

*Viola lanaiensis*  
(No common name)

**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: *Viola lanaiensis* (No common name)

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**5-YEAR REVIEW**  
***Viola lanaiensis* (No common name)**

**1.0 GENERAL INFORMATION**

**1.1 Reviewers**

**Lead Regional Office:**

Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia,  
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**Lead Field Office:**

Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808)  
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**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 April 8, 2010. The review was based on the proposal of critical habitat for *Viola lanaiensis* and the recovery plan for the Lanai plant cluster (USFWS 2003, 1995), as well as a review of current, available information. The Bernice Pauahi Bishop Museum 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 a recovery biologist and the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before submission to the 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. 2010. Endangered and threatened wildlife and plants; 5-year review status of 69 species in Idaho, Washington, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 75(67):17947-17950.

### 1.3.2 Listing history

#### Original Listing

**FR notice:** USFWS. 1991. Endangered and threatened wildlife and plants; determination of endangered status for six plants from the island of Lanai, Hawaii; final rule. Federal Register 56(183):47686-47695.

**Date listed:** September 20, 1991

**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 designation of critical habitat for three plant species from the island of Lanai, Hawaii; final rule. Federal Register 68(6):1220-1274.

In 2003, critical habitat was excluded for 28 plant species, including *Viola lanaiensis*, because of a preexisting cooperative agreement with Castle and Cooke Resorts, LLC to manage the lands in proposed unit Lanai D, as well as adjacent lands, for the conservation benefit of the 28 listed species. Because large portions of proposed unit D were already being managed under the Lanai Forest and Watershed Partnership by Castle and Cooke on a voluntary basis in cooperation with USFWS and the State of Hawaii to achieve important conservation goals. It was decided that the benefits of excluding unit Lanai D from critical habitat designation outweighed the costs (USFWS 2003).

USFWS 2012. Endangered and threatened wildlife and plants; listing 38 species on Molokai, Lanai, and Maui as endangered and designating critical habitat on Molokai, Lanai, Maui and Kahoolawe for 135 species. Federal Register 77(112):34464-34775.

Critical habitat is currently being proposed for *Viola lanaiensis* (USFWS 2012).

### 1.3.4 Review History:

Species status review [FY 2011 Recovery Data Call (August 2011)]:

Undetermined

#### **Recovery achieved:**

1 (0-25%) (FY 2007 Recovery Data Call)

**1.3.5 Species' Recovery Priority Number at start of this 5-year review:**  
2

**1.3.6 Current Recovery Plan or Outline**

**Name of plan or outline:** USFWS. 1995. Lanai plant cluster recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 138 pages. Available online at <http://www.fws.gov/pacificislands/recoveryplans.html>.

**Date issued:** September 29, 1995

**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, B, C, D, and E) affecting this species is presented in Section 2.3.2 and Table 2.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Lanai plant cluster (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Viola lanaiensis* is a short-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 Lanai. For the species to be considered stable, each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Viola lanaiensis* should be documented on the island of Lanai. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 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 *Viola lanaiensis* should be documented on the island of Lanai. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population. 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**

### **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:**

Historically, *Viola lanaiensis* was known from scattered sites on the summit, ridges, and upper slopes of Lanaihale, from near the head of Kaiholena and Hookio Gulches to the vicinity of Haalelepaakai, a distance of about 4.0 kilometers (2.5 miles), ranging from 850 to 975 meters (2,790 to 3,200 feet) elevation (Wagner *et al.* 1999; USFWS 1991, 1995). A flourishing population of about 20 individuals was known in the late 1970s along the Lanaihale summit road near the head of Waialala Gulch, but it has since disappeared due to habitat disturbance (USFWS 1995, 2003; Hawaii Biodiversity and Mapping Program 2010).

At the time *Viola lanaiensis* was federally listed (USFWS 1991), two small populations of unknown size were thought to exist. Later estimates of *V. lanaiensis* in the wild were less than 80 individuals occurring in two to three populations (USFWS 1995, 2003).

The Plant Extinction Prevention Program (2007) counted two populations with 15 individuals. In the past 20 years, sightings have concentrated around the extreme upper end of the northernmost drainage of Awehi Gulch (on the windward side of the summit ridge opposite Waiakeakua Spring on the leeward pali), and south of Puhielelu Ridge at 915 to 985 meters (3,000 to 3,230 feet) elevation; and in Kunoa Gulch and between Kunoa and Waialala Gulches from 770 to 817 meters (2,530 to 2,680 feet) elevation (USFWS 1995; Wood 2005; Hawaii Biodiversity and Mapping Program 2010). The Awehi Gulch population has historically been the

largest, estimated at 38 individuals in 1991, 28 in 1993, 20 in 1997, and currently listed at 6 individuals (Plant Extinction Prevention Program 2007, 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010). The Awehi site also had six seedlings in 2010 (Hank Oppenheimer, Plant Extinction Prevention Program, pers. comm. 2010).

In 1991, there were 38 to 40 individuals in the vicinity of Kunoa Gulch (Hawaii Biodiversity and Mapping Program 2010). These populations have not since been reported as extant, but Wood (2005) reported a new sighting of a single individual in 1997 in Kunoa Gulch (Hawaii Biodiversity and Mapping Program 2010). Subsequently, no individuals were observed in Kunoa until nine individuals were found scattered in the main gulch and a tributary in 2007 (Plant Extinction Prevention Program 2007). In 2008, an additional four individuals were found in another subgulch (Plant Extinction Prevention Program 2008).

The latest census totals are: two populations (Kunoa Gulch and Awehi) with 20 mature individuals (Plant Extinction Prevention Program 2009, 2010; USFWS 2010) and 6 seedlings (H. Oppenheimer, pers. comm. 2010).

#### **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:**

No new information

#### **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):**

The discovery of a colony of 27 individuals (all size classes) of *Viola lanaiensis* in Kunoa Gulch in 1991 on a relatively new landslide suggests that it is a pioneer species that does not respond well to competition (USFWS 1995; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010). Havran (2008) characterized known



populations as typically being distributed on steep banks dominated by *Metrosideros polymorpha* (ohia), but was unable to conclude whether extant populations represent the optimal range of this species, or whether the species has been displaced from its preferred native range by invasive introduced plants and ungulates.

The habitat of the Awehi population of *Viola lanaiensis* is stratified, with the middle to upper slopes consisting of *Metrosideros polymorpha* (ohia)-*Dicranopteris linearis* (uluhe) lowland mesic forest. A distinct change occurs along the lower slopes, where the community is composed of *Nestegis sandwicensis* (olopua), *Myrsine lanaiensis* (kolea), *Scaevola chamissoniana* (naupaka), *Kadua affinis* (manono), *Antidesma platyphyllum* (hame), *Pouteria sandwicensis* (alaa), and *Freycinetia arborea* (ieie) (Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010).

At Kunoa Gulch, *Viola lanaiensis* is found in a *Metrosideros polymorpha*-*Dicranopteris linearis* lowland wet to riparian forest associated with *Pittosporum confertiflorum* (hoawa), *Pipturus albidus* (mamaki), *Perrottetia sandwicensis* (olomea), *Scaevola chamissoniana*, *Broussaisia arguta* (kanawao), *Cyrtandra grayana* (haiwale), *Freycinetia arborea*, *Sadleria pallida* (amau), and *Diplopterygium pinnatum* (uluhe lau nui) (Wood 2005).

#### **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:**

- Ungulate degradation of habitat – Axis deer (*Axis axis*) (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010)
- Established ecosystem-altering invasive plant species degradation of habitat (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010)
  - *Melinis minutiflora* (molasses grass)

- *Morella faya* (firetree)
- *Psidium cattleianum* (strawberry guava)
- *Rubus rosifolius* (thimbleberry)
- Landslides and flooding (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010)

**Current conservation efforts:**

- Ungulate exclosure:
  - Castle and Cooke have begun the construction of approximately 35 kilometers (22 miles) of fencing around Lanaihale to control the depredations of feral axis deer. The fence will be completed in three increments. The first increment is completed and the second increment is well under construction (H. Oppenheimer, pers. comm. 2010).
  - The Awehi population is in a fenced exclosure of about 2 hectares (5 acres). Besides *Viola lanaiensis*, the Awehi exclosure also protects the only two known individuals of *Cyanea munroi*, several individuals *Labordia tinifolia* var. *lanaiensis*, and *Pleomele fernaldii*.
  - Staff of the Maui Nui Plant Extinction Prevention Program inspect the fenced exclosure at Awehi on a regular basis and makes repairs as necessary. Currently, erosion is undermining the fence, which was not constructed with a complete ground secured apron around the perimeter (H. Oppenheimer, pers. comm. 2010).

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

None reported.

**2.3.2.3 Disease or predation:**

**Threats:**

- Ungulate predation or herbivory – Axis deer (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010)
- Rodent predation or herbivory – Rats (*Rattus* spp.) (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers.

comm. 2010)

- Nonnative bird predation (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010)
  - Feral turkeys (*Meleagris gallopavo*)
  - Chickens (*Gallus gallus domesticus*)
  - Black francolin (*Francolinus francolinus*)

#### **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:**

##### **Threats:**

- Established invasive plant species competition (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; Wood 2005; H. Oppenheimer, pers. comm. 2010)
  - *Adiantum hispidulum* (rough maiden-hair)
  - *Blechnum appendiculatum* (palm fern)
  - *Christella parasitica* (no common name)
  - *Cinnamomum burmanii* (Padang cassia)
  - *Deparia petersenii* (no common name)
  - *Leptospermum scoparium* (New Zealand tea)
  - *Pluchea carolinensis* (sourbush)
- Fire (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010)
- Drought (Plant Extinction Prevention Program 2008, 2009, 2010; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010)
- Ungulate trampling – Axis deer (Wood 2005; Hawaii Biodiversity and Mapping Program 2010; H. Oppenheimer, pers. comm. 2010)
- Low numbers (Plant Extinction Prevention Program 2008, 2009, 2010)

- Climate change may 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 (PICCC) has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

**Current conservation efforts:**

- Captive propagation for genetic storage and reintroduction:
  - In 2011, the National Tropical Botanical Garden (2011) reported 31 seeds in genetic storage.
  - The Plant Extinction Prevention Program (2009) reported a single immature fruit was collected from the Awehi population for tissue culture by Lyon Arboretum; seeds have been collected several times but have not been successfully germinated (H. Oppenheimer, pers. comm. 2010).
  - The Lyon Arboretum Micropropagation Laboratory reported a single individual in genetic storage (Harold L. Lyon Micropropagation Laboratory 2010).
- Population viability monitoring – Individuals located within the Awehi enclosure and at Kunoa Gulch have all been numbered, tagged, and mapped with a Global Positioning System to ensure traceable seed parentage, and are being closely monitored for seed production (Plant Extinction Prevention Program 2007; H. Oppenheimer, pers. comm. 2010).

## 2.4 Synthesis

The interim stabilization goals for this species have not been met. There are only 20 mature individuals currently known (Table 1), and all threats are not being managed (Table 2). Therefore, *Viola lanaiensis* meets the definition of endangered as it remains in danger of extinction throughout its range.

**Table 1. Status of *Viola lanaiensis* from listing through 5-year review.**

<b>Date</b>	<b>No. wild individuals</b>	<b>No. outplanted</b>	<b>Stabilization Criteria identified in Recovery Plan</b>	<b>Stabilization Criteria Completed?</b>
1991 (listing)	<500	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1995 (recovery plan)	<80	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	<80	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2012 (5-year review)	20	0	All threats managed in all 3 populations	Partially (see Table 2)
			Complete genetic storage	Partially)
			3 populations with 50 mature individuals each	No

**Table 2. Threats to *Viola lanaiensis* and ongoing conservation efforts.**

<b>Threat</b>	<b>Listing factor</b>	<b>Current Status</b>	<b>Conservation/ Management Efforts</b>
Ungulates – Degradation of habitat, herbivory, trampling	A, C, E	Ongoing	Partially: Ungulate exclosure at Awehi and construction at Lanaihale is ongoing
Established ecosystem-altering invasive plant species degradation of habitat	A	Ongoing	No
Landslides and flooding	A	Ongoing	No
Rodent predation or herbivory – Rats	C	Ongoing	No
Nonnative bird predation	C	Ongoing	No
Established invasive plant species competition	E	Ongoing	No
Fire	E	Ongoing	No
Drought	E	Ongoing	No
Low numbers	E	Ongoing	Partially: Captive propagation for genetic storage and reintroduction and monitoring
Climate change	A, E	Increasing	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**

- Captive propagation for genetic storage and reintroduction
  - Continue to collect seeds from tagged individuals, keeping close track of the maternal source for use in *ex situ* propagation.
  - Continue to collect seeds from all existing populations and send to at least two or three different venues for propagation.
- Reintroduction / translocation protocol development – Maximize the genetic variation among individuals at each reintroduction site, based on microsatellite data and detailed information from crossing records.
- Reintroduction / translocation site identification – While surveying for new populations or reintroduced populations, determine which sites are least invaded by invasive introduced plant species and which appear to have the highest likelihood of maintaining new reintroductions.
- Reintroduction / translocation implementation – Once sites are identified and protected from feral ungulates, reintroduce the species back into its known historical range.
- Ungulate enclosure:
  - Complete repairs of fenced enclosure at Awehi by securing an apron around the perimeter of the fence to prevent erosion.
  - Complete the Lanaihale fencing project.
  - Continue to monitor all fences for any signs of breaching.
- Ungulate control – Protect all populations against disturbances from feral ungulates.
- Ecosystem-altering invasive plant species control – Control invasive introduced plant species around all populations.
- Predator / herbivore control – Implement effective control methods for rodents.
- Threats research – Study the impact of nonnative bird predation on populations of *Viola lanaiensis*. If necessary determine and implement effective control methods.
- Threat monitoring and control – Monitor newly established reintroduced and wild populations for evidence of plant disease and insect predation. If threats are found implement effective control methods.
- Site / area / habitat protection – Develop and implement effective measures to reduce the impact of tree fall, drought, and landslides and erosion.
- Surveys / inventories – Continue to conduct thorough surveys of all suitable habitats where *Viola lanaiensis* was historically seen.

- Alliance and partnership development – Work with Castle and Cooke and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Threats research – Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

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Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawaii, revised edition. University of Hawaii and Bishop Museum Press, Honolulu, Hawaii. 1,918 pages.

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**Personal communications:**

Oppenheimer, Hank. 2010. Maui Nui Coordinator, Maui Nui Plant Extinction Prevention Program, Lahaina, Hawaii. E-mail to Clyde Imada, Bishop Museum, dated October 13, 2010. Subject: *Viola lanaiensis*.

**Signature Page**  
**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of *Viola lanaiensis* (No common name)**

**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

**Appropriate Listing/Reclassification Priority Number, if applicable:**           

**Review Conducted By:**

Chelsie Javar, Fish and Wildlife Biologist  
Vickie Caraway, Fish and Wildlife Biologist  
Marie Bruegmann, Plant Recovery Coordinator  
Jess Newton, Endangered Species Recovery Program Leader  
Kristi Young, Assistant Field Supervisor for Endangered Species

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

*for*

          *Jess Newton*          

Date   8/28/2012