

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Melicope paniculata* (alani)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.

Lead Region/Field Office:

Interior Region 12/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, 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 (Service or USFWS) beginning in October 2021. The review was based on a review of current, available information since the last 5-year review for *Melicope paniculata* (USFWS 2017). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, 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 (<https://ecos.fws.gov/ecp/species/7436>).

Review Analysis:

Please refer to the previous 5-year review for *Melicope paniculata* published in the Federal Register on September 16, 2017 (available at http://ecos.fws.gov/docs/tess/species_nonpublish/2475.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. paniculata*.

This long-lived perennial tree in the Rutaceae (rue or citrus) family is listed as endangered and is known from the island of Kaua‘i. The status and trends for *Melicope paniculata* are provided in the tables below.

New Status Information:

- There are 318 wild individuals of *Melicope paniculata* on Kaua‘i (Nagendra et al. 2020a). In 2017, a new individual was discovered at Blue Hole and two individuals were monitored at the north fork of the Wailua river, with occasional plants observed in the Lumaha‘i drainage area (PEPP 2017; NTBG 2017a, b). In 2021, one of the two wild founders at Limahuli was observed to be in declining health; the other was fruiting (Nagendra et al. 2021).

New Threats:

- None reported.

New Management Actions:

- Surveys and monitoring—The Plant Extinction Prevention Program (PEPP) and the National Tropical Botanical Garden (NTBG) monitor and survey for populations of *Melicope paniculata* on Kaua‘i (NTBG 2017a, b; PEPP 2017).
- Feral ungulate monitoring and control—One subpopulation is within an enclosure (Nagendra et al. 2020a).
- Collection and propagation—
 - In 2018, 25 seeds were collected from two founders of *Melicope paniculata* at Limahuli and stored at NTBG (Nagendra 2018; NTBG 2021). In 2019, cuttings were collected from one founder at Limahuli for propagation at NTBG (Nagendra et al. 2020b).
 - In 2022, the Lyon Arboretum Micropropagation Laboratory reported 155 explants in storage representing two founders from Lumaha‘i (Lyon Arboretum 2022).
 - Approximately 126 plants have been outplanted at Limahuli Garden and Preserve (NTBG 2021).

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

Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2010 (listing and critical habitat)	ca 500	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No

2017 (5-year review)	125	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	Unknown
			3 populations with 25 mature individuals each	Partially
2022 (5-year review)	318	0	All threats managed in all 3 populations	Partially, 1 subpopulation in enclosure
			Complete genetic storage	Partially, 4 founders from 2 populations represented
			Natural reproduction at all 3 populations	Unknown
			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 paniculata* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat and herbivory by feral ungulates	A, C	Ongoing	Partial, 1 subpopulation in enclosure
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, 1 subpopulation in enclosure
Landslide and flooding destruction or degradation of habitat	A	Ongoing	None
Climate change degradation and destruction of habitat, including hurricanes	A	Ongoing	None
Rodent predation and herbivory	C	Ongoing	None
Invertebrate predation and herbivory	C	Ongoing	None

Inadequacy of existing regulatory mechanisms—lack of adequate hunting and biosecurity legislation	D	Ongoing	None
---	---	---------	------

Synthesis:

Currently, there are 318 wild individuals of *Melicope paniculata* on Kaua‘i. One subpopulation is within a managed enclosure. Only four founders from two populations are represented in collections.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Kaua‘i Islandwide Recovery Plan (USFWS 2021) 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.

Melicope paniculata is a long-lived perennial 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 Kaua‘i where this species now occurs or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings) with a minimum of 25 mature, reproducing individuals per population.

The preventing extinction goals for *Melicope paniculata* have not been met. There are 318 observed wild individuals mostly in one location (Table 1). However, only four founders have recent collections of seeds or propagules (Table 1, Table 2). This species is susceptible to threats including ungulate, rodent and invertebrate predation, nonnative plant competition, and landslides (Table 2). Therefore, *M. paniculata* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

No new threats and no significant new information regarding the species’ biological status have been reported since the last 5-year review in 2017. Thus, the following recommendations for future actions are reiterated or updated for the 5-year review for 2022.

- Surveys and inventories—Continue to survey for populations of *Melicope paniculata* in areas of potentially suitable habitat and monitor known populations to determine their current status.
- Ungulate monitoring and control—Construct and maintain exclosures to protect all occurrences from habitat disturbance and herbivory by feral ungulates.
- Nonnative invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species and those that compete with *M. paniculata* at all populations.
- Predator and herbivore monitoring and control—
 - Implement effective control measures for rats at all populations.
 - Determine effective methods to control invertebrates and the black twig borer and implement control measures if necessary.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock.
- Build resiliency and redundancy — Increase species’ viability through habitat restoration, threat control, and reintroduction and translocation into suitable habitat within historic range that is being managed for known threats to this species to reduce impacts of climate change, hurricanes, landslides, and flooding.
- Population biology research—Study *M. paniculata* populations to determine viable population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- 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 species.

References:

[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.

Nagendra, U. 2018. Limahuli Preserve rare plant restoration project, National Tropical Botanical Garden, FWS Agreement #F13AC00504, September 30, 2014-October 30, 2018. 16 pp.

Nagendra, U., B. Nyberg, and K. Wood. 2020a. *Melicope paniculata*. The IUCN Red List of Threatened Species 2020: e.T33675A83803153.
<https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T33675A83803153.en>.

Nagendra, U., A. Ramelb, and K. Jensen. 2020b. Limahuli Preserve rare plant conservation collections and habitat restoration project, National Tropical

- Botanical Garden, FWS Agreement #F18AC00508, October 1, 2019-September 30, 2020. 18 pp.
- Nagendra, U., M. Kahokuloa, Jr., and S. Umetsu. 2021. Limahuli Preserve rare plant conservation collections and habitat restoration project, National Tropical Botanical Garden, FWS Agreement #F18AC00508, October 1, 2020-September 30, 2021. 21 pp.
- [NTBG] National Tropical Botanical Garden. 2017a. NTBG database herbarium record detail for *Melicope paniculata*, PTBG1000062415, 076420, 4 APR 2017.
- [NTBG] 2017b. NTBG database herbarium record detail for *Melicope paniculata*, PTBG 100084239, 085270, 7 DEC 2017.
- NTBG 2021. 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. 2017. Plant Extinction Prevention Program FY 2017 annual report (Oct 1, 2016-Sep 30, 2017), Coop Agreement: F14A00174, U.S. Fish and Wildlife Service CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds. 235 pp.
- [USFWS] U.S. Fish and Wildlife Service. 2017. *Melicope paniculata* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/tess/species_nonpublish/2475.pdf.
- [USFWS] 2020. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.
- [USFWS] 2021. Kaua'i Islandwide Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 65 pp. + appendices.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Melicope paniculata* (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
- No Change in listing status

For Field Supervisor, Pacific Islands Fish and Wildlife Office

_____ Date_____