

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Kanaloa kahoowawensis* (kohe malama malama o Kanaloa; ka palupalu o Kanaloa)

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 *Kanaloa kahoowawensis* (USFWS 2014). 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).

Review Analysis:

Please refer to the previous 5-year reviews for *Kanaloa kahoowawensis* published in the Federal Register on January 18, 2008 and March 27, 2014 (available at https://ecos.fws.gov/docs/five_year_review/doc1843.pdf and https://ecos.fws.gov/docs/five_year_review/doc4398.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 *K. kahoowawensis*.

This short-lived, obligate outcrosser, perennial shrub in the Fabaceae (pea) family is endangered and is extirpated from Kaho‘olawe. Two plants are in refugia and propagative materials are in storage. The current status and trends for *Kanaloa kahoowawensis* are provided in the tables below.

New Status Information:

- Currently, there are no known wild individuals; the last individual died in 2014 (Portner *et al.* 2016).
- In 2016, five critical habitat units in the coastal and lowland dry ecosystems were designated for *Kanaloa kahoowawensis* on Kaho‘olawe (2,485 hectares (ha); 6,142 acres (ac)) (81 FR 17790, March 30, 2016).

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 *Kanaloa kahoowawensis* is extremely vulnerable to the impacts of climate change, with a vulnerability score of 0.997 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). In addition, the assessment classified *K. kahoowawensis* as a “wink-out” species. “Wink-out” species are those with no future climate envelope. No projected suitable climate areas exist for the species on islands within its known range to persist into the future. Therefore, additional management actions are needed to conserve this taxon into the future, such as ensuring that adequate viable genetic storage is maintained if plants are discovered, identifying suitable microsites where climate change effects are anticipated to occur more slowly, and considering suitable habitat in areas outside of the species’ known range.

New Management Actions:

- Surveys and inventories—Aerial surveys for *Kanaloa kahoowawensis* on the sea cliffs of its last known location were conducted in 2014, no additional plants were observed (PEPP 2014). In 2015, PEPP searched the last known location for seeds but did not locate any, and collected soil from the site for seed bank testing and for inoculation of cultivated plants (PEPP 2015).
- Captive propagation for genetic storage and reintroduction—
 - The Lyon Arboretum Micropropagation Laboratory reported 13 explants in propagation (Lyon 2019).
 - The Maui Nui Botanical Garden (MNBG) had one plant in refugia representing the last wild individual (MNBG 2019). Unfortunately, this plant died in July 2020 from *Phomopsis* fungal pathogen, despite best efforts to control (d’Avella 2020).
 - MNBG, DOFAW, and PEPP coordinated collection of fresh tip cuttings from the last two remaining refugia plants of *Kanaloa kahoowawensis* over the last several years. Cuttings previously taken from the *ex situ* plants have been unsuccessful from efforts on-island (PEPP 2014). These efforts produced two clones from the one plant, but failed to clone the other plant at MNBG (Ladao 2020, Weisenberger 2020, pers. comm.).

- The Olinda Rare Plant Facility (ORPF) has one plant in refugia representing the last wild individual (ORPF 2019). There are two clones of this individual at the facility as well.
- Collected pollen is in storage at the National Laboratory for Genetic Resources Preservation (Portner *et al.* 2016).
- When the *ex situ* plants flower, PEPP, MNBG, and ORPF make every effort to cross-pollinate. In the summer of 2020, 23 viable seeds were produced and germinated and are currently being propagated. Plans to distribute the seedlings among multiple facilities are ongoing to create redundancy throughout the *ex situ* collection (Ladao 2020, Weisenberger 2020, pers. comm.).

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1999 (listing)	2	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2002 (recovery plan)	1	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	2	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2008 (5-year review)	1	0	All threats managed in all 3 populations	Partially

			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	
2014 (5-yr review)	1	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2016 (critical habitat)	1	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2020 (5-year review)	0	0	All threats managed in all 3 populations	Partial
			Complete genetic storage	Yes
			Reproduction (<i>i.e.</i> viable seeds, seedlings) at all 3 populations	No
			3 populations with 250 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 *Kanaloa kahoowawensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation of habitat by introduced cats	A	Ongoing	Partial, KIRC plans to manage cats on Kahoolawe
Degradation of habitat and disturbance by seabirds	A	Ongoing	None
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, some nonnative plant control by KIRC
Drought	A	Ongoing	Partial, KIRC irrigates planted common native plant species
Climate change degradation or loss of habitat	A	Ongoing	None
Established invasive plant species competition	C	Ongoing	Partial, some nonnative plant control by KIRC
Predation and herbivory by rats and mice	C	Potential	None
Predation and disease caused by nonnative insects	C	Ongoing	Partial, insect control conducted at botanical facilities
Reduced viability due to low numbers	E	Ongoing	Partial, propagation efforts are ongoing

Synthesis:

Currently there are no known wild individuals of *Kanaloa kahoowawensis* on Kaho‘olawe. Three large plants and 23 seedlings representing the last known wild individual are in refugia at separate facilities. 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 *K. kahoowawensis* is highly vulnerable to the effects of climate change. Propagation of vegetative materials, pollination, and storage of pollen is ongoing. Plans are ongoing for coordinated restoration efforts.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Addendum to the Recovery Plan for the Multi-Island Plants 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.

Kanaloa kahoowawensis is a short-lived perennial shrub, and is an obligate outcrosser with a tendency for large declines in population size. 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 Kaho‘olawe where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings, saplings), with a minimum of 250 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. Although genetic storage is complete for the last known individual (Table 1), there are no known plants in the wild, and 26 plants in refugia. All threats are not being managed (Table 1, Table 2). Therefore, *Kanaloa kahoowawensis* 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 2014. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—Continue to search historical and suitable habitat for occurrences.
- Invasive plant monitoring and control—If plants are discovered, control established ecosystem-altering nonnative invasive plant species, and those that compete with *Kanaloa kahoowawensis*.
- 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.
- Rodent and cat control—Determine the need for rodent and rat control at the last known location of *K. kahoowawensis*, and implement effective controls if necessary.
- Disease control—Continue to control powdery mildew and mite infestations in refugia plants.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts of plant materials for maintenance of genetic stock and for reintroduction.
- Reintroduction and translocation—Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species to build resiliency and redundancy to reduce impacts of loss of viability.

- Population biology research—Research the necessity and type of root microflora required to improve micropropagation success.
- Alliance and partnership development—Continue to work with partners in planning and implementation of ecosystem-level restoration and management to benefit this species.

References:

- d'Avella, C. 2020. Kanaloa Monthly Report from Maui Nui Botanical Garden. email. 2 July 2020.
- 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.
- [HPPRCC] Hawai'i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.
- Ladao, M. 2020. Critically endangered plant from Kahoolawe gets new life with more than 20 seedlings. Honolulu Star-Advertiser. 13 July 2020. 8 pp.
- Lyon Arboretum. 2019. Report 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.
- [MNBG] Maui Nui Botanical Garden. 2019. Report 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.
- [ORPF] Olinda Rare Plant Facility. Report 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.
- [PEPP] Plant Extinction Prevention Program. 2014. Annual report fiscal year 2014 (July 1, 2013-June 30, 2014). 185 pp.
- [PEPP] 2015. Annual report fiscal year 2015 (July 1, 2014-June 30, 2015). 179 pp.
- Portner, T., M. Bruegmann, M. Chau, J. Kwon, V.L. Caraway, and M. Sporck-Koehler. 2016. *Kanaloa kahoolawensis*. The IUCN Red List of Threatened Species 2016: e.T80092456A115502184. <http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T80092456A80092468.en>.

- [USFWS] U.S. Fish and Wildlife Service. 2002. Addendum to the recovery plan for the multi-island plants, 1998. Portland. 93 pp. + appendices.
- [USFWS] 2008. *Kanaloa kahoowawensis* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/five_year_review/doc1843.pdf.
- [USFWS] 2014. *Kanaloa kahoowawensis* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/five_year_review/doc4398.pdf.
- [USFWS] 2016. Endangered and threatened wildlife and plants; designation and nondesignation of critical habitat on Molokai, Lanai, and Kahoolawe for 135 species, final rule. Department of the Interior, 81 FR 17790, March 30, 2016.
- [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.
- [USFWS] 2019. Draft recovery outline for the multi-island species. March, 2019. 27 pp. + maps.
- Weisenberger, L. 2020. Notes from the *Kanaloa kahoowawensis* planning meeting for the Kanaloa Working Group. Personal communication (notes) for virtual meeting. 18 May 2020.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Kanaloa kahoowawensis*
(kohe malama malama o Kanaloa; ka palupalu o Kanaloa)

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

For Field Supervisor, Pacific Islands Fish and Wildlife Office

Date _____