Integration and Synthesis Summary for Plants, Islands
Pacific Islands Species: Ferns and Allies (Assessment Group 2) and Conifers and Cycads (Assessment Group 3)*

The tables below contain summaries of the information and data we used to determine the ranking (high, medium, low) for vulnerability, risk and usage indicators. Information in most of the columns was used directly in the ranking determination (green fill). Where indicated, information in other columns was not used directly in the ranking calculation, but provided additional information about the species that fed into one of the ranking metrics or was used to make the draft determination when relevant. The summary for this assessment group also includes new conservation measures[1] that have been incorporated into the Action since the draft biological opinion was released. The measures and our related assumptions are incorporated into our analysis (immediately above Table 3), and also factor into the rationales for our conclusions for each species, as described below.

All species in Group 2 are ferns or lycophytes, fern "allies." They do not have flowers or seeds and reproduce sexually via spores pollinated and dispersed by wind. Ferns and their allies can also reproduce asexually, through vegetative reproduction in the form of bulbets or rhizomes. During sexual reproduction, ferns produce two free-living generations, a diploid sporophyte (what we think of as a fern plant) and a haploid gametophyte. The gametophytes are typically very small (around ½ inch), fragile and have very specific requirements for growth, such as damp soil conditions and high humidity.

Fadang (*Cycas micronesica*) is a cycad. Cycads are gymnosperms; vascular plants, usually trees or shrubs, that reproduce by means of an exposed seed, or ovule. Gymnosperms do not produce flowers and their pollen is dispersed by wind. Seed dispersal vectors for the Fadang are unknown, though suspected to be a combination of biotic and abiotic vectors.

*There are no listed lichen species in the Pacific islands, therefore a group 1 assessment document was not produced and we begin with group 2.

Table 1: Summarizing Data and Information for Vulnerability Ranking

Data Sources: Status of the Species (SOS) accounts updated as of November 2019 (Appendix C); NA=Not Applicable; HI=Hawaii; GU=Guam; CNMI=Commonwealth of the Northern Mariana Islands

Scientific Name	Common Name	Status	Location	Plant Assessment Group	Population Level Trends	Species Level Trends	Number of Populations	Distribution	Number of Individuals*	Pesticides Listed as a Threat	Pollinator Loss Listed as a Threat	Vulnerability Ranking
Adenophorus periens	Pendant kihi fern	Endangered	HI	2	Not Available	Decreasing (USFWS, 2015)	12 (USFWS, 2010)	Currently, it is only found on the islands of Kauai and Hawaii (Plant Extinction Prevention Program [PEPP] 2015) (USFWS, 2015).	~31 (USFWS, 2015)	No Mention	No Mention	High
Asplenium dielerectum	Asplenium-leaved diellia	Endangered	HI	2	Not Available	Declining (USFWS, 2015)	10 (USFWS, 2015)	Currently the species occurs on Kauai, Oahu, Molokai, and Maui (USFWS, 2015).	57 - 67 (USFWS, 2015)	No Mention	No Mention	High
Asplenium dielfalcatum	No common name	Endangered	HI	2	Not Available	Not Available	15 (USFWS, 2011)	Currently, D. falcata is locally common in the Waianae Range, but it is probably extirpated from the Koolau Range (USFWS, 2016).	5,540 - 6,540 (USFWS, 2016)	No Mention	No Mention	High
Asplenium diellaciniatum	No common name	Endangered	HI	2	Not Available	Declining (USFWS 2015)	3 (USFWS, 2016)	Known from western Kauai (USFWS, 2015).	100 (USFWS, 2016)	No Mention	No Mention	High
Asplenium dielmannii	No common name	Endangered	HI	2	Presumed extinct in 1900s (USFWS, 2010a)	Rediscovered in 2002 (USFWS, 2010a)	1 (USFWS, 2010a)	Currently occurs in the Waimea region, Kauai (NatureServe, 2015).	1 (USFWS, 2010a)	No Mention	No Mention	High
Asplenium dielpallidum	No common name	Endangered	HI	2	Rediscovered in 1988 (USFWS, 2008)	Not Available	3 (USFWS, 2008)	Currently, there are three populations totaling seven mature individuals, 10 juvenile individuals, and 24 sporelings (PEPP 2014, 2016) (USFWS, 2017).	12 mature (USFWS, 2008)	No Mention	No Mention	High

[1] Additional information on these new conservation measures can be found in the Description of the Action section of this biological opinion.

Scientific Name	Common Name	Status	Location	Plant Assessment Group	Population Level Trends	Species Level Trends	Number of Populations	Distribution	Number of Individuals*	Pesticides Listed as a Threat	Pollinator Loss Listed as a Threat	Vulnerability Ranking
Asplenium peruvianum var. insulare	No common name	Endangered	HI	2	Unknown	Not Available	Not Available	Currently on Maui there are two occurrences with 18 individuals found in Kalialinui within the East Maui Watershed Partnership. On the island of Hawaii, A. f. var. insulare is currently found in 17 occurrences with more than 600 individuals. There are 13 occurrences in the Pohakuloa Training Area, one in Hawaii Volcanoes National Park, two just south of the Upper Waiakea Forest Reserve and the Mauna Loa Forest Reserve, and one occurrence in the Keokea section of the South Kona District (68 FR 25934; 68 FR 39624).	~600	No Mention	No Mention	High
Asplenium unisorum	No common name	Endangered	HI	2	Not Available	Not Available	2 (USFWS, 2011)	This species is known to be extant in four areas of the southern Waianae Mountains: South Ekahanui Gulch, Palawai Gulch, Palikea, and the Pualii-Napepeiauolelo Ridge (HHP 1997; J. Lau, pers. comm. 1997) (Oahu) (USFWS, 1998).	1,148 (USFWS, 2011)	No Mention	No Mention	High
Ctenitis squamigera	Pauoa	Endangered	HI	2	Declining (USFWS, 2013)	Not Available	17 (USFWS, 2016)	This species is currently extant on Oahu, Molokai, Lanai, and Maui (USFWS, 2016).	210 - 220 (USFWS, 2013)	No Mention	No Mention	High
Cyclosorus boydiae	Boyds maiden fern	Endangered	HI	2	Not Available	Not Available	7 populations: 5 on Maui, 2 on Oahu (USFWS, 2014; USFWS, 2015)	U.S., Hawaii: Island of Oahu, Honolulu County; Island of Maui, Maui County. Currently, *Cyclosorus boydiae* is found only at higher elevations on Oahu and east Maui, in 7 occurrences totaling approximately 400 individuals (Palmer 2003, pp. 87–88; Oppenheimer 2008, in litt.; Fay 2010, in litt.; HBMP 2010; Welton 2010, in litt.). On east Maui, there are 5 occurrences (approximately 360 individuals) in the lowland wet and montane wet ecosystems, and on Oahu, there are 2 occurrences in the Koolau Mountains in the montane wet ecosystem, totaling 40 individuals (Palmer 2003, pp. 87–88; Wood 2007, in litt.; Kam 2008, in litt.; Oppenheimer 2008 and 2010, in litt.; HBMP 2010; Welton 2010, in litt.; Ching 2011, in litt.). The historical occurrence of *C. boydiae* on the island of Hawaii was found in the lowland wet ecosystem (HBMP 2010) (USFWS, 2014; USFWS, 2016).	~400 individuals (USFWS, 2014; USFWS, 2015)	No Mention	No Mention	High

Scientific Name	Common Name	Status	Location	Plant Assessment Group	Population Level Trends	Species Level Trends	Number of Populations	Distribution	Number of Individuals*	Pesticides Listed as a Threat	Pollinator Loss Listed as a Threat	Vulnerability Ranking
Deparia kaalaana	No common name	Endangered	HI	2	Not Available	Not Available	1 (USFWS, 2014; USFWS, 2015)	Currently, there is one single known individual in Haleakala National Park on East Maui *D. kaalaana* (Palmer 2003, pp. 109111; PEPP 2014, p. 91; PEPP 2014, in litt.). (USFWS, 2014; USFWS, 2015)	1 (USFWS, 2014; USFWS, 2015)	No Mention	No Mention	High
Diplazium molokaiense	No common name	Endangered	HI	2	Not Available	Increasing (USFWS, 2014)	3 (USFWS, 2014)	Current range is in Maui (NatureServe, 2015).	81 (USFWS, 2014)	No Mention	No Mention	High
Doryopteris angelica	No common name	Endangered	HI	2	Not Available	Not Available	5 (USFWS, 2010a)	Currently occurs in Awaawapuhi, Mahanalo, Makaha, Kuia, and Paaiki (NTBG 1998; Wagner [W.H.] et al. 1999b, p. 147; Wood 1999, 2000, 2007a; Perlman, in litt. 2006; HBMP 2007); on Kauai (USFWS, 2016).	29 - 54 (USFWS, 2010a). Currently, fewer than 250 individuals of Doryopteris angelica persist at eight locations. A new population of five individuals was discovered at Makaha (PEPP 2015). Spore collecting and propagation efforts are ongoing, and 17 individuals have been outplanted in a fenced exclosure at Paaiki (USFWS, 2017).	No Mention	No Mention	High
Doryopteris takeuchii	No common name	Endangered	HI	2	30 - 50% decline (NatureServe, 2015)	Not Available	1 - 3 (NatureServe, 2015)	Known only from the volcanic cone Leahi (Diamond Head Crater) on the island of Oahu, State of Hawaii (Palmer 2003) (NatureServe, 2015).	160 - 200 (USFWS, 2012)	No Mention	No Mention	High
Dryopteris crinalis var. podosorus	Palapalai aumakua	Endangered	HI	2	Not Available	Not Available	3 (USFWS, 2010b)	Currently, populations occur in Mohihi, south Kilohana, and Waialeale; Kauai (USFWS, 2016).	32 - 47 (USFWS, 2010b)	No Mention	No Mention	High

Scientific Name	Common Name	Status	Location	Plant Assessment Group	Population Level Trends	Species Level Trends	Number of Populations	Distribution	Number of Individuals*	Pesticides Listed as a Threat	Pollinator Loss Listed as a Threat	Vulnerability Ranking
Dryopteris glabra var. pusilla	kilau	Endangered	HI	2	Not Available	Not Available	1 (USFWS, 2014)	This species is currently known from the Kawaikoi Stream, Waiakoali Headwaters, and Alakai Swamp trail, in Kokee State Park, on the island of Kauai (PEPP 2014, in litt.; Smithsonian Institute 2014, Online Herbarium Database). (USFWS, 2014)	60-70 (USFWS, 2014); <250 (USFWS, 2015)	No Mention	No Mention	High
Huperzia mannii	Wawae`iole	Endangered	HI	2	Declined	Declined	Not Available	Known currently from the Hawaiian Islands of Maui and Hawaii.	29 - 34 individuals	No Mention	No Mention	High
Huperzia nutans	Wawae`iole	Endangered	HI	2	Decreasing	Not Available	Not Available	Currently, 11 individuals are found at five occurrences on the island of Oahu: north Kaukonahua Gulch (5 individuals), Kaukonahua Gulch (1), Kahana (2), Kaipapau (2), and Koloa Gulch (1) (K. Kawelo, U.S. Army, pers. comm. 2003; J. Lau, HINHP, pers. comm. 2003). Occurrences and individuals of *H.. nutans* are declining in the state of Hawaii. *Huperzia nutans* is considered to be extirpated from the island of Kauai. Occurrences on Oahu are small and widely dispersed (U.S. Army 2003a).	11	No Mention	No Mention	High
Huperzia stemmermanniae	Wawae`iole	Endangered	HI	2	Unknown	Unknown	3 known	On the islands of Hawaii and Maui, although the Maui population has not been observed since 1995. (USFWS, 2014)	20 individuals	No Mention	No Mention	High
Hypolepis hawaiiensis var. mauiensis	olua	Endangered	HI	2	Not Available	Not Available	1 - 5 (NatureServe, 2015)	Known from openings between bogs above 5,000 ft on west Maui, and a few individuals occur at Hanawi on east Maui" (USFWS 2015). (NatureServe, 2015)	<20 plants (NatureServe, 2015)	No Mention	No Mention	High
Marsilea villosa	Ihi`ihi	Endangered	HI	2	Not Available	Not Available	8 (USFWS, 2016)	Currently, there are approximately three populations of Marsilea villosa on Moloka‘i and two wild populations and one introduced population (at Makapu‘u) on O‘ahu (USFWS, 2018).	Possibly thousands (USFWS, 2016)	No Mention	No Mention	Medium
Microlepia strigosa var. mauiensis	Maui fern	Endangered	HI	2	Not assessed	Not assessed	Nine	U.S.: Hawaii: Maui, Maui County; Hawaii, Hawaii County; Ohau, Honolulu County. Currently, Microlepia strigosa var. mauiensis is found in the Waiakea and Hilo Watershed FRs, on the island of Hawaii; at Pohakea and Poelua gulches on west Maui, and at Hanaula, in The Nature Conservancys Waikamoi Preserve, and at Manawainui in Haleakala National Park on east Maui; and at Makaleha and Makaha Valley in the Waianae Mountains	Oahu: 40; Maui: < 20; Hawaii: 35 (USFWS, 2016)	No Mention	No Mention	High

Scientific Name	Common Name	Status	Location	Plant Assessment Group	Population Level Trends	Species Level Trends	Number of Populations	Distribution	Number of Individuals*	Pesticides Listed as a Threat	Pollinator Loss Listed as a Threat	Vulnerability Ranking
								on Oahu (Lau 2007, pers. comm.; Oppenheimer, in litt. 2007; HBMP 2008; Oppenheimer, in litt. 2008; Welton, in litt. 2008).				
Pteris lidgatei	No common name	Endangered	HI	2	Not Available	Not Available	Not Available	*Pteris lidgatei* is an endemic species that historically occurred in the Koolau Mountains of Oahu, and on Maui and Molokai (where it was collected only once in 1912). It has always been rare and in recent years has not been seen in areas where it had been previously observed, though living plants are still being found in new locations on Oahu and Maui (Palmer 2003). On these islands, there are an estimated 45 individuals in eight occurrences. On Oahu, 25 individuals are found as part of six occurrences in Kawainui (3 individuals), Kawai Iki (3), north Kaukonahua (1), south Kaukonahua (14), Kaluanui (1), and Waimano (3). On Maui, 20 individuals are found as part of two occurrences at Kauaula Valley (12) and Kahakuloa Stream (8) (Service 1998b; K. Kawelo, U.S. Army, pers. comm. 2003; J. Lau, HINHP pers. comm. 2003). Ecology On Oahu, Pteris lidgatei is generally found on streambanks and near waterfalls. It occurs at approximately 75 m (246 ft) elevation in wet *Metrosideros polymorpha-Dicranopteris linearis* forest with Asplenium spp, *Broussaisia arguta, Cibotium chamissoi, Cyrtandra spp., Diplopterygium pinnatum, Doodia lyonii, Dryopteris sandwicensis, Elaphoglossum crassifolium, Isachne pallens, Machaerina angustifolia, Sadleria squarrosa, Selaginella arbuscula,* and *Sphenomeris chinensis. M. polymorpha* is typically the dominant native overstory tree species (HINHP Database 2002; U.S. Army 2003a).	~45 individuals	No Mention	No Mention	High
Cycas micronesica	Fadang	Threatened	GU, CNMI	3	Not Available	Not Available	15 - 20 (USFWS, 2015)	It is known from Guam, Rota, and tentatively on Pagan, as well as Palau (politically the independent Republic of Palau) and Yap (geographically part of the Caroline Islands; politically part of the	900,000 - 950,000 (USFWS, 2015)	No Mention	No Mention	Medium

Scientific Name	Common Name	Status	Location	Plant Assessment Group	Population Level Trends	Species Level Trends	Number of Populations	Distribution	Number of Individuals*	Pesticides Listed as a Threat	Pollinator Loss Listed as a Threat	Vulnerability Ranking
								Federated States of Micronesia) (USFWS, 2015).				

*Information in this column was used to inform the ranking metrics or the draft determination when relevant.

Table 2: Summarizing Data and Information for Risk Ranking
Data Sources: SOS accounts (Appendix C); NA=Not Applicable; HI=Hawaii; GU=Guam; CNMI=Commonwealth of the Northern Marianas Islands

Risk to Individuals and Pollinators if exposed: The individual plants in this assessment group are estimated to experience up to a 12% decrease in dry weight if exposed to malathion on the following use sites, based on labeled application rates: orchards and vineyards, developed, nurseries, open space developed and Christmas trees. No effects are expected on other use sites. Ferns and their allies do not rely on animal species for pollination or seed dispersal, thus no effects are expected to these plants from loss in seed dispersers from malathion exposure across use sites within their ranges. The Fadang (a cycad) utilizes unknown biotic seed dispersers. Mortality is expected for insect seed dispersers exposed to malathion on use sites or via spray drift. Some bird seed dispersers exposed to malathion on use sites may experience mortality or sublethal effects, depending on the site of exposure and size of the bird. Smaller birds exposed on use sites with higher allowable use rates (e.g., developed, open space developed, orchards and vineyards) have a greater chance of being affected. Exposure to spray drift is not expected to result in effects to bird seed dispersers. No effects (mortality or sublethal) are expected for mammalian seed dispersers from malathion exposure either on use sites or from spray drift.

Scientific Name	Common Name	Assessment Group	Location	Direct effects expected (yes or no, reduction in dry weight when exposed in use areas that may have effects)	Effects to Pollinators	Method of Reproduction (risk modifier)	Seed Dispersal Vector (risk modifier)	Obligate or Specific Pollinator (risk modifier)	Pollination Vector*	% Range Overlap with Federal Lands	Risk Ranking
Adenophorus periens	Pendant kihi fern	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	91.45	Low
Asplenium peruvianum var. insulare	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	12.81	Low
Asplenium dielerectum	Asplenium-leaved diellia	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	7.74	Low
Asplenium dielfalcatum	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	8.56	Low
Diplazium molokaiense	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	6.24	Low
Marsilea villosa	Ihi`ihi	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	10.80	Low
Pteris lidgatei	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	6.87	Low
Ctenitis squamigera	Pauoa	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	10.42	Low
Huperzia mannii	Wawae`iole	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	18.79	Low
Huperzia nutans	Wawae`iole	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	6.79	Low
Asplenium unisorum	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	8.56	Low
Asplenium dielpallidum	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	0.39	Low
Cyclosorus boydiae	Boyds maiden fern	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	11.69	Low
Microlepia strigosa var. mauiensis	Maui fern	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	8.22	Low
Doryopteris takeuchii	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	0	Low
Dryopteris glabra var. pusilla	Kilau	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	0	Low
Huperzia stemmermanniae	Wawae`iole	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	17.53	Low
Asplenium dielmannii	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	0.39	Low
Doryopteris angelica	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	0	Low

Scientific Name	Common Name	Assessment Group	Location	Direct effects expected (yes or no, reduction in dry weight when exposed in use areas that may have effects)	Effects to Pollinators	Method of Reproduction (risk modifier)	Seed Dispersal Vector (risk modifier)	Obligate or Specific Pollinator (risk modifier)	Pollination Vector*	% Range Overlap with Federal Lands	Risk Ranking
Dryopteris crinalis var. podosorus	Palapalai aumakua	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	100	Low
Asplenium diellaciniatum	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	0.86	Low
Deparia kaalaana	No common name	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	17.20	Low
Hypolepis hawaiiensis var. mauiensis	Olua	2	HI	Yes (12%)	Low	Non-flowering	Abiotic	NA	Abiotic	10.78	Low
Cycas micronesica	Fadang	3	GU, CNMI	Yes (12%)	Low	Non-flowering	Abiotic, Biotic	NA	Abiotic	0	Low

*Information in this column was used to inform the ranking metrics or the draft determination when relevant.

Cumulative Effects and Environmental Baseline: Please refer to the Status of the Species accounts (Appendix XX) and overarching Environmental Baseline and Cumulative Effects sections of this Opinion.

Additional Conservation Measures:

Additional information on these new conservation measures can be found in the *Description of the Action* section and Appendix A-2 of this biological opinion, and further information on the anticipated impacts of each measure in the *Effects of the Action* section.

Several additional conservation measures have recently been provided by EPA and will be implemented as part of the Action. These measures will apply to both species in this assessment group. We summarize the new measures and our related assumptions below.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and groundfruit lower the maximum allowable number of applications (previously ranging from 3-13 applications per year, depending on the specific crop) to 2-4 per year, as described in the *Description of the Action* of this Opinion. This is anticipated to reduce the amount of malathion used and decrease exposure to these plant species, thus decreasing the risk of direct sub-lethal impacts to the plant itself.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are anticipated to significantly reduce exposure to species and their pollinators/seed dispersers that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from “repeat as necessary” to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing initial residues to degrade prior to the next application. We anticipate this measure will further reduce exposure to these plant species, thus decreasing the risk of sub-lethal impacts to the plant itself.

Table 3: Summary of Conclusions

Scientific Name	Common Name	Location	Plant Assessment Group	Vulnerability Ranking	Risk Ranking	Potential Exposure Ranking	Species Conclusion (J, NJ)
Adenophorus periens	Pendant kihi fern	HI	2	High	Low	Not determined*	NJ
Asplenium dielerectum	Asplenium-leaved diellia	HI	2	High	Low	Not determined*	NJ
Asplenium dielfalcatum	No common name	HI	2	High	Low	Not determined*	NJ
Asplenium diellaciniatum	No common name	HI	2	High	Low	Not determined*	NJ
Asplenium dielmannii	No common name	HI	2	High	Low	Not determined*	NJ
Asplenium dielpallidum	No common name	HI	2	High	Low	Not determined*	NJ
Asplenium peruvianum var. insulare	No common name	HI	2	High	Low	Not determined*	NJ
Asplenium unisorum	No common name	HI	2	High	Low	Not determined*	NJ
Ctenitis squamigera	Pauoa	HI	2	High	Low	Not determined*	NJ
Cyclosorus boydiae	Boyds maiden fern	HI	2	High	Low	Not determined*	NJ
Deparia kaalaana	No common name	HI	2	High	Low	Not determined*	NJ
Diplazium molokaiense	No common name	HI	2	High	Low	Not determined*	NJ
Doryopteris angelica	No common name	HI	2	High	Low	Not determined*	NJ
Doryopteris takeuchii	No common name	HI	2	High	Low	Not determined*	NJ
Dryopteris crinalis var. podosorus	Palapalai aumakua	HI	2	High	Low	Not determined*	NJ
Dryopteris glabra var. pusilla	Kilau	HI	2	High	Low	Not determined*	NJ
Huperzia mannii	Wawae`iole	HI	2	High	Low	Not determined*	NJ
Huperzia nutans	Wawae`iole	HI	2	High	Low	Not determined*	NJ
Huperzia stemmermanniae	Wawae`iole	HI	2	High	Low	Not determined*	NJ
Hypolepis hawaiiensis var. mauiensis	Olua	HI	2	High	Low	Not determined*	NJ
Marsilea villosa	Ihi`ihi	HI	2	Medium	Low	Not determined*	NJ
Microlepia strigosa var. mauiensis	Maui fern	HI	2	High	Low	Not determined*	NJ
Pteris lidgatei	No common name	HI	2	High	Low	Not determined*	NJ
Cycas micronesica	Fadang	GU, CNMI	3	Medium	Low	Not determined*	NJ

NJ = No Jeopardy; J = Jeopardy

*A Potential Exposure ranking was not undertaken for species in this assessment group as the magnitude of exposure for these species should not effect the outcome of the analysis given they do not use biotic vectors in their life cycle.

Rationale for Species Conclusions

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the plant species in this assessment group.

The species in this assessment group have either high or medium vulnerabilities based on their status, distribution, and trends and the risk to all species in this group posed by labeled uses across the range is anticipated to be low as shown above. As described in the Approach to the Analysis for Pacific and Caribbean Island Species, we considered available usage data broadly and determined the relative likelihood of exposure of island species based on their preferred habitat. However, for ferns and allies and cycads we did not undertake a Potential Exposure ranking as the magnitude of exposure for these species should not affect the outcome of the analysis given they do not rely on biotic pollinator or seed dispersal vectors. As such, we were able to make conclusions for these species based on their vulnerability and risk ranking.

While all species in this group had high vulnerabilities based on their endangered status and restricted ranges, all species had low risk given we do not anticipate adverse effects to the reproduction and survival of these species as they do not use biotic pollinator or seed dispersal vectors. While we expect some individual plants will experience reduced growth due to direct exposure to malathion, we do not anticipate this reduction in growth will result in species-level effects, and the additional conservation measures described above will further decrease the exposure and resultant sub-lethal effects to these species from malathion. For example, residential uses of malathion are now limited to two applications per year (reduced from as many as necessary) and to spot treatments only, reducing the application footprint and likelihood of spray drift within developed and open space developed areas.

Thus, do not anticipate that the use of this pesticide is likely to result in species-level effects to the species in this assessment group. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of these species in the wild.