5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Melicope munroi* (alani)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 77 Species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86(120):33726–33728, June 25, 2021.

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, Acting Recovery 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) beginning in October 2022. The review was based on a review of current, available information since the last 5-year review for *Melicope munroi* (USFWS 2018). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Acting Recovery 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/ecp/species/5818*).

Review Analysis:

Please refer to the previous 5-year reviews for *Melicope munroi* published in the Federal Register on August 28, 2012, and October 23, 2018 (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1978.pdf* and *https://ecos.fws.gov/docs/tess/species_nonpublish/2649.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. munroi*.

This long-lived perennial tree in the Rutaceae (rue) family is endangered and occurs on Lāna‘i and has not been observed on Moloka‘i since 1910. The status and trends for *M. munroi* are provided in the tables below.

New Status Information:

- Currently, on Lānaʻi, there are approximately 60 wild individuals of *Melicope munroi* (Keir and Bogner 2021).
- There are no reports of any founders (wild plants) represented in *ex situ* storage and propagation.

New Threats:

- None reported.

New Management Actions:

- Surveys and inventories—Pūlama Lānaʻi and the Maui Nui Plant Extinction Program (Maui PEPP) monitor subpopulations of *Melicope munroi* on Lānaʻi and reported observations of two wild individuals in upper Hauola Gulch in 2021; eight individuals in Puʻu Aʻaliʻi between 2019 and 2020; and 13 individuals at Lānaʻihale between 2019 and 2021 (Maui PEPP 2021). Other subpopulations at Kaunoa, Hauola, Puʻu Aʻaliʻi, Lānaʻihale, and Waiʻopa likely remain as reported in 2018.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1999 (listing)	300–500	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2012 (5-year review)	300–800	0	All threats managed in all 3 populations	Partially, some fenced areas
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No

Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2018 (5-year review)	several dozen (Lānaʻi) 0 (Molokaʻi)	4	All threats managed in all 3 populations	Partially, some fenced areas
			Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
2023 (5-year review)	ca 60	0	All threats managed in all 3 populations	Partially, exclosure at Lānaʻihale
			Complete genetic storage	No
			Natural reproduction at all 3 populations	No
			3 populations with 25 mature individuals each	Partially, 1 population >25

* 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 munroi* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, Lānaʻihale exclosure
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant control in exclosure

Drought destruction and degradation	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Predation and herbivory by invertebrates	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	None

Synthesis:
Currently, there are approximately 60 individuals of *Melicope munroi* on Lānaʻi. There are no reports of founders represented in collections, propagation, or translocations. The population at Lānaʻihale consists of more than 25 mature individuals. The wild individuals except those at Kaunoa are within an exclosure with some invasive nonnative plant control.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Addendum to the Recovery Plan for the Multi-Island Plants (U.S. Fish and Wildlife Service 2002) and have been updated according to the draft revised recovery objective guidelines developed by the Hawaiʻi 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 munroi 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 Lānaʻi and Molokaʻi 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 as there is only one population (or two subpopulations) of at least 25 mature individuals, and no founders are represented in collections (Table 1). Threats, including drought and invertebrate predation or herbivory, are not sufficiently managed throughout the range of the species (Table 1, Table 2). Therefore, *Melicope munroi* 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 2018. Thus, the following recommendations for future actions are added or reiterated for the 5-year review for 2023.

- Surveys and inventories—Continue to survey for individuals of *Melicope munroi* in areas of potentially suitable habitat on Lānaʻi and Molokaʻi.
- Ungulate monitoring and control—Continue to maintain the Lānaʻihale summit exclosures and remove all feral ungulates from the fenced area to protect *M. munroi*.
- Invasive nonnative plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species, and those that compete with *M. munroi*, at all populations.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and determine future landscape needed for its recovery.
- Invertebrate monitoring and control—Develop and implement effective control methods for the black twig borer.
- Captive propagation for genetic storage and reintroduction—
    - Begin collection of genetic resources for storage, propagation, and translocation into protected suitable habitat within historical range.
    - Determine effective alternate methods of propagation (air-layering, micropropagation, cuttings) since seeds are not abundantly produced.
- Translocation and augmentation—Begin to augment the current populations and translocate individuals into suitable habitat within historic range that is being managed for known threats to this species.
- Build resiliency, redundancy, and representation—Increase numbers of populations and individuals throughout historic range to reduce impacts of drought, invertebrate predation, and low numbers.
- 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 taxon.

References:

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

Keir, M. and K. Bogner. 2021. *Melicope munroi*. The IUCN Red List of Threatened Species, 2021: e.T80172262A80172746. *https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T80172262A80172746.en.*

[Maui PEPP] Maui Plant Extinction Prevention Program. 2021. GIS plant data.

[USFWS] U.S. Fish and Wildlife Service. 2002. Addendum to the Recovery Plan for the Multi-Island Plants. U.S. Department of the Interior. Portland. 93 pp. + appendices.

[USFWS] 2012. *Melicope munroi* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/1978.pdf.*

[USFWS] 2018. *Melicope munroi* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/2649.pdf*.

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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**

LAUREN WEISENBERGER Digitally signed by LAUREN WEISENBERGER Date: 2023.08.23 16:17:34 -10'00'

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