012. WRA Specialist. Personal Communication.	[Propagules dispersed by other animals (externally)? Unknown] Possible that spores may adhere to fur or mud on animals
708	2012. WRA Specialist. Personal Communication.	[Propagules survive passage through the gut? Unknown] Unlikely to be consumed and not adapted for internal dispersal
801	2010. Gordon, D.R./Mitterdorfer, B./Pheloung, P.C. et al.. Guidance for addressing the Australian Weed Risk Assessment questions. Plant Protection Quarterly. 25(2): 56-74.	[Prolific seed production (>1000/m <sup>2</sup> )? Yes] "Assume 'yes' for fern taxa unless contradictory evidence exists."
802	1992. Dyer, A.F./Lindsay, S.. Soil Spore Banks of Temperate Ferns. American Fern Journal. 82(3): 89-123.	[Evidence that a persistent propagule bank is formed (>1 yr)? Unknown for B. appendiculatum] "However, although it has now been established that spore banks lasting at least one year are widespread, there is still no direct evidence that any spore banks persist for much more than two years." ... "Other evidence confirms that some fern spores can remain viable for several decades under various artificial storage conditions."
803	2003. Motooka, P./Castro, L./Nelson, D./Nagai, G./Ching, L.. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI <a href="http://www.ctahr.hawaii.edu/invweed/weedsHi.html">http://www.ctahr.hawaii.edu/invweed/weedsHi.html</a>	[Well controlled by herbicides? Unknown] "Management: Probably susceptible to dicamba and glyphosate." [Control methods described for Blechnum occidentale L., synonym of Blechnum appendiculatum]
804	2012. Invasive Species Specialist Group. Ch 4 Appendix Weed treatment spreadsheet. <a href="http://www.issg.org/database/species/reference_files/Weedapp.pdf">www.issg.org/database/species/reference_files/Weedapp.pdf</a> [Accessed 15 Nov 2012]	[Tolerates, or benefits from, mutilation, cultivation, or fire?> Possibly Yes] "Control Methods. Mechanical. Largely ineffective given vegetative reproduction via stolons. Useful for only small, isolated plants."
805	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? No evidence] "...Common as clones forming large colonies in closed-canopy mesic forests, especially on rock or rocky substrates, and occurring in all but the most extreme habitats..."

## **Summary of Risk Traits**

### **High Risk / Undesirable Traits**

- Naturalized in the Hawaiian Islands
- Thrives in tropical climates
- Broad elevation range (exceeds 1000 m)
- Environmental weed (threatens rare and endangered native Hawaiian species)
- Shade tolerant
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- Forms solid stands in understory
- Spreads vegetatively by rhizomes
- Spores dispersed by wind

### **Low Risk / Desirable Traits**

- Unarmed (no spines, thorns or burrs)
- Non-toxic
- Landscaping and ornamental value