5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Remya mauiensis* (Maui remya)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawaii, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573.

Lead Region/Field Office:

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

Name of Reviewers:

Cheryl Phillipson, Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Gregory Koob, 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 (USFWS) beginning in August 2017. The review was based on a review of current, available information since the last 5-year review for *Remya mauiensis* (USFWS 2014). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Gregory Koob, 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 reviews for *Remya mauiensis* published in the Federal Register on July 23, 2009 and June 5, 2014 (available at *http://ecos.fws.gov/docs/five_year_review/doc2436.pdf* and *https://ecos.fws.gov/docs/five_year_review/doc4412.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 *R. mauiensis*.

This short-lived perennial shrub in the Asteraceae (sunflower) family is endangered and endemic to west Maui. The current status and trends for *Remya mauiensis* are provided in the tables below.

New Status Information:

- There are three populations at one location, Kauaʻula, west Maui, totaling approximately 400 individuals (PEPP 2017; Oppenheimer 2018, in litt.) and one population at Pāpalaua-Manawainui Gulches (undetermined number of individuals) (PEPP 2017). There is no new information regarding the status of populations at Lihau, Pōhākea, and Ukumehame.
- In 2016, 18 critical habitat units in five ecosystems (lowland dry, lowland mesic, lowland wet, montane mesic, and wet cliff) were designated on west Maui for *Remya mauiensis* (12,536 ac; 5,074 ha) (81 FR 17790, March 30, 2016).

New Threats:

- Climate change loss or degradation of habitat—We previously reported that climate change may pose a threat to this species, anticipating an analysis by 2013. The assessment conducted by Fortini *et al*. (2013) concluded that *Remya mauiensis* is extremely vulnerable to the impacts of climate change, with a vulnerability score of 0.889 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). In addition, this species has no overlap between current and future climate envelopes, and is unlikely to tolerate expected changes in climate at its current location. This means that this species must persist within suitable microrefugia, or move to newly available climate-compatible areas to avoid extinction. Therefore, additional management actions, including the possibility of assisted translocations, are needed to conserve this taxon into the future.

New Management Actions:

- Surveys and inventories—In 2016, the Plant Extinction Prevention Program (PEPP) noted that additional surveys of known populations on west Maui were needed to determine if elevation to PEPP status (fewer than 50 wild individuals) of this species was necessary (PEPP 2016).
- Captive propagation for genetic storage and reintroduction—In 2017, Lyon Arboretum Micropropagation Laboratory reported three containers of propagules of *Remya mauiensis* from collections made in 2012 in storage. The Lyon Seed Conservation Laboratory reports over 99,000 seeds in storage from collections representing multiple individuals from populations at Kauaʻula and Pōhākea (Lyon Arboretum 2017).

Synthesis:

Currently, there are four populations of *Remya mauiensis* in one restricted area on west Maui, totaling approximately 400 individuals for three of the four populations, and an uncertain number of individuals at the fourth. A landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *R. mauiensis* is extremely vulnerable to the effects of climate change, in that this species is unlikely to tolerate expected changes in climate at its current location. Seed collections are in storage.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Maui Plant Cluster (USFWS 1997), 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.

Remya mauiensis is a short-lived perennial shrub, possibly self-incompatible. 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 west Maui. Each of these populations must be naturally reproducing (i.e., viable seeds, seedlings, saplings) 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 as, although there are three populations of at least 100 individuals, it is uncertain how many are reproducing annually, genetic representation is incomplete (Table 1), and not all threats are being sufficiently managed throughout the range of the species (Table 2). Therefore, *Remya mauiensis* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
We are not aware of any new threats or significant new information regarding the species' biological status since the last 5-year review in 2014. Thus, the following recommendations for future actions are reiterated for 5-year review for 2018.

- Surveys and inventories—Continue to survey for additional populations of *Remya mauiensis* in areas of potentially suitable habitat on west Maui. Reassess the status of populations at Lihau, Pōhākea, and Ukumehame.
- Ungulate monitoring and control—Construct exclosure fences to protect currently unfenced populations from the negative impacts of feral pigs, goats, cattle, and axis deer.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species around all populations *of R. mauiensis*.
- Captive propagation for genetic storage and reintroduction—
    - Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.

    - Evaluate genetic resources currently in storage to determine the need to place additional genetic resources in long-term storage due to this species' vulnerability to climate change.
- Reintroduction and translocation—Augment known populations and reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species.
- Climate change adaptation strategy—Research the suitability of habitat for reintroducing this species in the future due to impacts of climate change.
- Alliance and partnership development—Work with the West Maui Mountains Watershed Partnership to continue ecosystem-level restoration and management to benefit this species.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1991 (listing)	9	0	Three populations with minimum of 50 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in numbers	No
			Populations secure from threats	Partially
1997 (recovery plan)	9	0	Three populations with minimum of 50 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in numbers	No
			Populations secure from threats	Partially
2003 (critical habitat)	21	0	Three populations with minimum of 50 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in numbers	No

			Populations secure from threats	Partially
			Populations persisting for minimum of five years	No
Date	**No. wild individuals**	**No. outplanted**	**Downlisting Criteria identified in Recovery Plan**	**Downlisting Criteria Completed?**
2009 (5-year review)	320	0	5–7 populations with minimum of 300 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in numbers	Partially
			Populations secure from threats	Partially
			Populations persisting for minimum of five years	No
2014 (5-year review)	~ 500	0	5–7 populations with minimum of 300 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in numbers	Partially
			Populations secure from threats	Partially
			Populations persisting for minimum of five years	No
2016 (critical habitat)	ca 500	0	5–7 populations with minimum of 300 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in numbers	Partially

			Populations secure from threats	Partially
			Populations persisting for minimum of five years	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2018 (5-year review)	400+	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	No
			Three populations with 100 mature individuals each	Yes

* 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 *Remya mauiensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, one population fenced
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, some monitored areas
Fire loss or destruction of habitat	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	Partial, one population fenced
Invertebrate predation or herbivory	C	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	Partial, seed storage
Rodent and invertebrate predation or herbivory	C	Ongoing	None

References:

See the previous 5-year reviews for a full list of references (USFWS 2009, 2014). 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. Hawai‘i Cooperative Studies Unit, University of Hawai‘i at Hilo, Hawai‘i. 134 pp.

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

Lyon Arboretum. 2017. Micropropagation and seed conservation laboratory databases.

Oppenheimer, H. 2018, in litt. Current status of Maui plant species, excel table.

[PEPP] Plant Extinction Prevention Program. 2016. Plant Extinction Prevention Program FY 2016 Annual Report (Oct 1, 2015-Sep 30, 2016), US FWS CFDA Program #15.657; Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F14AC00174, December 24, 2016, UH Manoa, PCSU, PEPP. 237 pp.

[PEPP] 2017. Statewide species totals *ex situ*, Excel table.

[USFWS] U.S. Fish and Wildlife Service. 2014. *Remya mauiensis* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc4412.pdf.*

[USFWS] 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawai‘i, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573, February 12, 2016.

[USFWS] 2016. Endangered and threatened wildlife and plants; designation and nondesignation of critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; final rule. Federal Register 81 (61): 17790–18110, March 30, 2016.

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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**

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