

## 5-YEAR REVIEW

Short Form Summary

**Species Reviewed:** *Doryopteris angelica* (no common name)

**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 *Doryopteris angelica* (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/8960>).

### **Review Analysis:**

Please refer to the previous 5-year review for *Doryopteris angelica* published in the Federal Register on September 13, 2017 (available at [https://ecos.fws.gov/docs/tess/species\\_nonpublish/2430.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/2430.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. angelica*.

This short-lived perennial fern in the Pteridaceae family is listed as endangered and is known from the island of Kaua‘i. The status and trends for *Doryopteris angelica* are provided in the tables below.

New Status Information:

- In 2017, there were estimated to be 250 individuals ranging from Mākaha to Nu‘alolo on Kaua‘i (USFWS 2017). Three sites have been visited at Mākaha and Miloli‘i since that time with five individuals monitored (Perlman 2019; Kishida and Perlman 2018a, 2018b). Currently, overall numbers are estimated to total approximately 100 individuals (Wood 2022, in litt.).

New Threats:

- None reported.

New Management Actions:

- Surveys and inventories—The Plant Extinction Prevention Program (PEPP) surveys for and monitors populations of *Doryopteris angelica* (Perlman 2019; Kishida and Perlman 2018a, 2018b).
- Ungulate management—In 2021, the National Tropical Botanical Garden (NTBG) conducted fence repair and maintenance for the Limahuli Preserve restoration area (Nagendra 2021a, p. 21).
- Invasive nonnative plant control—In 2021, NTBG removed nonnative plants at rare plant restoration sites in Limahuli Preserve (Nagendra 2021b, pp. 3–5).
- Rodent management—In 2021, more than 100 rats were controlled in Limahuli Preserve (Nagendra 2021a, p. 19).
- Collection and captive propagation—Between 2014 and 2015, thousands of spores were collected and stored representing nine founders at Nu‘alolo, 30 founders at Miloli‘i, and nine founders at Mākaha (Lyon Arboretum 2022).
- Reintroduction and augmentation—In 2021, 20 individuals of *D. angelica* were reintroduced in the Limahuli Preserve, and six individuals were reintroduced as part of the Lower Limahuli Preserve spring-fed stream restoration project (Nagendra 2021a, p. 15; Nagendra 2021b, p. 6).

**Table 1. Status and trends of *Doryopteris angelica* 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)	29–54	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)	259		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)	ca 100	26	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially, 48 founders from 3 populations
			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 *Doryopteris angelica* and ongoing conservation efforts.**

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, 2 wild subpopulations partially fenced
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, nonnative invasive plant control within fenced areas
Climate change degradation and destruction of habitat, including hurricanes	A	Ongoing	None
Predation and herbivory by rodents	C	Ongoing	None
Inadequacy of existing regulatory mechanisms—	D	Ongoing	None

lack of adequate hunting and biosecurity regulations			
Reduced viability due to low numbers	E	Ongoing	Partial, spore collection, propagation, and reintroduction

**Synthesis:**

Currently there are approximately 100 wild individuals of *Doryopteris angelica* on Kaua‘i. Some individuals at two wild populations and one introduction are protected from feral ungulates by fencing. Some nonnative plant control is conducted in the fenced areas. Collection, propagation, and reintroduction are ongoing. Thousands of spores are stored representing nine founders at Nu‘alolo, 30 founders at Miloli‘i, and nine founders at Mākaha.

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.

*Doryopteris angelica* 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 this species have not been met. Currently, there are approximately 100 wild individuals with no single populations total 100 mature, reproducing individuals (Table 1). Collection, propagation, and some reintroductions are ongoing; however, all threats are not being managed (Table 1, Table 2). Therefore, *Doryopteris angelica* 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 surveys to determine the current status of *Doryopteris angelica*.
- Ungulate monitoring and control—Continue to construct and maintain exclosures at all populations to protect remaining wild individuals against habitat disturbance from feral ungulates.
- Nonnative invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species and those that compete with *D. angelica* 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.
- Predator and herbivore monitoring and control—Implement effective control measures for rats.
- Captive propagation for genetic storage and reintroduction—Continue spore collections with complete representation of remaining wild individuals and establish secure *ex situ* stocks.
- Reintroduction and augmentation—Continue to reintroduce individuals into protected suitable habitat.
- Build resiliency and redundancy—Increase numbers of individuals and populations through historic range to reduce impacts of hurricanes.
- Population biology research—Study *D. angelica* populations to determine viable population size and structure, geographical distribution, spore dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Genetic research—Map genetic diversity of the populations 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 S. Perlman. 2018a. 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 *Doryopteris angelica*, Pacific Islands Fish and Wildlife Office.

- Kishida, W. and S. Perlman. 2018b. 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 *Doryopteris angelica*, 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.
- Nagendra, U. 2021a. Limahuli Preserve rare plant conservation collections and habitat restoration project, National Tropical Botanical Garden, FWS Agreement # F18AC00508, December 21, 2021. 21 pp.
- Nagendra, U. 2021b. Lower Limahuli Preserve spring-fed stream restoration project. National Tropical Botanical Garden, FWS Agreement # F18AC00509, December 21, 2021. 12 pp.
- Perlman, S. 2019. 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 *Doryopteris angelica*, Pacific Islands Fish and Wildlife Office.
- [USFWS] U.S. Fish and Wildlife Service. 2017. *Doryopteris angelica* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. [https://ecos.fws.gov/docs/tess/species\\_nonpublish/2430.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/2430.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.
- Wood, K. 2022, in litt., Email regarding estimates for listed species, non-PEP, on Kaua'i, 11 MAR 2022.

**U.S. FISH AND WILDLIFE SERVICE**  
SIGNATURE PAGE for 5-YEAR REVIEW of *Doryopteris angelica*  
(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
- X   No Change in listing status

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

\_\_\_\_\_ Date \_\_\_\_\_