

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Huperzia mannii* (wawae'iole)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; 5-year status reviews of 46 species in Idaho, Oregon, Washington, Nevada, Montana, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 77(44):13248-13251.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Chelsie Javar-Salas, Plant Biologist, PIFWO
Maui nui and Hawaii Island Team Manager, PIFWO
Marie Bruegmann, Plant Recovery Coordinator, PIFWO
Recovery Program Lead, PIFWO
Kristi Young, Programmatic Deputy Field Supervisor, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on March 6, 2012. The review was based on a review of current, available information since the last 5-year review for *Huperzia mannii* (USFWS 2011). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Island Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

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 *Huperzia mannii* published on August 2, 2011 (available at http://ecos.fws.gov/docs/five_year_review/doc3810.pdf) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of *H. mannii*.

This short-lived fern ally is endangered and is historically known from the islands of Kauai, Maui, and Hawaii (USFWS 1997). This species is currently known on Maui and Hawaii Island. As stated in the previous 5-year review, this species has not been

observed on Kauai since 1900 (USFWS 2011). The current status and trends for *Huperzia mannii* are provided in the tables below.

New status information:

There are approximately 22 wild individuals of *Huperzia mannii* at Cable Ridge within Haleakala National Park (USFWS 2010). At Lihau on West Maui, there are 5 to 10 wild individuals of *H. mannii* (USFWS 2010). There are approximately two wild individuals known from Kahikinui (USFWS 2010). Surveys are needed to determine the current status of the species at all known and historical locations. No current status information is known for *H. mannii* on Hawaii Island. Overall, *H. mannii* has decreased from approximately 61 to 71 individuals reported in the last 5-year review to approximately 29 to 34 individuals (USFWS 2010).

New taxonomic information:

In 1992, *Huperzia mannii* was listed as endangered and retained until 1996. In 1997, the list of endangered and threatened plants at 50 CFR 17.12 indicated the species name as *Phlegmariurus mannii*, and in 2003, critical habitat was designated under the species name *P. mannii* (USFWS 2003). The list of endangered and threatened plants at 50 CFR 17.12 currently has two entries: one for *H. mannii*, which is out-of-date because it does not contain the critical habitat information for this species, and one for *P. mannii*, which displays the current critical habitat information. USFWS currently follows the widely used and accepted *Hawaii's Fern and Fern Allies* by Palmer (2003), who recognizes this species as *Huperzia mannii*.

In 2012, USFWS proposed to revise the taxonomic status for this species when it proposed to revise critical habitat designations on Maui, Lanai, Kahoolawe, and Molokai (USFWS 2012). The proposed change will consolidate the entries for *Huperzia mannii* and *Phlegmariurus mannii*. The proposed change will also remove the entry for *P. mannii* and recognize the listed species as *H. mannii*. The range of the species has not changed. The recognition and official change by USFWS of *H. mannii* will be finalized in the final rule for critical habitat designations on Maui, Lanai, Kahoolawe, and Molokai. The species will be recognized as *H. mannii* for the remainder of this review.

New threats:

- Stochastic events – Drought mortality and reduced viability – In 2010, drought was reported as a threat to *H. mannii* (USFWS 2010).
- Climate change destruction or degradation of habitat – Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaii 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 *H. mannii* is minimally vulnerable to the impacts of climate change.

New management actions:

- Captive propagation for genetic storage and reintroduction

- The National Tropical Botanical Garden (2012, 2013) has an unspecified amount of spores in storage for *H. mannii*.
- The Volcano Rare Plant Facility (2013) has a single individual from Kohala on Hawaii Island in their nursery.
- Population viability monitoring and analysis
 - Monitoring of the wild population at Cable Ridge within Haleakala National Park reported natural regeneration occurring (USFWS 2010).
 - In 2012, approximately 10 individuals of *H. mannii* were monitored at Kaapahu on Maui (Haleakala National Park 2012).
- Listing and critical habitat designation – Twenty-three units of unoccupied and occupied areas of critical habitat for *H. mannii* were proposed in the lowland mesic, lowland wet, montane wet, montane mesic ecosystems on Maui (USFWS 2012). The final rule for critical habitat designations has not been published at the time of this review.

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Maui plant cluster (USFWS 1997), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Huperzia mannii* is a short-lived perennial, and to be considered stable, this species must be managed to control threats (e.g. fenced) and be represented in an *ex situ* (at other than the plant’s natural location, such as a nursery or arboretum) collection. In addition, a minimum total of three populations should be documented on Maui and, if possible, at least one other island where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have not been met, as currently no population of 50 mature individuals exists (Table 1) and all threats are not sufficiently managed throughout its range (Table 2). Therefore, *Huperzia mannii* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Surveys / inventories
 - Survey geographical and historical range for a current assessment of the species’ status.
 - Surveys are needed for status update at Lihau and Kalepa Ridge on Maui (USFWS 2010) and on Hawaii Island.
- Captive propagation for genetic storage and reintroduction – Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.
- Reintroduction / translocation – Augment current natural populations to increase numbers of individuals.
- Ungulate monitoring and control – Fence remaining populations to protect them from the impacts of feral ungulates.

- Invasive plant monitoring and control – Control invasive introduced plant species within enclosures.
- Predator / herbivore control – Control slugs and rodents within the vicinity of all known *H. mannii* populations.
- Population viability monitoring and analysis – Continue monitoring wild populations.
- Alliance and partnership development – Initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

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

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	35	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1997 (recovery plan)	<300	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	22	Unknown	All threats managed in all 3 populations	Unknown
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2010 (5-year review)	61-71	41	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2012 (critical habitat – proposed)	97-100 (Maui only)	Unknown	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2014 (5-yr review)	29-34	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

Table 2. Threats to *Huperzia mannii* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, Kahikinui and Cable Ridge is fenced
Invasive introduced plants	A, E	Ongoing	None
Drought	A, E	Ongoing	None
Rodent predation or herbivory – rats	C	Ongoing	None
Slugs herbivory	C	Ongoing	None
Climate change	A, E	Increasing	None

References:

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

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. 141 pages.

Haleakala National Park. 2012. Annual report for threatened and endangered species permit TE014497-11. Haleakala National Park, resource management, vegetation management. 4 pages. Unpublished.

National Tropical Botanical Garden. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 30 pages. Unpublished.

Palmer, D.D. 2003. Hawaii’s ferns and fern allies. University of Hawaii Press, Honolulu, Hawaii. 324 pages.

[USFWS] U.S. Fish and Wildlife Service. 1997. Recovery plan for Maui plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 130 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, Hawaii; final rule. Federal Register 68(93):25934- 26165.

[USFWS] U.S. Fish and Wildlife Service. 2010. Maui nui task force meeting notes, 2010-09-09. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 11 pages. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2011. *Huperzia mannii* 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 18 pages.

[USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; listing 38 species on Molokai, Lanai, and Maui as endangered and designating critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; proposed rule. Federal Register 77(112):34464-34775.

Volcano Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 21 pages. Unpublished.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Huperzia mannii* (wawae'iole)

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

Appropriate Listing/Reclassification Priority Number, if applicable: _____

for **Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office**

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