

*Melicope balloui*  
(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 balloui*/ alani**

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**5-YEAR REVIEW**  
***Melicope balloui* (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 balloui* and other species from the island of Maui (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. 1994. Endangered and threatened wildlife and plants; determination of threatened or endangered status for three Hawaiian plant species of the genus *Melicope*; final rule. Federal Register 59(232):62346-62352.

**Date listed:** December 5, 1994

**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; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, Hawaii; final rule. Federal Register 68(93):25934-26165.

Critical habitat was designated for *Melicope balloui* in two units totaling 545 hectares (1,345 acres) on the island of Maui. This designation includes habitat on Federal, 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:

5

### 1.3.6 Current Recovery Plan or Outline

**Name of plan or outline:** U.S. Fish and Wildlife Service. 1997. Recovery plan for the Maui plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 130 pages + appendices.

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*

*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 Maui plant cluster recovery plan (USFWS 1997), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Melicope balloui* 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 Maui, 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.

There is only a single confirmed population of more than 25 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 balloui* 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 balloui* 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:**

On East Maui, Hana District, in the Palikea drainage of Kipahulu, within Haleakala National Park, a species most closely matching the description of *Melicope balloui* was observed occasionally at 890 to 930 meters (2,920 to 3,050 feet) elevation in 1994 (Wood 2009). It was observed in 1997 in Opana Gulch in Waikamoi, north of Puu o Kakae at 1,311 meters (4,300 feet) elevation (Wood 2009). About 50 individuals were seen in 1999 in Kipahulu Valley, along Palikea Stream, Delta Camp Region, at 914 meters (3,000 feet) elevation (Wood 2009). In 2009, it was seen again in the same general area, but at a higher elevation of 1,082 meters (3,550 feet) (Wood 2009). In total, about 50 individuals are estimated to currently exist.

**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:**

The collections made by Ken Wood of the National Tropical Botanical Garden were tentatively identified as *Melicope balloui*, but there is also strong conflicting evidence that they may represent the closely related *Melicope volcanica*. Research is needed to determine the placement of these specimens and their occurrences within the genus (Wood 2009).

Hank Oppenheimer, island coordinator with the Plant Extinction Prevention Program, says he has not seen any trees that were unambiguously identified as *M. balloui*. Two of the main characters that separate this species from the more widespread, and quite variable, *M. volcanica*, are the more densely pubescent flowers and persistent sepals on the seed capsules.

Oppenheimer observed individual plants in Waikamoi and Palikea that have seed capsules with both persistent and fallen sepals on the same tree. When Oppenheimer and Wood visited Palikea in 2009, where putative *M. balloui* individuals had been seen, neither botanist could make a definitive identification. Voucher collections were sent to Bernice P. Bishop Museum Herbarium. So far, no one examining specimens in the herbaria at Bishop or the National Tropical Botanical Garden has reached a definitive conclusion. Although they should be examined by other experts, Oppenheimer suggests that genetic analysis be done, not only of these populations, but of *M. volcanica* throughout its habitat range. *Melicope volcanica* is very widespread around East Maui on all sides of Haleakala, including the Waikamoi area, where it is abundant. Perhaps *M. balloui* is just a variant of *M. volcanica*. However, some *Melicope* species fruit very sporadically so it can be difficult to collect sufficient material for study (H. Oppenheimer, Plant Extinction Prevention Program, pers. comm. 2010).

**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.):**

No new information

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

On East Maui, *Melicope balloui* occurs in *Acacia koa* (koa) – *Metrosideros polymorpha* (ohia) montane wet forest with *Alyxia stellata* (maile), *Broussaisia arguta* (kanawao), *Cheirodendron trigynum* (olapa), *Clermontia arborescens* (oha wai nui), *Cyrtandra hashimotoi* (kanawao keokeo haiwale), *C. spathulata* (kanawao keokeo haiwale), *Dubautia plantaginea* (naenae), *Freycinetia arborea* (ie ie), *Kadua affinis* (manono), *K. hillebrandii* (manono), *Labordia hedyosmifolia* (kamakahala), *L. hirtella* (kamakahala), *Leptecophylla tameiameiae* (pukiawe), *Machaerina angustifolia* (uki), *Melicope clusiifolia* (kolokolo mokihana), *M. ovalis* (alani), *M. molokaiensis* (alani), *M. volcanica* (alani), *Myrsine lessertiana* (kolea lau nui), *Peperomia* sp. (ala ala wai nui), *Perrottetia sandwicensis* (olomea), *Phyllostegia ambigua* (no common name [NCN]), *Pipturus* sp. (mamake), *Platydesma spathulata* (pilo kea), *Psychotria* sp. (kopiko), *Rubus hawaiiensis* (akala), and *Wikstroemia oahuensis*, and with an understory thick with ferns including *Asplenium hobdyi* (NCN), *A. insiticium* (analii), *Cibotium glaucum* (hapuu), *Dicranopteris linearis* (uluhe), *Diplazium sandwichianum* (hoio), and *Dryopteris tetrapinnata* (NCN) (Hawaii Biodiversity and Mapping Program 2009; Wood 2009).

**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 (*Sus scrofa*) and invasive introduced plant species including

*Ageratina adenophora* (sticky snakeroot), *Andropogon virginicus* (broom sedge), *Clidemia hirta* (Koster's curse), *Hedychium gardnerianum* (Kahili ginger), *Paspalum conjugatum* (Hilo grass), *P. urvillei* (vasey grass), *Psidium cattleianum* (strawberry guava), *Rubus argutus* (blackberry), and *Rubus rosifolius* (thimbleberry) (Wood 2009).

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

Not a threat.

#### **2.3.2.3 Disease or predation:**

Rats (*Rattus* spp.) are noted as a threat to this species because are known to eat plants in the genus *Melicope* (Wood 2009). Unidentified Lepidoptera moths eat the flowers of this species preventing seed production. Similarly, an unknown insect have been noted to bore into the seed capsules of this species limiting seed production. Black twig borer (*Xylosandrus compactus*) is a threat to the species. Oppenheimer believes the avian dispersal agent has become depleted and is potentially extinct, therefore constricting the dispersal area of this species (H. Oppenheimer, pers. comm. 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 balloui* because they compete with the species for water, light, and nutrients.

In addition to all of the other threats, species like *Melicope balloui* 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 1997).

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.

Habitat within Haleakala National Park is fenced and feral ungulates are being controlled and weed control is ongoing (USFWS 1997).

## 2.4 Synthesis

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Maui plant cluster (USFWS 1997), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Melicope balloui* 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 only a single population of more than 25 individuals, however, the taxonomic status of this species is unclear (Table 1) and all threats have not been managed (Table 2). Therefore, *Melicope balloui* meets the definition of endangered as it remains in danger of extinction throughout its range.

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

<b>Date</b>	<b>No. wild indivs</b>	<b>No. outplanted</b>	<b>Stability Criteria identified in Recovery Plan</b>	<b>Stability Criteria Completed?</b>
1994 (listing)	<10	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
1997 (recovery plan)	<300	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
2003 (critical habitat)	100-200	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
2010 (5-year review)	~50	0	All threats managed in all 3 populations	Partially (Table 2)
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No: only 1 population with more than 25 individuals

**Table 2. Threats to *Melicope balloui*.**

<b>Threat</b>	<b>Listing factor</b>	<b>Current Status</b>	<b>Conservation/ Management Efforts</b>
Ungulates – habitat modification and predation	A, C, D	Ongoing	Partially: only known population is fenced, but it is unclear if it is a viable population of this species
Rats – herbivory	C	Ongoing	No
Moths – herbivory	C	Ongoing	No
Black twig borer – herbivory	C	Ongoing	No
Invasive introduced plants	A, E	Ongoing	Partially: weed control ongoing, benefit unknown
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 balloui* has been reported to establish current status of the species.
- Conduct taxonomic and genetic study to determine if the currently known individuals are appropriately identified as this species.
- Monitor known populations and collect any available seeds.
- Maintain the fences around existing populations to provide protection from the negative impacts of feral ungulates.
- Continue to control invasive introduced species around known populations.
- Control rats in the vicinity of these populations.
- Develop and implement methods to control unidentified Lepidoptera moths.
- 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. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; determination of threatened or endangered status for three Hawaiian plant species of the genus *Melicope*; final rule. Federal Register 59(232):62346-62352.

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

appendices. Available online at  
<<http://www.fws.gov/pacificislands/recoveryplans.html>>.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, Hawaii; final rule. Federal Register 68(93):25934-26165.

Wood, K.R. 2009. Notes on *Melicope balloui*. National Tropical Botanical Garden, Kalaheo, Hawaii. 4 pages. Unpublished.

**Personal Communications:**

Oppenheimer, Hank. 2010. Maui Nui coordinator, Plant Extinction Prevention Program, Lahaina, Hawaii. E-mail to Margaret Clark, National Tropical Botanical Garden, dated January 15, 2010. Subject: *Melicope balloui* 5 year review.

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**U.S. FISH AND WILDLIFE SERVICE**  
5-YEAR REVIEW of *Melicope balloui* (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:**

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Marie Bruegmann, Plant Recovery Coordinator  
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Assistant Field Supervisor for Endangered Species

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

  
\_\_\_\_\_

Date 8/7/11