5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Melicope zahlbruckneri* (alani)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2023. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 133 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 88(56): 17611–17614, March 23, 2023.

Lead Region/Field Office:

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

Name of Reviewer:

Daniel Adamski, 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 zahlbruckneri* (USFWS 2020). The evaluation by Daniel Adamski, 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/7338*).

Review Analysis:

Please refer to the previous 5-year reviews for *Melicope zahlbruckneri* published in the Federal Register on January 18, 2008 (available at *https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1176.pdf*), on August 3, 2015, (available at *https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2278.pdf*), and on September 30, 2020, (available at *https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3169.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. zahlbruckneri*.

This long-lived perennial tree in the Rutaceae (citrus) family is endangered and found on the island of Hawai‘i. The status and trends for *Melicope zahlbruckneri* are provided in the tables below.

New Status Information:

- At the time of the previous 5-year review in 2020, there were 15 wild individuals at Kīpukapuaulu and one plant at Laupāhoehoe. At least six of the wild individuals at Kīpukapuaulu were monitored in 2024, and of these, one individual wild plant had died (Hawai‘i Volcanoes National Park [HVNP] 2024; Plant Extinction Prevention Program [PEPP] 2024). No individual could be relocated at Laupāhoehoe, and the current estimate for the species is approximately five wild individuals remain (HVNP 2024; PEPP 2024; VanDeMark, J., pers. comm. 6 AUG 2025).
- Currently, there is one founder line represented in *ex situ* storage and propagation collections, including seeds in seed banks and plants in a nursery or living collection (HVNP 2024; Volcano Rare Plant Facility [VRPF] 2024).

New Threats:

- None

New Management Actions:

- Monitoring and surveys—HVNP staff and PEPP survey historic locations and monitors the current wild and reintroduced populations of *Melicope zahlbruckneri* (HVNP 2024; PEPP 2024).
- Established ecosystem altering invasive plant species control—Nonnative grasses and plants are controlled by HVNP staff and PEPP at Kīpukapuaulu (HVNP 2024; PEPP 2024).
- Collection and propagation for genetic storage and reintroduction—
    - HVNP reports collection of eight seeds from two wild individuals at Kīpukapuaulu, and an additional 34 seeds and four cuttings from outplanted individuals (HVNP 2024).
    - Volcano Rare Plant Facility [VRPF] reports 24 seeds in storage and two potted plants representing one founder from Kīpukapuaulu (VRPF 2024).
- Translocations—Between 2004 and 2014, there were approximately 43 individuals reintroduced at HVNP at two outplanting sites, Kīpuka Ki and Kīpuka Ahi. During monitoring at both sites in 2024, outplanted individuals were observed and air-layering was attempted, although the exact number of plants observed was not reported (HVNP 2024).

Table 1. Status and trends of *Melicope zahlbruckneri* from listing through current 5-year review. Table 1a shows progress according to Interim Stabilization Goals; Table 1b shows progress according to Preventing Extinction Goals.

Table 1a.

Date	No. wild individuals	No. Outplanted	Stability Goals identified in Recovery Plan	Stability Goals Completed?
1996 (Listing)	30–35	0	All threats managed in the 3 populations	Partially
			Complete genetic storage	No
			3 populations with 25 individuals each	Partially
2008 (5-year review)	35	4	All threats managed in the 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 individuals each	Partially
2015 (5-year review)	25	38	All threats managed in the 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 individuals each	Partially

Table 1b.

Date	No. wild individuals	No. outplanted	*Preventing Extinction Targets identified by HPPRCC	*Preventing Extinction Targets Completed?
2020 (5-year review)	15	0	All threats managed in all 3 populations	Partially
			Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2025 (5-year review)	5	unknown	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations	Partially
			3 populations with 50 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 zahlbruckneri* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate predation, and destruction and degradation of habitat	A, C	Ongoing	Partial, some individuals are fenced
Established ecosystem altering invasive plant species degradation of habitat	A, E	Ongoing	None
Habitat degradation and destruction by fire	A	Ongoing	Partial, fire management plan for HVNP
Climate change degradation and loss of habitat	A	Ongoing	None
Rodent predation and herbivory	C	Ongoing	None
Invertebrate herbivory by slugs	C	Ongoing	None
Lack of adequate hunting regulations	D	Ongoing	Partial, some individuals are fenced
Reduced viability due to low	E	Ongoing	Partial, seed collections, air-layering, propagation, and reintroduction ongoing

Synthesis:
Currently there are five wild individuals of *Melicope zahlbruckneri* on the island of Hawai‘i. Individuals are provided protection from ungulates by fencing. Seed collections and propagation are ongoing.

Stabilizing (interim) targets, and Downlisting and Delisting criteria are provided in the Addendum to the Recovery Plan for the Big Island Plant Cluster (USFWS 1998), and 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. 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 zahlbruckneri is a long-lived perennial tree that is 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 a total of three populations should be documented on the island

of Hawai‘i, where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings) with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met (Table 1). There are only five wild individuals, all threats are not being managed, and genetic storage is not complete (Table 2). Therefore, *Melicope zahlbruckneri* 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 2020. Thus, the following recommendations for future actions are updated or reiterated for the 5-year review for 2025.

- Surveys and monitoring—
  - Continue to monitor known populations of *Melicope zahlbruckneri* to assess resiliency and make collections.
  - Determine suitable locations for reintroductions.
- Ungulate monitoring and control—Monitor and maintain existing fenced exclosures and construct new fences to protect individuals from the negative impacts of browsing by ungulates.
- Invasive nonnative plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species, and those that compete with *Melicope zahlbruckneri.*
- Site and habitat protection—
  - Develop and implement effective control measures to reduce the impacts of destruction by fire and continue to update fire management plans.
- Predator and herbivore monitoring and control—
  - Develop and implement effective control measures to reduce the impact of invasive invertebrate predation, specifically from slugs.
  - Develop and implement effective control measures to reduce the impact of invasive vertebrate predation from rats.
- Climate change adaptation strategy—Research suitability of habitat for viability of species, including where to conduct translocations in the future due to the impacts of climate change.
- Captive propagation for genetic storage and reintroduction—Continue to maintain collection and propagation efforts for maintenance of genetic stock and for reintroduction.
- 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 reduced viability due to low numbers.
- Research—Conduct genetic studies to determine genetic variation within the population (and between populations) and plan an effective breeding program.

- Alliance and partnership development—Continue to work with partners and other land managers in preventing site destruction from commercial timber harvest, as well as 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.

[HVNP] Hawai‘i Volcanoes National Park. 2024. Annual report to the U.S. Fish and Wildlife Service threatened and endangered plants Hawaii Volcanoes National Park ES019078. 39 pp.

[PEPP] 2024. Plant Extinction Prevention Program FY 2023 annual report Oct 1, 2023-Sep 30, 2024), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F14AC00174, December 24, 2016, UH Mānoa, PCSU, PEPP. 56 pp.

[USFWS] U.S. Fish and Wildlife Service. 1998. Addendum to Recovery plan for the Big Island plant cluster. Portland. 69 pp. + appendices.

[USFWS] 2008. *Melicope zahlbruckneri* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1176.pdf*.

[USFWS] 2015. *Melicope zahlbruckneri* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2278.pdf*.

[USFWS] 2020. *Melicope zahlbruckneri* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3169.pdf*.

[USFWS] 2023. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 133 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 88(56): 17611–17614, March 23, 2023.

[VRPPF] Volcano Rare Plant Propagation Facility. 2024. 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.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Melicope zahlbruckneri* (alani)

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 Reclassify from Endangered to Threatened status
_____ No Change in listing status

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

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