

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Vigna o-wahuensis* (no common name)

Current Classification: Endangered

Federal Register Notice 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.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Marie Bruegmann, Plant Recovery Coordinator, PIFWO

Jess Newton, Recovery Program Lead, PIFWO

Assistant Field Supervisor for Endangered Species, PIFWO

Methodology used to complete this 5-year 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 *Vigna o-wahuensis* and other species from the islands of Hawaii, Maui, Kahoolawe, Molokai, Oahu, Lanai, Kauai, and Niihau (USFWS 2003a-f), 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 Tamara Sherrill, 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 Field Supervisor for approval.

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).

Application of the 1996 Distinct Population Segment (DPS) Policy:

This Policy does not apply to plants.

Review Analysis:

Please refer to the final critical habitat designations for *Vigna o-wahuensis* published in the Federal Register on January 9, February 27, March 18, May 14, June 17, and July 2, 2003 (USFWS2003a-f) for a complete review of the species' status (including biology and habitat), threats, and management efforts. No new threats and no significant new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *V. o-wahuensis*.

Vigna o-wahuensis was listed as endangered in 1994 (USFWS 1994). Many observations of *Vigna o-wahuensis* were made on all the major Hawaiian Islands in the early decades of the 1900s, but it may be extirpated from the islands of Oahu, Lanai, and Kahoolawe. On Oahu, it was known from between Waimanalo and Makapuu Point, the Mokulua Islets, and the Waianae Mountains (USFWS 1999). On Lanai, *Vigna o-wahuensis* was last seen in 1986 on the windward slopes northeast of Kanepuu above Lapaiki at about 370 meters (1,200 feet) elevation on privately-owned land (Hawaii Biodiversity and Mapping Program 2009).

On the State-owned island of Kahoolawe, *Vigna o-wahuensis* may still exist, but has not been noted for some time. A population growing south of Hanakanaea near “Sailor’s Hat” on Kahoolawe was last noted in 1978. Near the summit, about 20 individuals grew at about 400 meters (1,300 feet) elevation in 1982, with a few more individuals scattered nearby (Hawaii Biodiversity and Mapping Program 2009). A single individual of *Vigna o-wahuensis* was observed in 1992 between Makaalae and Lua Kealialalo at 140 meters (460 feet) elevation (Hawaii Biodiversity and Mapping Program 2009).

On East Maui, about ten individuals of *Vigna o-wahuensis* were discovered in 1997 on the dry lava plain at Kanaio Beach at 30 meters (100 feet) elevation, inland 300 to 500 meters (985 to 1,400 feet) from the beach (National Tropical Botanical Garden 2009a; Wood 2010). This and several other native species were not seen at Kanaio Beach when visited in the winter of 2009, but a seed bank may still remain (H. Oppenheimer, Plant Extinction Prevention Program, pers. comm. 2010; T. Sherrill, Maui Nui Botanical Gardens, pers. comm. 2010). The species was found in the last few years at Auwahi, where there were 12 to 20 plants at about 1,310 meters (4,300 feet) elevation (A. Medeiros, U.S. Geological Survey, pers. comm. 2010; H. Oppenheimer, pers. comm. 2010). It was also growing at the lower Kanaio enclosure managed by the U.S. Army National Guard as recently as 2002 and was seen in the Kanaio Natural Area Reserve at about 823 meters (2,700 feet) elevation in 2004 (T. Sherrill, pers. comm. 2010).

On Molokai, two populations are known. One population, at Makakupaia, south of Onini Gulch in The Nature Conservancy’s Kamakou Preserve at 850 to 914 meters (2,800 to 3000 feet) elevation contained two individuals when visited in 2001. Another population on Molokai contained about ten individuals located on privately-owned land at Makolelau in 1992 (Hawaii Biodiversity and Mapping Program 2009).

On the island of Hawaii, *Vigna o-wahuensis* is known only from Nohonaohae Cinder Cone in Kohala, on privately-owned land (USFWS 1999). About 40 individuals were last seen in 2005 at 899 to 914 meters (2,950 to 3,000 feet) elevation by botanists with the National Tropical Botanical Garden and the State Division of Forestry and Wildlife (National Tropical Botanical Garden 2009a; Perlman 2010).

As of 2010, the current number of individuals of *Vigna o-wahuensis* is at least 72 individuals contained within four to six populations on three islands.

At Kanaio Beach on East Maui, *Vigna o-wahuensis* grows climbing and sprawling over the surrounding vegetation and ground, in *Dodonaea viscosa* (aalii) – *Sida fallax* (ilima) shrubland with barren aa lava flows on each side. Associated native plant species includes *Lipochaeta* sp. (nehe), *Pandanus tectorius* (hala), and *Waltheria indica* (uhaloa) (Wood 2010).

On Molokai, *Vigna o-wahuensis* occurs in lowland mesic shrubland with associated native species including *Bidens menziesii* (kookoolau), *Dodonaea viscosa*, and *Wikstroemia oahuensis* (akia) (Hawaii Biodiversity and Mapping Program 2009).

On the island of Hawaii at Nohonaohae Cinder Cone, the habitat where *Vigna o-wahuensis* occurs is *Dodonaea viscosa* shrubland with *Bidens menziesii*, *Chenopodium oahuense* (aheahea), *Cocculus orbiculatus* (huehue), *Dubautia menziesii* (naenae), *Ipomoea* sp. (no common name [NCN]), *Osteomeles anthyllidifolia* (ulei), *Sida fallax*, and *Wikstroemia* sp. (National Tropical Botanical Garden 2009a; Perlman 2010).

Fire is a threat to this species on Molokai (Listing Factor E). Invasive introduced plant species degrade the habitat of *Vigna o-wahuensis* and compete for resources these species are *Ageratum conyzoides* (billy goat weed), *Emilia* sp. (paintbrush), *Leucaena leucocephala* (haole koa), *Melinis minutiflora* (molasses grass), *Melinis repens* (Natal redtop), *Opuntia* sp. (prickly pear), *Pennisetum setaceum* (fountain grass), *Portulaca pilosa* (pigweed), *Schinus terebinthifolius* (Christmasberry), and *Tridax procumbens* (coat buttons) (Listing Factors A and E) (Perlman 2010; Wood 2010).

On East Maui, an invertebrate infestation was noted but the culprit species remains unknown (Listing Factor C) (Wood 2010). Feral goats (*Capra hircus*) degrade and graze on native vegetation in the area along and inland of Kanaio beach and are therefore a probable threat to *Vigna o-wahuensis* (Listing Factors A and C) (T. Sherrill pers. comm. 2010). On the island of Hawaii, grazing by goats is also a problem, and rats (*Rattus* spp.) and slugs (unidentified species) feed on this species (Listing Factors C) (Perlman 2010).

Climate change may also pose a threat to *Vigna o-wahuensis* (Listing Factors A and E). 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.

Vigna o-wahuensis was reintroduced into the fenced enclosure at Auwahi, Maui, managed by the Leeward Haleakala Watershed Partnership (A. Medieros pers. comm. 2010; H. Oppenheimer pers. comm. 2010). More than 200 individuals were reintroduced into the enclosure, but most of the individuals were eaten by a small pig that breached the fence (A. Medieros pers. comm. 2010). The individuals located in the lower Kanaio Army National Guard property is in a fenced enclosure as of 2002 (T. Sherrill pers. comm. 2010).

There are a total of three *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) populations containing 71 individuals on the island of Hawaii (Plant Extinction Prevention Program 2009). Waimea Valley has seven plants in cultivation from the island of Hawaii (Waimea Valley Arboretum 2009). The Lyon Arboretum has 679 seeds in long-term storage collected largely from the island of Hawaii (Center for Conservation Research and Training Seed Storage Facility 2009). Volcano Rare Plant Facility reintroduced 62 individuals and broadcasted over 1,000 seeds in Puu Waawaa from 2008 to 2009 (Volcano Rare Plant Facility 2009). The U.S. Army has 16 seeds representing three plants from Nohonaohae at the Pohakuloa Training Area (U.S. Army 2010). The National Tropical Botanical Garden and the Center for Conservation Research and Training Seed Storage Facility in Honolulu have seeds in storage from Maui and the island of Hawaii (Center for Conservation Research and Training Seed Storage Facility 2009; National Tropical Botanical Garden 2009b). Maui Nui Botanical Garden has around 1,200 cultivated and 40 wild seeds in storage from Kanaio (Maui Nui Botanical Garden 2009; T. Sherrill pers. comm. 2010).

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Vigna o-wahuensis* is a short-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* collection. In addition, a minimum of three populations should be documented on the islands where they now occur (Maui, Molokai, and Hawaii) or occurred historically (Lanai, Kahoolawe, Niihau, Kauai, and Oahu). Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have not been met, as there are approximately 72 individuals in the wild and none of the four to six populations contain more than 50 mature individuals (Table 1). In addition, all threats are not being managed (Table 2). Therefore, *Vigna o-wahuensis* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Monitor all populations and collect material for genetic storage and propagation for reintroduction.
- Conduct surveys following rainy periods within historical range and other potentially suitable habitat.
- Control introduced invasive plant species around all populations.
- Construct large-scale fences around all naturally occurring and reintroduced individuals to provide protection against the negative impacts of feral ungulates.
- Control rats in the vicinity of these populations.

- Develop and implement methods to control slugs and invertebrates.
- Develop and implement a wildfire management plan.
- Establish additional populations within protected suitable habitat.
- Collect fruit from any reintroduced individuals that set seed to add to the genetic diversity of the *ex situ* material.
- Work with Hawaii Division of Forestry and Wildlife, The Nature Conservancy of Hawaii, U.S. Army National Guard, Leeward Haleakala Watershed Partnership, Plant Extinction Prevention Program, 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.

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Personal Communications

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Table 1. Status of *Vigna o-wahuensis* from listing through 5-year review.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	<100		All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1999 (recovery plan)	8	<100	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	>19		All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2010 (5-yr review)	72	<200	All threats managed in all 3 populations	Partially (Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No: none of the 6 to 7 populations contains 50 individuals

Table 2. Threats to *Vigna o-wahuensis*.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – habitat modification and herbivory	A, C, D	Ongoing	Partially: the reintroduced population in Auwahi is within a fenced enclosure. Population in lower Kanaio is fenced.
Rats – herbivory	C	Ongoing	No
Slugs – herbivory	C	Ongoing	No
Invertebrates – herbivory	C	Ongoing	No
Fire	E	Ongoing	No
Loss of pollinators and seed dispersers	E	Ongoing	No
Invasive introduced plants	A, E	Ongoing	No
Climate change	A, E	Increasing	No

U.S. FISH AND WILDLIFE SERVICE

SIGNATURE PAGE for 5-YEAR REVIEW of *Vigna o-wahuensis* (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
- No Change in listing status


Field Supervisor, Pacific Islands Fish and Wildlife Office



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