

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Asplenium dielfalcatum* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer:

Cheryl Phillipson, Biologist, PIFWO

Lauren Weisenberger, Plant Recovery Coordinator, PIFWO

Megan Laut, Conservation & Restoration Team Manager, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) beginning in October 2018. The review was based on a review of current, available information since the last 5-year review for *Asplenium dielfalcatum* (USFWS 2011). The evaluation completed by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

Background:

For information regarding the species' listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species (http://ecos.fws.gov/tess_public).

Review Analysis:

Please refer to the previous 5-year review for *Asplenium dielfalcatum* (as *Diellia falcata*) published in the Federal Register on August 2, 2011 (available at https://ecos.fws.gov/docs/five_year_review/doc3816.pdf) for a complete review of the species' status, threats, and management efforts. We are not aware of any significant new information regarding the species' biological status since listing to warrant a change in the Federal listing status of *A. dielfalcatum*.

This short-lived perennial fern in the Aspleniaceae (spleenwort) family is endangered and endemic to O‘ahu. The current status and trends for *Asplenium dielfalcatum* are provided in the tables below.

New Status Information:

- Currently, there are about 14 small subpopulations spread across the summit area of the Wai‘anae mountains, possibly totaling as many as 1,000 individuals. Several additional subpopulations have not been monitored in over 10 years (Hawai‘i Biodiversity and Mapping Program (HBMP) 2010; Army Natural Resources Program-O‘ahu (ANRP) 2018). The Army Natural Resources Program undertakes stabilization and management of other endangered species to fulfill the requirements of the Biological Opinions for U.S. Army activities in Mākua and O‘ahu training areas, and *Asplenium dielfalcatum* may benefit from these actions (fencing, ungulate and predator control, nonnative plant control) in management areas.
- In 2012, 15 critical habitat units in two ecosystems (lowland mesic and dry cliff) were designated for *A. dielfalcatum* in the Wai‘anae mountains of O‘ahu (9,269 ac, 3,753 ha) (77 FR 57648, September 18, 2012).
- In 2015, the Service published a technical correction for this and other plant and wildlife species, recognizing the taxonomic change from *Diellia falcata* to *Asplenium dielfalcatum* (80 FR 35860, June 23, 2015). The taxonomic change does not affect the range or endangered status of this species, and is the most recent taxonomy in the Hawaiian Vascular Plant Updates (Wagner *et al.* 2012).

New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this species. Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawai‘i using high resolution climate change projections. Climate change vulnerability is defined as the relative inability of a species to display the possible responses necessary for persistence under climate change. The assessment by Fortini *et al.* (2013) concluded that *Asplenium dielfalcatum* is vulnerable to the impacts of climate change, with a vulnerability score of 0.547 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.

New Management Actions:

- Surveys and inventories—The ANRP monitors some individuals of *Asplenium dielfalcatum* in the Wai‘anae mountains of O‘ahu (ANRP 2018).
- Ungulate monitoring and control—Fencing is monitored and maintained at several management units, including ‘Ēkahanui, Manuwai, and Kaluaa-Wai‘eli (ANRP 2018).
- Invasive plant monitoring and control—Between 2017 and 2018, the ANRP controlled nonnative plants at the Kahanahāiki and Līhu‘e management units (ANRP 2018).
- Fire destruction and degradation—In August, 2018, fires in Wai‘anae, Kea‘au, and Mākaha valleys burned 5,000 ac (2,023 ha) destroying two exclosures in the Kea‘au FR, and impacting two endangered plant taxa, *Hibiscus brackenridgei*

subsp. *mokuleianus* and *Gouania vitifolia*, which was a major setback for the ANRP's restoration work (ANRP 2018). The Army managed the fire response in the northernmost portion of the wildfire area. These fires came within less than one mile (1.6 kilometers) of *A. dielfalcatum* populations.

- Captive propagation for genetic storage and reintroduction—
 - Lyon Arboretum Micropropagation Laboratory reported a few propagules in storage of *A. dielfalcatum* representing two wild individuals at Kawai Iki (Lyon Arboretum 2018.).
 - The National Tropical Botanical Garden (NTBG) reported collection of spores from one individual in storage; however, the viability of this collection is unknown (NTBG 2013.).

Synthesis:

Currently there are approximately 1,000 wild individuals of *Asplenium dielfalcatum* on O'ahu with several more populations not monitored in over 10 years. This shows a decline in the total population size for the species. A landscape-based assessment of climate change vulnerability for native plants of Hawai'i using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *A. dielfalcatum* is vulnerable to the effects of climate change. Some individuals may be provided protection by fencing and nonnative plant control in areas managed for other endangered plants. Only a few collections are in storage.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the O'ahu Plants (USFWS 1998), and have been updated according to the draft revised recovery objective guidelines developed by the Hawai'i and Pacific Plants Recovery Coordinating Committee (HPPRCC 2011). The HPPRCC identifies an additional initial objective, the Preventing Extinction Stage, in addition to the Interim Stabilization, Delisting, and Downlisting objectives. Furthermore, life history traits such as breeding system, population size fluctuation or decline, and reproduction type (sexual or vegetative), have been included in the calculation of goals for the number of populations and reproducing individuals for each stage. The goals for each stage remain grouped by life span defined as annual, short-lived perennial (fewer than 10 years), or long-lived perennial.

Asplenium dielfalcatum is a short-lived perennial fern, and an obligate outcrosser. To prevent extinction, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and have 50 individuals (or the total number of individuals if fewer than 50 exist) from each of three populations represented in *ex situ* (secured off-site, such as a nursery or seed bank) collections. In addition, a minimum of three populations should be documented on O'ahu where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e.*, viable spores and sporelings) and increasing in number, with a minimum of 100 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met (Table 1). Although there may be three populations totaling over 100 reproducing individuals (Table 2),

genetic representation is incomplete, and all threats are not being managed. Therefore, *Asplenium dielfalcatum* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

With the exception of the new data on this taxon’s vulnerability to climate change and the threat of wildfires, we are not aware of any new threats or significant new information regarding the species’ biological status since the last 5-year review in 2011. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2019.

- Surveys and monitoring—Survey populations to better determine the current status of the species; and include historic habitat for unknown populations.
- Ungulate monitoring and control—Continue to maintain fenced exclosures, and construct new fenced exclosures specifically for this species, if required, to protect individuals from the negative impacts of browsing by ungulates.
- Invasive plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species, and those that compete with *Asplenium dielfalcatum*.
- Fire monitoring and control—Develop and implement fire management plans for areas where this species occurs.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for the recovery of the species.
- Herbivory by rats—Control rats in the vicinity of all populations.
- Captive propagation for genetic storage and reintroduction—Increase collection and propagation efforts for maintenance of genetic stock and for reintroduction.
- Reintroduction and translocation—Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species to build resiliency, redundancy, and representation to reduce impacts of landslides.
- Alliance and partnership development—Continue to work with partners in planning and implementation of ecosystem-level restoration and management to benefit this species.

Table 1. Status and trends of *Asplenium dielfalcatum* from listing through current 5-year review.

Date	No. wild individuals	No. outplanted	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria Completed?
1991 (listing)	3,000	0	All threats managed in all 5–7 populations	No
			5–7 populations with 300 mature individuals each	Unknown
			Each population persist for 5 consecutive years	Unknown
1998 (recovery plan)	5,540–6,540	0	All threats managed in all 5–7 populations	No
			5–7 populations with 300 mature individuals each	Unknown
			Each population persist for 5 consecutive years	Unknown
2003 (critical habitat)	>6,000	0	All threats managed in all 5–7 populations	No
			5–7 populations with 300 mature individuals each	Unknown
			Each population persist for 5 consecutive years	Unknown
2011 (5-year review)	1,000s	0	All threats managed in all 5–7 populations	No
			5–7 populations with 300 mature individuals each	Unknown
			Each population persist for 5 consecutive years	Unknown
2012 (critical habitat)	4,000–7,000	0	All threats managed in all three populations	Partially
			Complete genetic storage	Partially

			Three populations with 50 mature individuals each	Partially, only Mākaha Makai population >50
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2019 (5-year review)	ca 1,000	0	All threats managed in all three populations	Partially
			Complete genetic storage	No
			Reproduction (<i>i.e.</i> viable seeds, seedlings) at all three populations	Partially
			Three populations with 100 mature individuals each	No

* The Preventing Extinction Stage was established in 2011. Prior to 2011, the Interim Stabilization Stage was the first stage towards recovery (now it is the second after Preventing Extinction).

Table 2. Threats to *Asplenium dielfalcatum* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, two exclosures provide protection
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant control within two exclosures
Climate change degradation or loss of habitat	A	Ongoing	None
Landslides	A	Ongoing	None
Fire destruction and degradation of habitat	A	Ongoing	Partial, fire management plan
Ungulate predation or herbivory	C	Ongoing	Partial, two exclosures provide protection
Rodent predation or herbivory	C	Ongoing	None
Greenhouse thrips-herbivory	C	Ongoing	None

References:

See previous 5-year review for a full list of references (USFWS 2011). Only references for new information are provided below.

[ANRP] 2018. Status report for the Mākua and O‘ahu implementation plans. Prepared by Pacific International Center for High Technology Research. 217 pp. + 723 pp. appendices.

Fortini, L., J. Price, J. Jacobi, A. Vorsino, J. Burgett, K. Brinck, F. Amidon, S. Miller, S. Gon II, G. Koob, and E. Paxton. 2013. A landscape-based assessment of climate change vulnerability for all native Hawaiian plants. Technical report HCSU-044. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 134 pp.

[HBMP] Hawai‘i Biodiversity and Mapping Program. 2010. GIS and database information for *Asplenium dielfalcatum*. 121 pp.

[HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.

Lyon Arboretum. 2018. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[NTBG] National Tropical Botanical Garden. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[USFWS] U.S. Fish and Wildlife Service. 2011. *Diellia falcata* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/five_year_review/doc3816.pdf.

[USFWS] 2012. Endangered and threatened wildlife and plants; Endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Department of the Interior, Federal Register 77 (181): 57648–57862, September 18, 2012.

[USFWS] 2015. Endangered and threatened wildlife and plants; technical corrections for 54 wildlife and plant species on the list of endangered and threatened wildlife and plants. Federal Register 80 (12) FR 35860–35869, June 23, 2015.

[USFWS] 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Asplenium dielfalcatum* (no common name)

Pre-1996 DPS listing still considered a listable entity? N/A

Recommendation resulting from the 5-year review:

- Delisting
- Reclassify from Endangered to Threatened status
- Reclassify from Threatened to Endangered status
- No Change in listing status

For Field Supervisor, Pacific Islands Fish and Wildlife Office

Date _____