5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Melicope reflexa* (alani)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

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, 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) beginning in October 2018. The review was based on a review of current, available information since the last 5-year review for *Melicope reflexa* (USFWS 2011). The evaluation completed 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 (*http://ecos.fws.gov/tess_public*).

Review Analysis:

Please refer to the previous 5-year review for *Melicope reflexa* published in the Federal Register on August 2, 2011 (available at *https://ecos.fws.gov/docs/five_year_review/doc3791.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 *M. reflexa*.

This long-lived perennial sprawling shrub in the Rutaceae (rue) family is endangered and endemic to Moloka‘i. The current status and trends for *Melicope reflexa* are provided in the tables below.

New Status Information:

- Currently, there are 70 to 100 individuals of *Melicope reflexa* in one population (Kaluaʻaha-Mapulehu) on Molokaʻi (Bakutis 2019, in litt.). The current status of a second occurrence at Puʻuʻōhelo is unknown; however, in 2015 there were estimated to be approximately 100 individuals at both populations combined (Weisenberger *et al.* 2015).
- In 2016, seven critical habitat units in three ecosystems (lowland mesic, lowland wet, and montane wet) were designated for *Melicope reflexa* on Molokaʻi (21,998 ac, 8,902 ha) (81 FR 17790, March 30, 2016).

New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this species. Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi using high resolution climate change projections. Climate change vulnerability is defined as the relative inability of a species to display the possible responses necessary for persistence under climate change. The assessment by Fortini *et al.* (2013) concluded that *Melicope reflexa* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.679 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.

New Management Actions:

- Fencing for ungulates—The proposed Pākuʻi fence, when completed, will provide *Melicope reflexa* protection from habitat degradation and predation by feral ungulates (The Nature Conservancy 2017).

Synthesis:

Currently there are 70 to 100 individuals of *Melicope reflexa* in one population on Molokaʻi, and possibly a small number of individuals (as many as 30) at second population. 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 *M. reflexa* is highly vulnerable to the effects of climate change. Fencing is planned and may protect this population from habitat degradation and predation by feral ungulates when completed.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Oʻahu Plants (USFWS 1998), 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 reflexa is a long-lived perennial sprawling shrub. 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 Moloka‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e.,* viable seeds, seedlings, saplings) and increasing in number, with a minimum of 25 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There is one population totaling 70 to 100 individuals, and a second population of unknown status. Genetic representation has not been initiated and not all threats are managed (Table 1, Table 2). Therefore, *Melicope reflexa* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
Other than the new data on this taxon’s vulnerability to climate change, we are not aware of any new threats or significant new information regarding the species’ biological status since the last 5-year review in 2011. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2019.

- Surveys and inventories—Continue to conduct thorough surveys of suitable habitat where *Melicope reflexa* currently and historically occurred for a thorough assessment of the species.
- Ungulate monitoring and control—Construct and monitor fencing to provide protection from the negative impacts of feral ungulates.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species, and those that compete with *Melicope reflexa* at all populations.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for the recovery of the species.
- Predation an herbivory by ungulates—Construct and monitor fencing to provide protection from predation and herbivory by ungulates.
- Rodent predation and herbivory—Control rats in the vicinity of all known populations.
- Invertebrate predation and herbivory—Develop and implement methods to control the black twig borer.
- Captive propagation—Collect material for genetic storage and for propagation and reintroduction. Propagate to establish and augment populations.

- Research—Research taxonomy and genetic relationships to clarify the *M. volcanica/M. reflexa/M. pseudoanisata* species complex.
- Alliance and partnership development—Work with the Division of Forestry and Wildlife, the East Molokaʻi Watershed Partnership, and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1992 (listing)	<1,000	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
1996 (recovery plan)	<1,000	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
2003 (critical habitat)	<1,000	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
2011 (5-year review)	6	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
2012 (critical habitat)	6	0	All threats managed in all three populations	No

			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2019 (5-year review)	70–100	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	No
			Three 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 after Preventing Extinction).

Table 2. Threats to *Melicope reflexa* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate destruction and degradation of habitat	A	Ongoing	None
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Ungulate predation and herbivory	C	Ongoing	None
Rodent predation and herbivory	C	Ongoing	None
Invertebrate predation and herbivory	C	Ongoing	None
Competition with established invasive plant species	E	Ongoing	None
Low numbers	E	Ongoing	None

References:

See previous 5-year review for a full list of references (USFWS 2011). Only references for new information are provided below.

Bakutis, A. 2019, in litt. Email regarding current status of *Melicope reflexa* on Molokaʻi, 5 AUG 2019.

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. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 134 pp.

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

The Nature Conservancy. 2017. Final environmental assessment and finding of no significant impact for the Pākuʻi watershed project. Prepared for the East Molokaʻi Watershed Partnership. 48 pp. + appendices.

[USFWS] 2011. *Melicope reflexa* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc3791.pdf.*

[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. Department of the Interior, Federal Register 81 (61): 17790–18110, March 30, 2016.

[USFWS] U.S. Fish and Wildlife Service. 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

Weisenberger, L., T. Portner, M. Keir, V.L. Caraway, and J. Kwon. 2015. *Melicope reflexa.* The IUCN Red List of Threatened Species 2015: e.T80172785A80172818. *http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T80172785A80172818.en.*

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SIGNATURE PAGE for 5-YEAR REVIEW of *Melicope reflexa* (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	No Change in listing status

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

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