

**Family:** *Pteridaceae*

**Taxon:** *Adiantum raddianum*

**Synonym:**  *Adiantum cuneatum* Langsd. & Fisch.

**Common Name:** delta maidenhair

<b>Questionnaire :</b>	current 20090513	<b>Assessor:</b>	Chuck Chimera	<b>Designation:</b>	H(HPWRA)
<b>Status:</b>	Assessor Approved	<b>Data Entry Person:</b>	Chuck Chimera	<b>WRA Score</b>	<b>15</b>
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	y
301	Naturalized beyond native range			y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed			n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed			n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed			n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed			n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs			y=1, n=0	n
402	Allelopathic			y=1, n=0	n
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	n
407	Causes allergies or is otherwise toxic to humans			y=1, n=0	n
408	Creates a fire hazard in natural ecosystems			y=1, n=0	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	n
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	
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	y
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	n
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	n
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: H(HPWRA)

WRA Score 15

## Supporting Data:

101	1998. Riffle, R.L.. The Tropical Look - An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR	"an exceptionally variable species that has produced numerous cultivars with variously shaped leaflets and varying plant structures."
101	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	No evidence that <i>Adiantum raddianum</i> is highly domesticated
201	1987. Jones, D. L.. Encyclopedia of Ferns. Timber Press, Portland, OR.	Central and South America, Mexico, West Indies
201	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Native to the American Tropics
202	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Native to the American Tropics
203	1998. Riffle, R.L.. The Tropical Look - An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR	"Hardy to zones 9b through 11"
203	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Common on moist consolidated cinder, and basalt banks, along trails and streams, sea level to 4,400 m, all major islands." [broad elevational range in Hawaiian Islands, exhibits environmental versatility]
204	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Common on moist consolidated cinder, and basalt banks, along trails and streams, sea level to 4,400 m, all major islands. Native to the American Tropics."
205	1987. Jones, D. L.. Encyclopedia of Ferns. Timber Press, Portland, OR.	"This is the most commonly grown maidenhair in the world" [a history of repeated introductions outside its natural range]
301	1987. Jones, D. L.. Encyclopedia of Ferns. Timber Press, Portland, OR.	"now naturalized in many countries"
301	1989. Brownsey, P.J./Smith-Dodsworth, J.C.. New Zealand Ferns and Allied Plants. David Bateman Ltd, Auckland, New Zealand	"A naturalized species occurring in Auckland, Taranaki and Wellington, probably as an escape from cultivation."
301	1996. Wilson, K.A.. Alien Ferns in Hawaii. Pacific Science. 50 (2): 127-141.	"Only four species now naturalized in New Zealand are also established aliens in Hawaii": <i>Adiantum raddianum</i> , <i>Cyrtomium falcatum</i> , <i>Cheilanthes viridis</i> , and <i>Selaginella kraussiana</i> ."
301	2003. Murdock, A.G./Smith, A.R.. Pteridophytes of Moorea, French Polynesia, with a New Species, <i>Tmesipteris gracilis</i> (Psilotaceae). Pacific Science. 57 (3): 253-265.	"Terrestrial or lithophytic in forest understory. Native to South America, naturalized on Moorea."
301	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Common on moist consolidated cinder, and basalt banks, along trails and streams, sea level to 4,400 m, all major islands." [Hawaiian Islands]
302	2010. WRA Specialist. Personal Communication.	A weed with some negative environmental impacts [see 3.04]
303	2007. Randall, R.P.. Global Compendium of Weeds - <i>Adiantum raddianum</i> . <a href="http://www.hear.org/gcw/species/adiantum_raddianum/">http://www.hear.org/gcw/species/adiantum_raddianum/</a>	Listed as an agricultural weed, but no evidence of agricultural impacts found in literature or web searches
304	1996. Wilson, K.A.. Alien Ferns in Hawaii. Pacific Science. 50 (2): 127-141.	"This alien species continues to spread, whereas the indigenous <i>A. capillus-veneris</i> L. is now uncommon and is apparently being replaced by <i>A. raddianum</i> ." [A. <i>raddianum</i> may be competitively excluding native <i>A. capillus-veneris</i> ]
304	2007. Martin, T.. Management of Invasive Plants at Centennial Park, Auckland. Report No. 1814. Wildland Consultants, Rotorua, New Zealand	Table 1: Naturalising or invasive adventive plants in Centennial Park and relative priorities for control effort. Control priorities are presented in four categories, Classes 1-4, with Classes 1 3 being the highest priorities for control effort. [Adiantum <i>raddianum</i> = Control priority 3]
304	2009. Freifeld, H./Bruegmann, M./Zablan, M.A./Shultz, G.. 5-Year Review: Short Form Summary Species Reviewed: <i>Dubautia plantaginea</i> ssp. <i>humilis</i> (Naenae). U.S. Fish and Wildlife Service, Honolulu, HI <a href="http://www.fws.gov/ecos/ajax/docs/five_year_review/doc24">http://www.fws.gov/ecos/ajax/docs/five_year_review/doc24</a>	"Major threats to <i>Dubautia plantaginea</i> ssp. <i>humilis</i> include: landslides (Factor E); rockslides (Factor E); erosion (Factor E); flooding (Factor E); and displacement by introduced invasive plant species, including <i>Paspalum conjugatum</i> (Hilo grass), <i>Psidium guajava</i> (common guava), <i>Casuarina equisetifolia</i> (ironwood), <i>Sporobolus africanus</i> (smutgrass), and <i>Pluchea carolinensis</i> (sourbush), <i>Blechnum appendiculatum</i> (no common name), <i>Erigeron karvinskianus</i> (daisy fleabane), <i>Oplismenus hirtellus</i> (basketgrass), <i>Rubus rosifolius</i> (thimbleberry), <i>Lythrum maritimum</i> (loosestrife), and <i>Adiantum raddianum</i> (maidenhair fern) (Jensen and Russell 1999; USFWS 2002) (Factor E)." [listed as a threat to the Endangered plant <i>Dubautia plantaginea</i> ssp. <i>Humilis</i> ]
305	1989. Moody, K.. Weeds reported in rice in South and Southeast Asia. International Rice Research Institute, Manila, Philippines	<i>Adiantum lunulatum</i> [listed as one of the Weeds reported to occur in rice in India]

305	2007. Randall, R.P.. Global Compendium of Weeds - Index. <a href="http://www.hear.org/gcw/">http://www.hear.org/gcw/</a>	<i>Adiantum capillus-veneris</i> , <i>Adiantum caudatum</i> , <i>Adiantum cristatum</i> , <i>Adiantum cuneatum</i> , <i>Adiantum hispidulum</i> , <i>Adiantum latifolium</i> , <i>Adiantum lunulatum</i> , <i>Adiantum pedatum</i> , <i>Adiantum tenerum</i> , <i>Adiantum trapeziforme</i> , & <i>Adiantum villosum</i> [listed as naturalized and/or weeds of some kind outside of their native range]
401	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	No spines, thorns or burrs
402	2010. WRA Specialist. Personal Communication.	No evidence of allelopathy
403	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Not parasitic
404	2010. WRA Specialist. Personal Communication.	Unknown [probably not eaten by grazing animals, but no direct evidence found]
405	2001. Harborne, J.B./Baxter, H.. Chemical dictionary of economic plants. John Wiley and Sons, New York, NY	No evidence of toxicity to animals
406	2010. PlantCare.com. Plant Encyclopedia - Delta Maidenhair. <a href="http://www.plantcare.com/encyclopedia/delta-maidenhair-17.aspx">http://www.plantcare.com/encyclopedia/delta-maidenhair-17.aspx</a>	"Prone to mealy bugs, scale and spider mites Always inspect any new plant for pests before introducing it to your home or greenhouse." [not considered an important host of any of these pests]
407	2001. Harborne, J.B./Baxter, H.. Chemical dictionary of economic plants. John Wiley and Sons, New York, NY	No evidence of toxicity or allergens affecting humans
408	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants delicate, terrestrial or epipetric on moist, rocky banks" [not a fire hazard]
409	2000. Michigan State University Extension. Ornamental Plants plus Version 3.0 - <i>Adiantum raddianum</i> --Maidenhair Fern. <a href="http://web1.msue.msu.edu/msue/imp/modzz/00000051.html">http://web1.msue.msu.edu/msue/imp/modzz/00000051.html</a>	"The plant grows best in diffused, bright light but not strong sunlight or dense shading. Strong light scorches the foliage and dim light causes weak growth."
409	2010. Evans, E.. Plant Fact Sheets - <i>Adiantum raddianum</i> . North Carolina State University, <a href="http://www.ces.ncsu.edu/depts/hort/consumer/fact-sheets/hardyferns/adiantum_raddianum.html">http://www.ces.ncsu.edu/depts/hort/consumer/fact-sheets/hardyferns/adiantum_raddianum.html</a>	Comments: Partial shade to shade; moist to wet soil; spreads by rhizomes
410	2010. Backyard Gardener. <i>Adiantum raddianum</i> . <a href="http://www.backyardgardener.com/plantname/pda_dabd.html">http://www.backyardgardener.com/plantname/pda_dabd.html</a>	pH Range: <input type="checkbox"/> 5.5 to ; Soil Range: <input type="checkbox"/> Loam to Loam
410	2010. PlantCare.com. Plant Encyclopedia - Delta Maidenhair. <a href="http://www.plantcare.com/encyclopedia/delta-maidenhair-17.aspx">http://www.plantcare.com/encyclopedia/delta-maidenhair-17.aspx</a>	"A GOOD general purpose potting soil (a soil that retains water yet drains well) will suffice."
411	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants delicate, terrestrial or epipetric on moist, rocky banks." [not climbing or smothering]
412	2009. Freifeld, H./Bruegmann, M./Zablan, M.A./Shultz, G.. 5-Year Review: Short Form Summary Species Reviewed: <i>Dubautia plantaginea</i> ssp. <i>humilis</i> (Naenae). U.S. Fish and Wildlife Service, Honolulu, HI <a href="http://www.fws.gov/ecos/ajax/docs/five_year_review/doc24">http://www.fws.gov/ecos/ajax/docs/five_year_review/doc24</a>	"Major threats to <i>Dubautia plantaginea</i> ssp. <i>humilis</i> include: landslides (Factor E); rockslides (Factor E); erosion (Factor E); flooding (Factor E); and displacement by introduced invasive plant species, including <i>Paspalum conjugatum</i> (Hilo grass), <i>Psidium guajava</i> (common guava), <i>Casuarina equisetifolia</i> (ironwood), <i>Sporobolus africanus</i> (smutgrass), and <i>Pluchea carolinensis</i> (sourbush), <i>Blechnum appendiculatum</i> (no common name), <i>Erigeron karvinskianus</i> (daisy fleabane), <i>Oplismenus hirtellus</i> (basketgrass), <i>Rubus rosifolius</i> (thimbleberry), <i>Lythrum maritimum</i> (loosestrife), and <i>Adiantum raddianum</i> (maidenhair fern) (Jensen and Russell 1999; USFWS 2002) (Factor E)." [A. <i>raddianum</i> may be excluding endangered plant by thick growth, but no further evidence of dense thicket formation in literature]
501	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Plants delicate, terrestrial or epipetric on moist, rocky banks." [not aquatic]
502	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Pteridaceae
503	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Pteridaceae [not a nitrogen fixing woody plant]
504	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Rhizomes short-creeping" [but not a true geophyte]

601	1987. Jones, D. L.. Encyclopedia of Ferns. Timber Press, Portland, OR.	No evidence of substantial reproductive failure in native habitat
602	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Sori often 1-2 per segment, U-shaped at bases of sinuses." [produces viable spores]
602	2010. PlantCare.com. Plant Encyclopedia - Delta Maidenhair. <a href="http://www.plantcare.com/encyclopedia/delta-maidenhair-17.aspx">http://www.plantcare.com/encyclopedia/delta-maidenhair-17.aspx</a>	Propagation: Division and spores in the spring. After dividing plant, pot in the plant's regular potting mix. Take spores from ripe spore cases on the undersides of the fronds. Put the spores in an envelope and allow to dry. Place a brick in a plastic box or pan and put 2 inches (5cm) of distilled water in it and cover the brick with a quarter inch of moist peat. Sprinkle spores on the peat and cover the container with a piece of glass or plastic. Be sure to maintain the water level. Place in low light, after a few months a green moss like growth should cover the peat. Eventually leaves will appear, divide and transplant after they are 2 inches (5cm) tall.
603	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Adiantum 'Edwinii' is probably a cultivar of <i>A. raddianum</i> , a native of the American tropics, but is also possibly a hybrid or a cultivar of <i>A. concinnum</i> , a native of southern Mexico to northern South America." [potential hybridization, but ability to naturally hybridize unknown]
604	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	Unknown if <i>Adiantum raddianum</i> is self-compatible [no evidence found]
605	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	Pteridaceae [no pollinators required]
606	2003. Roux, J.P.. <i>Adiantum raddianum</i> - Swaziland ferns and fern allies. South African National Biodiversity Institute, Compton Herbarium, Cape Town <a href="http://plants.jstor.org/flora/sffa002740354400006">http://plants.jstor.org/flora/sffa002740354400006</a>	"Vegetative reproduction by subterranean, short-creeping and branched rhizome."
607	2010. WRA Specialist. Personal Communication.	Time to reproduction unknown
701	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Common on moist consolidated cinder, and basalt banks, along trails and streams, sea level to 4,400 m, all major islands." [trailside habit suggests inadvertent movement of spores on shoes, clothing etc. is a likely vector]
702	1987. Jones, D. L.. Encyclopedia of Ferns. Timber Press, Portland, OR.	"This is the most commonly grown maidenhair in the world" [popular ornamental]
704	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Sori often 1-2 per segment, U-shaped at bases of sinuses." [wind-dispersed spores]
705	1996. Wilson, K.A.. Alien Ferns in Hawaii. Pacific Science. 50 (2): 127-141.	"it grows on moist and shaded rocks, slopes, and river and roadside banks." [suggests water dispersal of spores]
706	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Sori often 1-2 per segment, U-shaped at bases of sinuses." [not adapted for bird dispersal]
707	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Sori often 1-2 per segment, U-shaped at bases of sinuses." [spores may theoretically adhere to animals in mud, but otherwise not specifically adapted for external dispersal by animals]
708	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Sori often 1-2 per segment, U-shaped at bases of sinuses." [spores may be unintentionally ingested, but unknown if viability is maintained following gut passage]
801	2003. Palmer, D.D.. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu, HI	"Sori often 1-2 per segment, U-shaped at bases of sinuses." [presumably produces high densities of spores]
802	2010. WRA Specialist. Personal Communication.	Unknown how long spores can remain viable
803	2010. WRA Specialist. Personal Communication.	Unknown [no evidence of control with herbicides found]
804	2008. Associated Content. Maidenhair Fern Plant Care Tips. <a href="http://www.associatedcontent.com/article/1214851/maidenhair_fern_plant_care_tips.html?cat=32">http://www.associatedcontent.com/article/1214851/maidenhair_fern_plant_care_tips.html?cat=32</a>	The Maidenhair Fern is a beautiful, but unfortunately rather sensitive plant. [No evidence that this delicate fern benefits from mutilation, cultivation or fire]
805	2010. WRA Specialist. Personal Communication.	Unknown if any effective natural enemies are present locally

