

## 5-YEAR REVIEW

Short Form Summary

**Species Reviewed:** *Plantago hawaiiensis* (laukahi kuahiwi)

**Current Classification:** Endangered

### **Federal Register Notice announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. Federal Register 88(83): 20088–20092, May 7, 2018.

### **Lead Region/Field Office:**

Interior Region 12/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

### **Name of Reviewer:**

Cheryl Phillipson, Biologist, PIFWO

Lauren Weisenberger, Plant Recovery Coordinator, PIFWO

Megan Laut, Conservation & Restoration Team Manager, PIFWO

### **Methodology used to complete this 5-year review:**

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) beginning in October 2019. The review was based on a review of current, available information since the last 5-year review for *Plantago hawaiiensis* (USFWS 2012). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

### **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](http://ecos.fws.gov/tess_public)).

### **Review Analysis:**

Please refer to the previous 5-year review for *Plantago hawaiiensis* published in the Federal Register on August 28, 2012 (available at [https://ecos.fws.gov/docs/five\\_year\\_review/doc4064.pdf](https://ecos.fws.gov/docs/five_year_review/doc4064.pdf)) for a complete review of the species' status, threats, management efforts, and references cited. We are not aware of any significant new information regarding the species' biological status since listing to warrant a change in the Federal listing status of *P. hawaiiensis*.

This short-lived perennial herb in the Plantaginaceae (plantain) family is endangered and found on the island of Hawai‘i. The current status and trends for *Plantago hawaiiensis* are provided in the tables below.

#### New Status Information:

- At the time of the 5-year review in 2012 there were five populations of *Plantago hawaiiensis* totaling several 100 individuals. By 2014, there were two populations totaling as many as 133 individuals; with 13 new individuals found in Kahuku (Hawai‘i Volcanoes National Park (HVNP) 2019; PEPP 2014). One individual was discovered in a kīpuka next to Kipimana, Aīnahou (PEPP 2019). Currently, there are approximately 33 individuals at two locations in Hawai‘i Volcanoes National Park (Kahuku Unit and Kīpukamauna‘iu) (HVNP 2019; PEPP 2019; Keir 2018). This is a significant decline from the estimated 5,000 in 1996.

#### New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this species. Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawai‘i 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 *Plantago hawaiiensis* is vulnerable to the impacts of climate change, with a vulnerability score of 0.466 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.

#### New Management Actions:

- Surveys and inventories—
  - The Plant Extinction Prevention Program (PEPP) surveys for and monitors populations of *Plantago hawaiiensis* in ‘Āinahou and Kahuku (PEPP 2014, 2019).
  - HVNP monitors wild plants at three exclosures (Kīpukamauna‘iu, Kīpukakulālio, and Kīpukaaiakaalala) (HVNP 2019, p. 19).
- Ungulate monitoring and control—In 2013, 40 immature and two mature wild plants were found in Kahuku and cages were placed to protect the immature plants from mouflon (HVNP 2019, p. 19). The Division of Forestry and Wildlife and PEPP staff placed a temporary fence around the largest population (HVNP 2019, p. 19). Wild plants within the cages were recruiting seedlings in late 2017 (HVNP 2019, p. 19).
- Captive propagation for genetic storage and reintroduction—
  - The Volcano Rare Plant Facility (VRPF) maintained three plants in refugia representing one individual from HVNP from 2013 through 2017 (VRPF 2013-2019).
  - HVNP propagated 31 plants representing seven individuals from Kapāpala Upper (HVNP 2019). HVNP collected and stored 7,535 seeds representing 39 founders from Kapāpala Upper and 545 seeds representing one founder from Kahuku East at Pi‘ikea (HVNP 2019).

- Reintroduction and translocation—HVNP reported reintroduction of 183 individuals of *Plantago hawaiensis* at Kahuku in 2014. In 2015, an additional 200 individuals were planted. Initial survival of the 2014 plants was high in 2015 with 93 percent (186 individuals) remaining. By 2017; however, survival had dropped to 37 percent (74 individuals) with about one-third of the plants flowering (HVNP 2019, p 19).

**Table 1. Status and trends of *Plantago hawaiensis* from listing through current 5-year review.**

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1994 (listing)	10	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1996 (recovery plan)	>5,000	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Yes
2003 (critical habitat)	5,705–5,805	Unknown	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Yes
2012 (5-year review)	several 100	>1,000, 301 survived	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Yes

Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2020 (5-year review)	34	<74 survive (383 planted)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			Reproduction (i.e. viable seeds, seedlings) at all 3 populations	Partially, viable seeds
			3 populations with 50 mature individuals each	No

\* The Preventing Extinction Stage was established in 2011. Prior to 2011, the Interim Stabilization Stage was the first stage towards recovery (now it is the second stage after Preventing Extinction).

**Table 2. Threats to *Plantago hawaiiensis* and ongoing conservation efforts.**

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat and predation	A, C, D	Ongoing	Partial, exclosures at Kīpukamauna'iu, Kīpukakulalio, and Kipukaaiakaalala
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Predation by nonnative birds	C	Ongoing	None

**Synthesis:**

Approximately 34 wild individuals remain at three locations on the island of Hawai'i (Kahuku, Kīpukamauna'iu, 'Āinahou). This is a drastic decline from estimates in the mid-1990's of 5,000 individuals, and even a substantial decline from the several 100 estimated in the previous five year review in 2012. A landscape-based assessment of climate change vulnerability for native plants of Hawai'i using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *Plantago hawaiiensis* is vulnerable to the effects of climate change. Seed collections from wild and reintroduced individuals, propagation, and reintroduction are ongoing.

Approximately 383 individuals were reintroduced since the last 5-year review and only 74 were known to have survived in 2017, it is anticipated that maybe more have died since then. Reintroduced populations are provided protection from feral ungulates by fencing and ungulate control and recruitment of seedlings is observed at one population.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Big Island Plant Cluster (USFWS 1996), and have been updated according to the draft revised recovery objective guidelines developed by the Hawai‘i and Pacific Plants Recovery Coordinating Committee (HPPRCC 2011). The HPPRCC identifies an additional initial objective, the Preventing Extinction Stage, in addition to the Interim Stabilization, Delisting, and Downlisting objectives. Furthermore, life history traits such as breeding system, population size fluctuation or decline, and reproduction type (sexual or vegetative), have been included in the calculation of goals for the number of populations and reproducing individuals for each stage. The goals for each stage remain grouped by life span defined as annual, short-lived perennial (fewer than 10 years), or long-lived perennial.

*Plantago hawaiiensis* is a short-lived perennial herb. To prevent extinction, which is the first milestone in recovering the species, the taxon must be managed to control threats (e.g., fenced) and have 50 individuals (or the total number of individuals if fewer than 50 exist) from each of three populations represented in *ex situ* (secured off-site, such as a nursery or seed bank) collections. In addition, a minimum of three populations should be documented on the island of Hawai‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings), with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are only 34 wild individuals and no regeneration or reintroductions, although recruitment has been observed at one reintroduction. Survivorship at reintroduced populations declines over a few years. Genetic storage goals have been met for one of the three populations (Table 1). All threats are not being managed (Table 1, Table 2). Therefore, *Plantago hawaiiensis* meets the definition of Endangered as it remains in danger of extinction throughout its range.

#### **Recommendations for Future Actions:**

We are not aware of any new threats or significant new information regarding the species' biological status since the last 5-year review in 2012. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—Continue to conduct thorough surveys of all historical and suitable habitat for new occurrences and to determine current status of known wild individuals, especially in Upper Waiākea Forest Reserve.
- Ungulate monitoring and control—Continue to construct and maintain fenced enclosures to protect individuals from the negative impacts of habitat destruction and degradation, and browsing and trampling by ungulates.

- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species, and those that compete with *Plantago hawaiiensis* at all populations.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for the recovery of the species.
- Predation by nonnative birds—Assess the effects of predation by nonnative birds and develop management strategies if necessary.
- Captive propagation for genetic storage and reintroduction—
  - Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
  - Track maternal source of propagative materials for use in *ex situ* propagation.
- Reintroduction and translocation—Determine optimal sites and continue to reintroduce individuals into areas that are being managed for known threats.
- Population biology research—
  - Determine relative level of genetic diversity among remaining individuals.
  - Determine possible factors for early senescence of reintroduced individuals.
  - Study the reproductive biology of *P. hawaiiensis* to determine the pollinators and factors that aid in seed dispersal.
- Alliance and partnership development—Continue to work with the Hawai‘i Division of Forestry and Wildlife, Hawai‘i Volcanoes National Park, and other partners and land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

## References:

- 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. 134 pp.
- Keir, M. 2018. *Plantago hawaiiensis*. The IUCN Red List of Threatened Species 2018:e.T80175325A80175443. <http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T80175325A80175443.en>.
- [HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.
- [HVNP] Hawai‘i Volcanoes National Park. 2019. Annual report to the U.S. Fish and Wildlife Service threatened and endangered plants, Hawaii Volcanoes National Park TE-018078-21, 2019, 26 pp.

[PEPP] Plant Extinction Prevention Program. 2014. Annual report fiscal year 2014 (July 1, 2013-June 30, 2014). 185 pp.

[PEPP] 2019. Plant Extinction Prevention Program, annual recovery subpermit FWSPIFWO-26 report (January 1<sup>st</sup>, 2018–December 31<sup>st</sup> 2018), as designated under the U.S. Endangered Species Act. Unpublished report submitted to U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

[USFWS] U.S. Fish and Wildlife Service. 1996. Recovery plan for the Big Island plant cluster, 1996. Portland. 176 pp. + appendices.

[USFWS] 2012. *Plantago hawaiensis* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI.  
[https://ecos.fws.gov/docs/five\\_year\\_review/doc4064.pdf](https://ecos.fws.gov/docs/five_year_review/doc4064.pdf).

[USFWS] 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. 88 FR 20088, May 7, 2018.

[VRPF] Volcano Rare Plant Facility. 2013-2019. Summary of reports on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

**U.S. FISH AND WILDLIFE SERVICE**

SIGNATURE PAGE for 5-YEAR REVIEW of *Plantago hawaiiensis* (laukahi kuahiwi)

**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

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

\_\_\_\_\_ Date \_\_\_\_\_