

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. 2013. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews of 44 species in Oregon, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 78(24):8185-8187.

Lead Region/Field Office:

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

Name of Reviewer(s):

Chelsie Javar-Salas, Plant Biologist, PIFWO

Marie Bruegmann, Plant Recovery Coordinator, PIFWO

Kristi Young, Programmatic Deputy Field Supervisor, 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 4, 2013. The review was based on a review of current, available information since the last 5-year review for *Vigna o-wahuensis* (USFWS 2011). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Plant Recovery Coordinator. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

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 at: http://ecos.fws.gov/tess_public.

Review Analysis:

Please refer to the previous 5-year review for *Vigna o-wahuensis* published on September 20, 2011 (available at: http://ecos.fws.gov/docs/five_year_review/doc3878.pdf) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of *V. o-wahuensis*.

This short-lived twining annual or perennial herb in the pea family (Fabaceae) is endangered and is known from all of the main Hawaiian Islands except Kauai (Geesink *et al.* 1999). Historically, *Vigna o-wahuensis* was found in the lowland dry and lowland mesic ecosystems on Lanai, and in the coastal ecosystem on Kahoolawe (USFWS 2012a). The last collection from Oahu was made on the Mokulua Islets and North Islet, off Oahu's northeastern coast in 1938 (Hawaii Biodiversity and Mapping Program 2008). There are still no known occurrences on Oahu's offshore islets (Hawaii Biodiversity and

Mapping Program 2008). The status and trends for *V. o-wahuensis* are provided in the tables below.

New status information:

- Currently, there are 26 individuals of *Vigna o-wahuensis* in 5 populations on Molokai, Maui, and Kahoolawe (USFWS 2012a). On Molokai, 2 populations totaling 12 individuals are known from Makakupaia and Makolelau. On East Maui, there are approximately 10 individuals at Kanaio Beach. In 2014, a survey discovered approximately three individuals of *V. o-wahuensis* in a new location on Maui (Plant Extinction Prevention Program [PEPP] 2014). On Kahoolawe, there is a single individual.
- On Hawaii Island, in 2009 and 2010 there were 3 known populations containing 71 individuals (PEPP 2009, 2010).
- During 2011 to 2013, approximately 200 to 300 individuals of *Vigna o-wahuensis* were known from Pohakuloa Training Area (PTA) (U.S. Army Garrison Pohakuloa [U.S. Army] 2014).
- Overall, the numbers of individuals have increased from the approximately 72 wild individuals reported in the previous 5-year review to approximately 226 to 326 wild individuals in 2015 (USFWS 2012a; PEPP 2014; U.S. Army 2014).

New threats:

- Nonnative bird predation or herbivory – This species is often browsed by game birds at reintroduction sites thus leading to shorter statue plants and limited reproduction (U.S. Army 2010).
- Stochastic events – Drought mortality or reduced viability – Drought may exacerbate the effects of ungulates and has direct adverse impacts on *V. o-wahuensis* (PEPP 2013).

New management actions:

- Surveys / inventories
 - A survey discovered approximately three individuals of *V. o-wahuensis* in a new location on Maui (PEPP 2014).
 - During 2011 to 2012, approximately 18.25 square kilometers (7.05 square miles) were surveyed at PTA (U.S. Army 2013). Surveys were completed within the following fence units: *Haplostachys haplostachya* (165 acres), *Kadua coriacea* (392 hectares [969 acres]), Kipuka Alala North (407 hectares [1,066 acres]), Puu Nohona O Hae (79 hectares [195 acres]), Puu Papapa (28 hectares [68 acres]), and *Silene hawaiiensis* (18 hectares [44 acres]). During that survey, only a single location was recorded for *V. o-wahuensis* (U.S. Army 2013).
 - In 2014, surveys conducted in previously un-surveyed areas and previously surveyed areas discovered approximately nine locations of *V. o-wahuensis* (U.S. Army 2015).
- Ungulate monitoring and control
 - All known locations of *V. o-wahuensis* that contain live plants are protected by the Puu Papapa and Nohona o Hae fence units at PTA (U.S. Army 2010). These fence units are ungulate free (U.S. Army 2014). The location in western

- Keamuku Maneuver Area that formerly contained individuals of *V. o-wahuensis* is not fenced (U.S. Army 2010).
- Invasive plant monitoring and control – Weed control for this species is problematic due to the loose and steep terrain associated with plants located on Puu Papapa (U.S. Army 2010). The Army Natural Resources Office at PTA is investigating alternative weed control methods for this species.
 - Captive propagation for genetic storage and reintroduction
 - The Volcano Rare Plant Facility (2013, 2014) had five individuals growing in their nursery and eight individuals were propagated for reintroduction activities to occur next year.
 - The Lyon Arboretum’s Seed Conservation Laboratory (2014) has more than 4,300 seeds in storage from Maui, Kahoolawe, and Hawaii Island.
 - Waimea Valley (2014) has two plants in cultivation from Maui.
 - The National Tropical Botanical Garden (2014) has more than 300 seeds in storage from Maui and Hawaii Island.
 - Maui Nui Botanical Garden (2014) has thousands of seeds in genetic storage representing eight cultivated individuals from Kanaio.
 - During 2011 to 2013, more than 14,000 seeds from 35 accessions representing 1 group and 35 founders of *V. o-wahuensis* were collected and placed in long-term storage at PTA (U.S. Army 2014). There are now more than 33,000 seeds in storage from 55 accessions representing 1 group and 47 founders in long-term storage at PTA (U.S. Army 2014).
 - Captive propagation protocol development – Propagation trials were conducted to determine appropriate storage and propagation techniques for *V. o-wahuensis*. The trials indicated that seeds from *V. o-wahuensis* germinated readily at a rate of more than 50 percent (U.S. Army 2015). Seed longevity for *V. o-wahuensis* is unknown (U.S. Army 2015).
 - Population viability monitoring and analysis
 - The Plant Extinction Prevention Program (2013) monitored the wild population on Maui.
 - In 2010, annual monitoring recorded several new plant locations on Puu Papapa at PTA (U.S. Army 2010). In addition to annual monitoring, supplemental monitoring was conducted in 2010 but no additional management actions were required implementation (U.S. Army 2010).
 - In 2010, no individuals were observed in an area in western Keamuku Maneuver Area which formerly contained individuals of *V. o-wahuensis* (U.S. Army 2010). This location will continue to be monitored for regeneration of new individuals.
 - A new quarterly monitoring methodology was implemented for this species in 2010 at PTA (U.S. Army 2010). Elements of the protocol were started in October of 2009, with refinements made based on feedback and data collected. The new methodology was fully implemented in April 2010. Data collection objectives are to quantify plant abundance and plant cluster density at different times of the year so that seasonal variation and variation because of spatial and temporal gradients in resource availability can be accounted for in this ephemeral species. Plant stems are used to estimate abundance and vigor, since it is difficult to distinguish between individual plants of this species (U.S. Army 2010). Cluster counts were

- not made until the last quarterly monitoring for this species where 27 plant clusters were found in the survey area.
- Monitoring conducted in the first quarter of 2010 recorded 110 out of the 183 previously known plant stems in previously recorded plant clusters known from PTA (U.S. Army 2010). The prolonged drought from 2009 to 2010 seemed to have had a considerable impact on this and other species' abundance and vigor at PTA (U.S. Army 2010). During the second quarter monitoring only 25 out of the 183 previously known *V. o-wahuensis* stems remained alive. The number of remaining stems declined to just 3 stems in the fourth quarter. Preliminary results from monitoring in 2011 indicated that there are no living stems in the survey area (U.S. Army 2010).
 - Reintroduction / translocation
 - During 2002 to 2012, a single individual of *V. o-wahuensis* was outplanted at Kipuka Alala South fence unit, another individual was outplanted in 2014, and one plant remained in 2014 (U.S. Army 2015).
 - Near Saddle Road on State-owned lands, 7 individuals were reintroduced during 2002 to 2012, no individuals were added in 2014, and no plants remained in 2014 (U.S. Army 2015).
 - In North Kona on State-owned lands, 100 seeds were broadcasted during 2004 to 2009 (U.S. Army 2015).
 - At Puu Waawaa Cone Unit on State-owned lands, 42 individuals were reintroduced during 2005 to 2012 (U.S. Army 2015). In 2014, an additional five individuals were reintroduced and monitoring conducted during the same year, recorded only three reintroduced individuals remained (U.S. Army 2015).
 - On County-owned lands in North Kona, 11 individuals were reintroduced during 2008 to 2012 and no reintroduced individuals remained in 2014 (U.S. Army 2015).
 - The Waikoloa Dry Forest Initiative has 74 reintroduced individuals with many of those individuals reaching maturity and producing seeds (J. Lawson, Waikoloa Dry Forest Initiative, pers. comm. 2015).
 - In 2014, two individuals were reintroduced on private land in North Kona (Wagner 2014).
 - Reintroduced / translocated population management and monitoring
 - In North Kona on State-owned lands, natural recruitment of a single immature individual was observed in 2014 (U.S. Army 2015).
 - At Puu Waawaa Cone Unit on State-owned lands monitoring conducted in 2014 recorded natural recruitment of a single immature individual of *V. o-wahuensis* (U.S. Army 2015).
 - On County-owned lands in North Kona, 11 individuals were outplanted during 2008 to 2012 and no outplants remained in 2014 (U.S. Army 2015).
 - Climate change adaptation strategy – Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaii using high resolution climate change projections. Climate change vulnerability is defined as the relative inability of a species to display the possible responses necessary for persistence under climate change. The assessment by Fortini *et al.* (2013) concluded that *V. o-wahuensis* is minimally vulnerable to the impacts of climate change.

- Listing and critical habitat designation
 - Fifteen units of critical habitat were designated for *V. o-wahuensis* on Oahu in the coastal ecosystem (USFWS 2012b).
 - Eight units of critical habitat for *V. o-wahuensis* were proposed in the coastal ecosystem on Maui and five units of critical habitat were proposed in the coastal and lowland dry ecosystems on Kahoolawe (USFWS 2012a). On Molokai, a single unit of critical habitat was proposed in the lowland mesic ecosystem (USFWS 2012a). On Lanai, critical habitat for *V. o-wahuensis* was proposed in three units in the lowland dry and lowland mesic ecosystems. The final rule for these critical habitat designations has not been published at the time of this review.

Synthesis:

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* (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 the islands where they now occur or occurred historically. 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 only one population is known to contain more than 50 mature individuals (Table 1). In addition, all threats are not being sufficiently managed throughout all of the populations (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:

- Surveys / inventories – Survey geographical and historical range for a current assessment of the species’ status.
- Captive propagation for genetic storage and reintroduction – Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.
- Ungulate monitoring and control – Maintain existing exclosures and monitor for potential incursions.
- Invasive plant monitoring and control – Eradicate invasive introduced plants within ungulate exclosures and maintain exclosures free of invasive plants.
- Population viability monitoring and analysis – Continue monitoring wild and outplanted individuals.
- Fire monitoring and control – Develop and implement a fire management plan at the existing exclosures.
- Alliance and partnership development – Initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

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

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	<100	0	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	Unknown	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2011 (5-yr review)	72	<200	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2015 (5-yr review)	226-326	78	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially

Table 2. Threats to *Vigna o-wahuensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, the reintroduced population in Auwahi is fenced. Population in lower Kanaio is fenced.
Invasive introduced plants	A, E	Ongoing	Partially, at PTA
Slug herbivory	C	Ongoing	None
Rodent predation or herbivory – rats	C	Ongoing	None
Nonnative bird predation or herbivory – game birds	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Drought	E	Ongoing	None
Fire	E	Ongoing	None
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2011). Only references for new information are provided below.

Fortini, L., J. Price, J. Jacobi, A. Vorsino, J. Burgett, K. Brinck, F. Amidon, S. Miller, S. Gon II, G. Koob, and E. Paxton. 2013. A landscape-based assessment of climate change vulnerability for all native Hawaiian plants. Technical report HCSU-044. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 141 pages.

Geesink, R., W.L. Wagner, and D.R. Herbst. 1999. Fabaceae. Pages 641-680 in Wagner, W.L., D.R. Herbst, and S.H. Sohmer (editors), Manual of the flowering plants of Hawaii, revised edition. University of Hawaii Press and Bishop Museum Press, Honolulu, Hawaii. Bishop Museum Special Publication 97.

Harold L. Lyon Arboretum Seed Conservation Laboratory. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Seed storage Microsoft Access database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Hawaii Biodiversity and Mapping Program. 2008. Hawaii species database. GIS shapefiles and database. Unpublished.

Maui Nui Botanical Gardens. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

- [PEPP] Plant Extinction Prevention Program. 2009. Plant Extinction Prevention Program annual report, fiscal year 2009 (July 1, 2008-June 30, 2009). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [PEPP] Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [PEPP] Plant Extinction Prevention Program. 2013. Maui nui Plant Extinction Prevention Program monthly report for December 2013. Microsoft Excel worksheet. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [PEPP] Plant Extinction Prevention Program. 2014. Plant Extinction Prevention Program annual report, fiscal year 2014 (July 1, 2013-June 30, 2014). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [U.S. Army] U.S. Army Garrison Pohakuloa. 2010. Natural Resources Program, annual report, Pohakuloa Training Area, Island of Hawaii. 01 October 2009 to 30 September 2010. U.S. Army Garrison Pohakuloa LTC Rolland C. Niles, Commanding December 2010. Prepared in cooperation with the Center for Environmental Management of Military Lands, Colorado State University. 147 pages.
- [U.S. Army] U.S. Army Garrison Pohakuloa. 2013. FY 2012 annual report for the Natural Resources Office, Pohakuloa Training Area, Island of Hawaii. 01 October 2011 to 30 September 2012. Prepared in cooperation with the Center for Environmental Management of Military Lands, Colorado State University
- [U.S. Army] U.S. Army Garrison Pohakuloa. 2014. Natural Resources Office, biennial report, Pohakuloa Training Area, Island of Hawaii. 01 October 2011 to 30 September 2013. Prepared in cooperation with the Center for Environmental Management of Military Lands, Colorado State University. 166 pages.
- [U.S. Army] U.S. Army Garrison Pohakuloa. 2015. FY 2014 annual report for the natural resources office, Pohakuloa Training Area, Island of Hawaii. 84 pages. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [USFWS] U.S. Fish and Wildlife Service. 1999. Recovery plan for multi-island plants. U.S. Fish and Wildlife Service, Portland, Oregon. 206 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2011. *Vigna o-wahuensis* 5-year review short form summary. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 10 pages.

[USFWS] U.S. Fish and Wildlife Service. 2012a. 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; proposed rule. Federal Register 77(112):34464-34775.

[USFWS] U.S. Fish and Wildlife Service. 2012b. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Federal Register 77(181):57648-57862.

Volcano Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

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Wagner, J. 2014. Dry forest preserve six month progress report, December 2014. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

Waimea Valley. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Personal communication:

Lawson, Jen. 2015. Project manager, Waikoloa Dry Forest Initiative. E-mail to Chelsie Javar-Salas, Pacific Islands Fish and Wildlife Office, dated April 30, 2015. Subject: Request for info for 5-year reviews.

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

Appropriate Listing/Reclassification Priority Number, if applicable: _____

for **Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office**

Maura M. Bugman

Date *2015-08-20*