Melicope mucronulata
(Alani)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW

Species reviewed: *Melicope mucronulata* (Alani)

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5-YEAR REVIEW
Melicope mucronulata (Alani)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Jesse D'Elia, Chief, Division of Recovery, (503) 231-2071

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor for Endangered Species, (808) 792-9400

Cooperating Field Office(s):
N/A

Cooperating Regional Office(s):
N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) between June 2006 and June 2007. The National Tropical Botanical Garden provided most of the updated information on the current status of *Melicope mucronulata*. They also provided recommendations for conservation actions that may be needed prior to the next five-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator. These comments were incorporated into the draft five-year review. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before final approval.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:
USFWS. 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

1.3.2 Listing history

Original Listing
FR notice: USFWS. 1992. Determination of endangered or threatened status for 21 plants from the island of Maui, Hawaii final rule. Federal Register 57(95):20772-20788.
Date listed: May 15, 1992
Entity listed: Species
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.3.3 Associated rulemakings:

USFWS. 2003a. Endangered and threatened wildlife and plants: final designation or nondesignation of critical habitat for 42 plant species from the island of Molokai, HI: final rule. Federal Register 68(52):12982-13141.

USFWS. 2003b. Endangered and threatened wildlife and plants: final designation or nondesignation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, HI: final rule. Federal Register 68(93):25934-26165.

Critical habitat was designated for *Melicope mucronulata* in five units totaling 456 hectares (1,127 acres) on Molokai and 2 units totaling 228 hectares (564 acres) on Maui. This designation includes habitat on state and private lands (USFWS 2003a and b).

1.3.4 Review History:

Species status review [FY 2006 Recovery Data Call (September 2006)]: Declining

Recovery achieved:
1 (0-25%) (FY 2006 Recovery Data Call)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

5

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Recovery plan for the Maui plant cluster. 1997. U.S. Fish and Wildlife Service, Portland, Oregon. 130+pages.
Date issued: July 29, 1997
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

_____ *Yes*
__X__ *No*

2.1.2 Is the species under review listed as a DPS?

____ *Yes*
__X_ *No*

2.1.3 Was the DPS listed prior to 1996?

____ *Yes*
____ *No*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____ *Yes*
____ *No*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____ *Yes*
____ *No*

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

____ *Yes*
__X_ *No*

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X_ *Yes*
____ *No*

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

__X_ *Yes*
____ *No*

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

__X__ *Yes*
____ *No*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Factors A, C, D, and E) affecting this species is presented in section 2.4. Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Maui plant cluster (USFWS 1997), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Melicope mucronulata* is a long-lived perennial, and to be considered stable, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on Maui and at least one on Molokai, where the species now occurs or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Melicope mucronulata* should be documented on Maui and at least one other on Molokai where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 100 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Melicope mucronulata* should be documented on Maui and at least one other on Molokai where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 100 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section I.C.5 ("Associated Rulemakings") and in section II.D ("Synthesis") below, which also includes any new information about the status and threats of the species.

Status of *Melicope mucronulata* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
1992 – listing	5	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1997 – recovery plan	3	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 – critical habitat	3	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2007 – 5-yr review	2	0	All threats managed	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

2.3.1.4 Taxonomic classification or changes in nomenclature:

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

2.3.1.7 Other:

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

Melicope mucronulata was known historically from Molokai and East Maui, and was rediscovered on Molokai in 1985 and East Maui in 1983 (Stone *et al.* 1999; Hawaii Biodiversity and Mapping Program 2005). There has been a decline in both numbers of individuals and populations historically, and the East Maui population has not been seen since 1983 (Wood *et al.* 2002; Hawaii Biodiversity and Mapping Program 2005). Only two populations remain, at Onini Gulch and Kupaia Gulch on Molokai. Kupaia Gulch has only one tree. There were four trees at Onini Gulch as recently as 2002 (Wood *et al.* 2002) and one of them had died, probably from an infestation by

coffee twig borer (*Xylosandra compactum*). The fourth tree seen by Ken Wood in 2002 has not been located since, leaving a total of three known individuals (Perlman 2006).

The surviving plants grow at 2,500 to 3,000 foot (672 to 914 meters) elevation, on north-facing steep slopes in deep rich brown soil with terrestrial moss and leaf litter (Wood *et al.* 2002).

Habitat modification by feral ungulates (goats, pigs, and axis deer) continues in the area of the last known plants (Factors A and D) (USFWS 1997; Wood *et al.* 2002; Perlman 2006). *Melicope mucronulata* is also threatened by habitat degradation by and competition from introduced invasive plant species (Factor E) (Tangalin 2006). The coffee twig borer (*Xylosandrus compactus*) may be responsible for the death of at least one previously healthy tree at Onini Gulch (Factor C) (Perlman 2006). This insect does attack the plants in the nursery (R. Nishek, National Tropical Botanical Garden, pers. comm., 2006). An endemic insect (*Prays* cf. *fulvocanella*) in known to feed on buds, flowers and seeds of various *Melicope* species and may impact this species (Factor C) (USFWS 1997). Rats have been observed to eat the seeds (Factor C) (Perlman 2006).

The majority of Hawaiian *Melicope* species are dioecious (flowers of males and females on separate plants) (Stone *et al.* 1999). Although the breeding system of *Melicope mucronulata* is uncertain, one of the collected specimens is apparently hermaphroditic, having a well developed pistil (female reproductive part) and eight taller apparently normal stamens (male reproductive parts) and was able to fruit. The other specimen exanimate was a female with a well developed pistil and non-functional stamens (D. Lorence, National Tropical Botanical Garden, pers. comm. 2007).

Species like *Melicope mucronulata* that are currently restricted to one small portion of an island, and limited to a few populations and individuals, are inherently more vulnerable to extinction than widespread species because of the higher risks posed by genetic bottlenecks, random demographic fluctuations and localized catastrophes such as hurricanes, landslides or drought (Factor E) . This species is also threatened by fire and flood (Factor E) (Wood *et al.* 2002; Perlman 2006; Tangalin 2006).

Approximately twenty seed collections were made by National Tropical Botanical Garden field botanists between 1997 and 2006, but at this time National Tropical Botanical Garden has only three plants alive in the greenhouse, and one outplanted in the Native Hawaiian collection for genetic storage (National Tropical Botanical Garden 2006). Lyon Arboretum has one seedling in their greenhouse from the Kupaia Gulch population and one seedling in their lab from the Onini Gulch population (N. Sugii, pers. comm., 2006; Harold L. Lyon Arboretum Micropropagation Laboratory 2006). In February 2006, three plants from the National Tropical Botanical Garden nursery were taken to Kalaupapa National Historic Monument on Molokai. Two

survived and will be outplanted as soon as a secure location is established (B. Garnett, pers. comm. 2006).

The stabilization and recovery goals for this species have not been met, as only two individuals are known. Therefore, *Melicope mucronulata* meets the definition of endangered as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X__ No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS:

- Continue seed collection for genetic storage.
- Fence individual plants for short-term protection from ungulates.
- Control introduced invasive plant species around remaining plants.
- Control rodents around remaining plants.
- Experiment with various propagation methods (air layers, micropropagation, grafting, and cuttings), since seeds are not abundantly produced.
- Survey for populations in known historical sites and suitable habitat.
- Augment populations as plants become available in nurseries.

- Reintroduce individuals into suitable habitat within historical range that is being managed for the known threats to this species.

5.0 REFERENCES:

Harold L. Lyon Arboretum Micropropagation Laboratory. 2006. Report on controlled propagation of species, as designated under the U.S. Endangered Species Act. Unpublished.

Hawaii Biodiversity and Mapping Program. 2005. Program Database, Unpublished.

National Tropical Botanical Garden. 2006. Database of accessions, including plantout records.

Perlman, S. 2006. National Tropical Botanical Garden, field log summaries, compiled June, 2006. Unpublished.

Stone, C.B., W.L. Wagner, and D.R. Herbst. 1999. Rutaceae (Rue family). Pages. 1174-1216 *in* Wagner, W.L., D.R. Herbst, and S.H. Sohmer (editors), Manual of the flowering plants of Hawai`i, Revised Edition. University of Hawai`i Press, Bishop Museum Press, Special Publication. 97: 1-1918.

Tangalin, N. 2006. National Tropical Botanical Garden, field log summaries. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2003a. Endangered and threatened wildlife and plants: final designation or nondesignation of critical habitat for 42 plant species from the island of Molokai, Hawaii; final rule. Federal Register 68(52):12982-13141.

[USFWS] U.S. Fish and Wildlife Service. 2003b. Endangered and threatened wildlife and plants: final designation or nondesignation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, HI; final rule. Federal Register 68(93):25934-25165.

[USFWS] U.S. Fish and Wildlife Service. 1997. Recovery plan for the Maui Plant cluster, Portland, OR. 130+ pages.

[USFWS] U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; Determination of endangered or threatened status for 15 plants from the island of Maui, HI; final rule. Federal Register 57(95):20772-20788.

Wood, K., M.H. Chapin, S. Perlman and M. Maunder. 2002. Critically endangered Hawaiian plant taxa and conservation collections within the Genetic Safety Net. Unpublished

Personal and Written Communications:

Bill Garnett, Endangered Species Horticulturist, Kalaupapa National Historic Monument, June 30, 2006.

David H. Lorence, Director of Science, National Tropical Botanical Garden, February 28, 2007.

Robert Nishek, Nursery Manager, National Tropical Botanical Garden, July 6, 2006.

Nellie Sugii, Researcher, Lyon Arboretum Tissue Culture Laboratory, June 27, 2006.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Melicope mucronulata* (Alani)

Current Classification: E

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:

Marilet A. Zablan, Recovery Program Leader and Acting Assistant Field Supervisor for Endangered Species, June 24, 2007
Marie Bruegmann, Plant Recovery Coordinator, January 17, February 6 and 20, May 24, and June 29, 2007
Christian Torres-Santana, Fish and Wildlife Biologist, December 20, 2006, January 12, February 16 and 18, 2007

Approve Patrick Leonard Date 1/16/08
Lead Field Supervisor, Fish and Wildlife Service