

5-YEAR REVIEW
Short Form Summary
Species Reviewed: *Melicope makahae* (alani)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 167 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 87(90): 28031–28034, May 10, 2022.

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, Recovery Program 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 2023. The review was based on a review of current, available information since the last 5-year review for *Melicope makahae* (USFWS 2019). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Recovery Program 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/ecp/species/1171>).

Review Analysis:

Please refer to the previous 5-year review for *Melicope makahae* published in the Federal Register on August 30, 2019 (available at https://ecos.fws.gov/docs/tess/species_nonpublish/2794.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 *M. makahae*.

This long-lived perennial shrub or tree in the Rutaceae (rue) family is endangered and is known from the island of O‘ahu. The status and trends for *Melicope makahae* are provided in the tables below.

New Status Information:

- Currently, there are estimated to be 65 mature and four immature wild individuals in four populations in the Wai‘anae mountains of O‘ahu (Plant Extinction Prevention Program [PEPP] 2019–2023; Army Natural Resources Program of O‘ahu [ANRPO] 2023a). However, fewer than 20 plants have been monitored within the last 10 years and populations are in decline. Recruitment is observed at a subpopulation at ‘Ōhikilolo (ANRPO 2023b appendices, p. 253).
- Currently, only one founder at Mākaha is represented in seed collections and propagation (Lyon Arboretum 2022).

New Threats:

- None reported.

New Management Actions:

- Feral ungulate monitoring and control—Portions of the populations at ‘Ōhikilolo and Mākaha are within exclosures (PEPP 2019–2023; ANRPO 2023a).
- Nonnative invasive plant monitoring and control—The ANRPO manages the ‘Ōhikilolo population by controlling nonnative invasive plants (ANRPO 2021 appendices, p. 192).
- Collection and propagation for genetic storage and reintroduction—
 - In 2017, the Lyon Arboretum Seed Conservation Laboratory reported storage of 49 seeds representing one founder at Mākaha (Lyon Arboretum 2022).
 - In 2020, the O‘ahu Rare Plant Nursery reported propagation at the Pahole Rare Plant Facility of one plant representing one founder at Mākaha (O‘ahu Rare Plant Nursery 2023).

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

Date	No. wild individuals	No. Outplanted	*Preventing Extinction Targets identified by HPPRCC	*Preventing Extinction Targets Completed?
2012 (listing)	<200	1	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2019 (5-year review)	50–57	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partial

			Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations	No
			3 populations with 25 mature individuals each	No
2024 (5-year review)	15-69	0	All threats managed in all 3 populations	Partial, fencing at Kaukonahua and Helemano
			Complete genetic storage	Partial, 1 founder represented
			Natural reproduction at all 3 populations	Partial, recruitment at 1 subpopulation
			3 populations with 25 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 *Melicope makahae* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, fenced areas ‘Ōhikilolo and Mākaha
Degradation of habitat by established ecosystem-altering nonnative plants and competition	A, E	Ongoing	Partial, control in 2 fenced areas
Landslides and rockfall destruction and degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Invertebrate predation and herbivory	C	Ongoing	None
Reduced viability due to low numbers and no regeneration	E	Ongoing	Partial, seed collection and propagation

Synthesis:

Currently there are fewer than 20 to at most 69 wild individuals of *Melicope makahae* in four populations in the Wai‘anae mountains of O‘ahu. Populations are in decline. Portions of all populations have not been surveyed in more than 10 years. Two areas are fenced with some nonnative invasive plant control. Seed collections and plants in propagation represent only one founder.

Stabilizing (interim) and preventing extinction targets, and downlisting and delisting criteria are recommended-based on 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.

Melicope makahae is a long-lived perennial shrub or tree. 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 a total 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 seeds, seedlings, saplings) with a minimum of 25 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. No populations total more than 25 mature individuals. Only one founder from one population is represented in collections and propagation (Table 1). Recruitment is reported at one subpopulation (Table 1). Not all threats are being addressed (Table 2). Therefore, *Melicope makahae* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

No significant new information regarding the species' biological status has been reported since the last 5-year review in 2019. Thus, the following recommendations for future actions are updated or reiterated for the 5-year review for 2024.

- Surveys and monitoring—Continue to monitor known populations of *Melicope makahae*.
- Ungulate monitoring and control—Continue to construct and maintain exclosures to protect habitat and plants from the negative impacts of feral ungulates.
- Invasive nonnative plant monitoring and control—Control invasive nonnative plants at all populations of *M. makahae*.
- Climate change adaptation strategy—Research suitability of habitat in the future for viability of species due to the impacts of climate change.
- Predator and herbivore monitoring and control—Develop and implement control methods for the black twig borer.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
- Reintroduction and augmentation—Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to the species.
- Build resiliency, redundancy, and representation—Increase species' viability through habitat restoration, threat control, and reintroduction and translocation into suitable habitat that is being managed for known threats to this species to reduce impacts of landslides and rockfall, predation, low regeneration, and climate change.
- Alliance and partnership development—Continue to work with ANRPO, the State, and other land managers and partners to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

References:

- [ANRPO] Army Natural Resources Program of O‘ahu. 2021. 2021 Status report for the Mākua and O‘ahu Implementation Plans. Office of the Vice President for Innovation and Research, University of Hawai‘i. 207 pp., appendices 623 pp.
- [ANRPO] 2023a. 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.
- [ANRPO] 2023b. 2023 Status report for the Mākua and O‘ahu Implementation Plans, Prepared by Army Natural Resources Program, O‘ahu, Office of the Vice President for Research and Innovation, University of Hawai‘i. 255 pp., appendices 534 pp.
- [HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.
- 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.
- O‘ahu Rare Plant Nursery. 2023. 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.
- [PEPP] Plant Extinction Prevention Program. 2019–2023. Plant Extinction Prevention Program fiscal years 2019 to 2023 interim performance report (October 1, 2018-September 30, 2023). U.S. Fish and Wildlife Service CFDA Program \$15.657 Endangered Species Conservation—Recovery Implementation Funds, Cooperative Agreement: F18AC00502 (Final performance report), University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit. 105 pp.
- [USFWS] U.S. Fish and Wildlife Service. 2019. *Melicope makahae* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/five_year_review/doc/2794.pdf.
- [USFWS] 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 167 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 87(90): 28031–28034, May 10, 2022.

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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
- No Change in listing status

For Field Supervisor, Pacific Islands Fish and Wildlife Office

_____ Date_____