

Melicope reflexa
(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 reflexa* / alani

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5-YEAR REVIEW
Melicope reflexa (alani)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

Region 1, Endangered Species Program, Division of Recovery, Jesse D`Elia, (503) 231-2071

Lead Field Office:

Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (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 of the U.S. Fish and Wildlife Service (USFWS), beginning on March 16, 2009. The review was based on final critical habitat designations for *Melicope reflexa* and other species from the islands of Molokai (USFWS 2003) as well as a review of current, available information. The National Tropical Botanical Garden provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Samuel Aruch, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Lead and the Assistant Field Supervisor for Endangered Species before submission to the Deputy Field Supervisor for approval.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2009. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 103 species in Hawaii. Federal Register 74(49):11130-11133.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1992. Endangered and threatened wildlife and plants; determination of threatened or endangered status for 16 plants from the island of Molokai, Hawaii; final rule. Federal Register 57(196):46325-46340.

Date listed: October 8, 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. 2003. Endangered and threatened wildlife and plants; final designations and nondesignations of critical habitat for 42 plant species from the island of Molokai, Hawaii; final rule. Federal Register 68(52):12982-13141.

Critical habitat was designated for *Melicope reflexa* in two units totaling 2,710 hectares (6,695 acres) on the island of Molokai. This designation includes habitat on State and private lands (USFWS 2003).

1.3.4 Review History:

Species status review [FY 2010 Recovery Data Call (September 2010)]: Declining

Recovery achieved:

1 (0-25%) (FY 2007 Recovery Data Call – most recent year reported)

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

8

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: U.S. Fish and Wildlife Service. 1996. Recovery plan for the Molokai plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 143 pages.

Date issued: September 26, 1996.

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
 No

2.1.2 Is the species under review listed as a DPS?

Yes
 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
 No

2.2 Recovery Criteria

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

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?

Yes
 No

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

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 (Listing Factors A, C, D, and E) affecting this species is presented in section 2.3.2 and Table 2. Listing 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 Molokai plant cluster recovery plan (USFWS 1996), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Melicope reflexa* is a long-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced, weeding, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on Molokai, and if possible, at least one other island where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population.

Currently, there are at least two populations totaling fewer than six individuals and all threats have not been managed. This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Melicope reflexa* should be documented on islands where they now occur 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 reflexa* should be documented on islands where they now occur 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 long-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

No new information.

2.3.1 Biology and Habitat

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

No new information.

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:

Melicope reflexa is endemic to the island of Molokai. Approximately 20 individuals were seen in 2001 on Kukuinui Ridge and on forested slopes above Wailau and Kahawaiiki at 607 to 762 meters (1,991 to 2,500 feet) elevation (National Tropical Botanical Garden 2009a).

Historical observations include in Kaluaaha, in 1912; Puniuohua at 762 meters (2,500 feet) elevation in 1923; Waikolu Valley, on a ridge between Hanalilolilo and Pepeopae, at 1,189 meters (3,900 feet) elevation in 1932; Mapulehu Valley at 792 meters (2,600 feet) elevation in 1932; in Kamakou near Hanalilolilo in 1969; Honomuni, southeast of Kawaiuliuli Gulch, in 1979 at about 884 meters (2,900 feet) elevation; and Wailau to Mapulehu summit area from 792 to 975 meters (2,600 to 3,200 feet) elevation in 1989 (Hawaii Biodiversity and Mapping Program 2009; Wood 2009). Although a single specimen collected by Oppenheimer in Wailau in 1997 at 841 meters

(2,760 feet) elevation was identified by Dave Lorence of the National Tropical Botanical Garden as *M. volcanica*, Oppenheimer believes there is also *M. reflexa* in that area (Oppenheimer 2010).

In 2009, Oppenheimer observed a single individual at Puniuohua which he thinks is probably *Melicope reflexa*. It was in very poor condition due to pigs (*Sus scrofa*) and deer (*Axis axis*) and the degradation of the surrounding plant community. Also in 2009, Oppenheimer saw five individual trees at Puu Ohelo at 1,020 meters (3,346 feet) elevation. He thought there were probably more individuals in the summit region from Puu Ohelo north to Kukuinui Ridge, and further west to the Wailau trail crossover at Mapulehu Valley. This region is rarely visited by botanists (Oppenheimer 2010).

Currently, there are at least two populations of *Melicope reflexa* totaling fewer than six individuals.

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

No new information.

2.3.1.4 Taxonomic classification or changes in nomenclature:

In 1998, four trees were seen in Waihee, West Maui that were tentatively identified as *Melicope reflexa*, however, these individuals have now been determined to represent a new taxon, which is expected to be formally described by staff at the National Tropical Botanical Garden and Smithsonian. In addition, a population thought to be *Melicope reflexa* collected by Ken Wood and Hank Oppenheimer in Wailau Valley, on Kukuinui Ridge in 1997 (Wood 2009) was annotated by David Lorence as actually being *M. volcanica*. Further research is needed to clarify the *M. volcanica/M. reflexa/M. pseudoanisata* species complex (K. Wood, National Tropical Botanical Garden, pers. comm. 2009).

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.):

See above section 2.3.1.2.

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

The habitats on East Molokai where *Melicope reflexa* occurs are *Metrosideros polymorpha* (ohia) – *Dicranopteris linearis* (uluhe) lowland or montane wet forests with associated species including *Alyxia stellata* (maile), *Antidesma platyphyllum* (hame), *Broussaisia arguta* (kanawao), *Canavalia molokaiensis* (awikiwiki), *Cheirodendron trigynum* (olapa), *Cibotium glaucum* (hapuu), *C. menziesii* (hapuu ii), *Clermontia kokeana* (haha), *Cyanea solenocalyx* (pua kala), *Cyrtandra grayi* (kanawao keokeo), *C. grayana* (haiwale), *Cyrtandra lydgatei* (kanawao keokeo), *Deparia prolifera* (no common name [NCN]), *Diospyros sandwicensis* (lama), *Dodonaea viscosa* (aalii), *Elaphoglossum crassifolium* (hoe a Maui), *Freycinetia arborea* (ie ie), *Ilex anomala* (kawau), *Labordia hedyosmifolia* (kamakahala), *Mecodium recurvum* (ohia ku), *Melicope clusiifolia* (kolokolo mokihana), *Nothoestrum longifolium* (aiea), *Perrottetia sandwicensis* (olomea), *Pneumatopteris sandwicensis* (hoio kula), *Pritchardia lowreyana* (loulou), *Psychotria mariniana* (kopiko), *Syzygium sandwicensis* (ohia ha), *Tetraplasandra hawaiiensis* (ohe), *T. oahuensis* (ohe mauka), *Touchardia latifolia* (olona), *Vandenboschia davallioides* (palai hihii), and *Wikstroemia* sp. (akia) (National Tropical Botanical Garden 2009a, b; Wood 2009).

Associated native vegetation at Puu Ohelo includes the genera *Metrosideros* sp., *Cheirodendron* sp., *Dicranopteris linearis*, *Diplopterygium pinnatum* (uluhe lau nui), *Broussaisia arguta*, *Elaphoglossum* sp., *Cibotium* sp., *Sadleria* sp. (apuu or amau), *Peperomia* sp. (ala ala wai nui), *Coprosma* sp. (pilo), *Kadua* sp., *Labordia* sp. (kamakahala), *Clermontia* sp., *Vaccinium* sp. (ohelo), and *Melicope* sp., (alani) (Oppenheimer 2010).

2.3.1.7 Other:

No new information.

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:

Threats that modify habitat include feral goats (*Capra hircus*), pigs, and deer that disturb the ground where *Melicope reflexa* occurs, and degrade the habitat by uprooting seedlings of native plants and creating conditions that may cause landslides and erosion. Pig activity is severe in Puu Ohelo (Oppenheimer 2010). Invasive introduced plant species including *Ageratina adenophora* (sticky snakeroot), *Clidemia hirta* (Koster's curse), *Psidium cattleianum* (strawberry guava), and *Tibouchina herbacea* (glory bush) compete with and inhibit regeneration around existing plants (Oppenheimer 2010; National Tropical Botanical Garden 2009a; Wood 2009).

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

Not a threat.

2.3.2.3 Disease or predation:

Melicope reflexa is threatened by predation by goats, rats, (*Rattus* sp.) and deer (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2009a). Black twig borer (*Xylosandrus compactus*) is probably also a threat to this species (Oppenheimer 2010).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

No new information.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

The introduced invasive plant species discussed in section 2.3.2.1 above are also a threat to *Melicope reflexa* because they compete with the species for water, light, and nutrients.

In addition to all of the other threats, species like *Melicope reflexa* that are endemic to small portions of a single island are

inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes, landslides, flooding, and disease outbreaks. The extent of these natural processes on this single island endemic are exacerbated by anthropogenic threats, such as habitat loss for human development or predation by introduced species (USFWS 1996).

Climate change may also pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

In 2009, one million dollars in funds from the federal Department of Interior's Cooperative Endangered Species Conservation Fund will be used on Molokai, to help acquire a perpetual conservation easement over 248 hectares (614 acres) of strategic watershed on the eastern end of the island. The property has several federally listed threatened or endangered species as well as critical habitat in and around the proposed easement area. Among federally listed species that will benefit from this protection are *Cyanea mannii* (haha), *Canavalia molokaiensis* (awikiwiki), *Hibiscus arnottianus* ssp. *immaculatus* (kokio keokeo), *Brighamia rockii* (puaala), *Phyllostegia dunbariae* (haha), *Gardenia brighamii* (nanu), *Pritchardia munroi* (loulu), and *Phyllostegia hispida* (USFWS 2009; C. Rowland, USFWS, pers. comm. 2010). This area may also provide habitat for reintroduction of this species.

2.4 Synthesis

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Molokai plant cluster (USFWS 1996), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Melicope reflexa* is a long-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on islands where they now occur or occurred historically. For the species to be considered stable, each of these populations must be naturally

reproducing and increasing in number, with a minimum of 25 mature individuals per population.

The interim stabilization goals for this species have not been met as there is no known population of more than 25 individuals (Table 1) and all threats are not being managed (Table 2). Therefore, *Melicope reflexa* meets the definition of endangered as it remains in danger of extinction throughout its range.

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

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	<1000	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
1996 (recovery plan)	<1000	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2003 (critical habitat)	<1000	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2010 (5-year review)	6	0	All threats managed in all 3 populations	No (Table 2)
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No: only two populations totaling 6 individuals

Table 2. Threats to *Melicope reflexa*.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – habitat modification and herbivory	A, C, D	Ongoing	No
Rats – herbivory	C	Ongoing	No
Black twig borer – herbivory	C	Ongoing	No
Landslides and erosion	A, E	Ongoing	No
Invasive introduced plants	A, E	Ongoing	No
Climate change	A, E	Increasing	No
Small population size	E	Ongoing	No

3.0 RESULTS

3.1 Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist

Extinction

Recovery

Original data for classification in error

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

- Survey areas where *Melicope reflexa* was reported to determine the current status of the species.
- Monitor known populations and collect seeds for genetic storage and reintroduction.
- Fence existing populations to protect them from the negative impacts of feral ungulates.
- Control invasive introduced plant species around known populations.
- Research taxonomy and genetic relationships to clarify the *M. volcanica*/*M. reflexa*/*M. pseudoanisata* species complex.
- Control rats in the vicinity of these populations.
- Develop and implement methods to control black twig borer.
- Propagate to augment the existing populations.
- Establish additional populations within protected suitable habitat.
- Work with Hawaii Division of Forestry and Wildlife and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

5.0 REFERENCES

- Hawaii Biodiversity and Mapping Program. 2009. Program Database. Hawaii Biodiversity and Mapping Program, Honolulu, Hawaii.
- National Tropical Botanical Garden. 2009a. Living collections database. National Tropical Botanical Garden, Kalaheo, Hawaii. Unpublished database.
- National Tropical Botanical Garden. 2009b. Herbarium database. National Tropical Botanical Garden, Kalaheo, Hawaii. Unpublished database.
- Oppenheimer, H.L. 2010. *Melicope reflexa* 5-year review, edits and comments. Plant Extinction Prevention Program, Lahaina, Hawaii. 5 pages. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; determination of threatened or endangered status for 16 plants from the island of Molokai, Hawaii; final rule. Federal Register 57(196):46325-46340.

[USFWS] U.S. Fish and Wildlife Service. 1996. Recovery plan for the Molokai plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 143 pages. Available online at <<http://www.fws.gov/pacificislands/recoveryplans.html>>.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations and nondesignations 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. 2009. Press release: Fish and Wildlife Service provides \$1 million in land acquisition funds to Hawaii, Honolulu, Hawaii. April 17, 2009.

Wood, K.R. 2009. Notes on *Melicope reflexa*. National Tropical Botanical Garden, Kalaheo, Hawaii. One page. Unpublished.

Personal Communications:

Rowland, Craig. 2010. Conservation Partnerships Program Coordinator, Pacific Islands Fish and Wildlife Office, U.S. Fish and Wildlife Service, Honolulu, Hawaii. E-mail to Marie Bruegmann, U.S. Fish and Wildlife Service, dated April 16, 2010. Subject: Additional information on status of Molokai easement.

Wood, Ken. 2009. Research Biologist, National Tropical Botanical Garden, Kalaheo, Hawaii. E-mail to Margret Clark, National Botanical Garden, Kalaheo, Hawaii, dated December 28, 2009. Subject: *Melicope reflexa*.

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U.S. FISH AND WILDLIFE SERVICE
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:

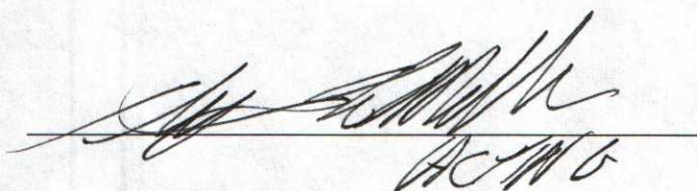
- Delisting
- Reclassify from Endangered to Threatened status
- Reclassify from Threatened to Endangered status
- No Change in listing status

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

Chelsie Javar, Fish and Wildlife Biologist
Marie Bruegmann, Plant Recovery Coordinator
Jess Newton, Recovery Program Lead
Assistant Field Supervisor for Endangered Species

Field Supervisor, Pacific Islands Fish and Wildlife Office


ACMB

Date 8/2/11