

## 5-YEAR REVIEW

### Short Form Summary

**Species Reviewed:** *Dryopteris crinalis* var. *podosorus* (palapalai ‘aumakua)

**Current Classification:** Endangered

#### **Federal Register Notice announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.

#### **Lead Region/Field Office:**

Interior Region 12/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 or USFWS) beginning in October 2021. The review was based on a review of current, available information since the last 5-year review for *Dryopteris crinalis* var. *podosorus* (USFWS 2017). The evaluation 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 (<https://ecos.fws.gov/ecp/species/8961>).

#### **Review Analysis:**

Please refer to the previous 5-year review for *Dryopteris crinalis* var. *podosorus* published in the Federal Register on September 13, 2017 (available at [https://ecos.fws.gov/docs/tess/species\\_nonpublish/2431.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/2431.pdf)) for a complete review of the species’ status, threats, management efforts, and references cited. 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 *D. crinalis* var. *podosorus*.

This short-lived perennial fern in the Dryopteridaceae (wood fern) family is listed as endangered and is known from the island of Kaua‘i. The status and trends for *Dryopteris crinalis* var. *podosorus* are provided in the tables below.

New Status Information:

- In 2017, there were estimated to be 68 individuals at Mōhihi drainage, Kilohana, Wai‘ale‘ale summit, and Alaka‘i-Pihea on Kaua‘i (USFWS 2017). Currently, three sites at Kawaikōi stream and Waiakoali stream (Alaka‘i-Pihea-Kilohana) total 22 mature and 14 immature individuals (Kishida and Arnold 2018; Kishida and Perlman 2018; Kishida et al. 2015). There is no current information regarding the 1990s occurrences at Mōhihi or Wai‘ale‘ale.

New Threats:

- None reported.

New Management Actions:

- Surveys and inventories—The Plant Extinction Prevention Program (PEPP) monitors *Dryopteris crinalis* var. *podosorus* at Alaka‘i-Pihea (Kawaikōi and Waiakoali streams, Kilohana) (Kishida and Arnold 2018; Kishida and Perlman 2018; Kishida et al. 2015).
- Collection and propagation—PEPP collects fertile fronds for storage and propagation (Perlman and Kishida 2014). Currently, the Lyon Arboretum Micropropagation Laboratory reports 70 explants in storage representing two founders from Alaka‘i-Pihea (Lyon Arboretum 2022). The Arboretum’s Seed Conservation Laboratory reports thousands of spores in storage representing three subpopulations at Alaka‘i-Pihea (Lyon Arboretum 2022).

**Table 1. Status and trends of *Dryopteris crinalis* var. *podosorus* from listing through current 5-year review.**

Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2010 (listing and critical habitat)	32–47	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 100 mature individuals each	No
2017 (5-year review)	68	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially

			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	Unknown
			3 populations with 100 mature individuals each	No
2022 (5-year review)	22 mature 14 immature	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially, 3 founders represented
			Natural reproduction at all 3 populations	Unknown
			3 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 stage after Preventing Extinction).

**Table 2. Threats to *Dryopteris crinalis* var. *podosorus* and ongoing conservation efforts.**

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat and herbivory by feral ungulates	A, C	Ongoing	None
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	None
Landslides and flooding destruction and degradation of habitat	A	Ongoing	None
Climate change degradation and destruction of habitat, including hurricanes	A	Ongoing	None
Inadequacy of existing regulatory mechanisms—lack of adequate hunting and biosecurity regulations	D	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, spore collection and propagation

**Synthesis:**

Currently, there are 22 mature and 14 immature wild individuals of *Dryopteris crinalis* var. *podosorus* on Kaua‘i. This represents a 44% decline in the total population within the last five years. Although within the Alaka‘i Wilderness Preserve, none of the wild individuals are protected from feral ungulates by fencing or from nonnative invasive plants. Collection and propagation are reported representing at least three founders from three subpopulations at Alaka‘i-Pihea. There are no reported reintroductions.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Kaua‘i Islandwide Recovery Plan (USFWS 2021) 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.

*Dryopteris crinalis* var. *podosorus* is a short-lived perennial fern and an obligate outcrosser. To prevent extinction, which is the first milestone 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 that are well managed. In addition, a minimum of three populations should be documented on Kaua‘i where the species occurs or occurred historically and these populations must be naturally reproducing (i.e., viable spores, sporelings) with a minimum of 100 mature, reproducing individuals.

The preventing extinction goals for *Dryopteris crinalis* var. *podosorus* have not been met. Currently, there are only 36 known wild individuals and numbers continue to decline (Table 1). There is collection and propagation of materials representing three or more founders at three subpopulations. No threats are being managed (Table 1, Table 2). Therefore, *Dryopteris crinalis* var. *podosorus* meets the definition of Endangered as it remains in danger of extinction throughout its range.

**Recommendations for Future Actions:**

No new threats and no significant new information regarding the species’ biological status have been reported since the last 5-year review in 2017. Thus, the following recommendations for future actions are reiterated or updated for the 5-year review for 2022.

- Surveys and inventories—Continue to survey to determine the current status of *Dryopteris crinalis* var. *podosorus*.

- Ungulate monitoring and control—Construct and maintain enclosures around all populations to protect remaining wild individuals against habitat disturbance and herbivory by feral ungulates.
- Nonnative invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species and those that compete with *D. crinalis* var. *podosorus* at all populations.
- Climate change adaptation strategy—Research suitability of habitat for viability of species, including where to conduct translocations in the future due to impacts of climate change.
- Captive propagation for genetic storage and reintroduction—
  - Continue to collect material for genetic storage and for propagation for reintroduction.
  - Develop horticultural protocols for spore collection and propagation.
- Reintroduction and augmentation—Augment wild populations and establish new populations within protected suitable habitat.
- Build resiliency and redundancy—Increase numbers of individuals and populations through historic range to reduce impacts of landslides and hurricanes.
- Genetic research—Determine genetic diversity in the surviving populations and *ex situ* holdings to guide future reintroduction and augmentation efforts.
- Alliance and partnership development—Continue to work with partners and other land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

## References:

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

Kishida, W. and L. Arnold. 2018. Hawai‘i Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Dryopteris crinalis* var. *podosorus*, Pacific Islands Fish and Wildlife Office.

Kishida, W. and S. Perlman. 2018. Hawai‘i Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Dryopteris crinalis* var. *podosorus*, Pacific Islands Fish and Wildlife Office.

Kishida, W., S. Perlman, K. Wood, S. Walsh. 2015. Hawai‘i Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention

- Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Dryopteris crinalis* var. *podosorus*, Pacific Islands Fish and Wildlife Office.
- Lyon Arboretum. 2022. Report on controlled propagation of listed 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, Hawai‘i.
- Perlman, S. and W. Kishida. 2014. Hawai‘i Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Dryopteris crinalis* var. *podosorus*, Pacific Islands Fish and Wildlife Office.
- [USFWS] U.S. Fish and Wildlife Service. 2017. *Dryopteris crinalis* var. *podosorus* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. [https://ecos.fws.gov/docs/tess/species\\_nonpublish/2431.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/2431.pdf).
- [USFWS] 2020. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.
- [USFWS] 2021. Kaua‘i Islandwide Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 65 pp. + appendices.

**U.S. FISH AND WILDLIFE SERVICE**  
SIGNATURE PAGE for 5-YEAR REVIEW of *Dryopteris crinalis* var. *podosorus*  
(palapalai 'aumakua)

**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
- X   No Change in listing status

**For Field Supervisor, Pacific Islands Fish and Wildlife Office**

\_\_\_\_\_

Date \_\_\_\_\_