

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Kanaloa kahoowawensis* (kohe malama malama o kanaloa)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; 5-year status reviews of 46 species in Idaho, Oregon, Washington, Nevada, Montana, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 77(44):13248-13251.

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
Maui nui and Hawaii Island Team Manager, PIFWO
Marie Bruegmann, Plant Recovery Coordinator, PIFWO
Recovery Program Lead, 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 6, 2012. The review was based on a review of current, available information since the last 5-year review for *Kanaloa kahoowawensis* (USFWS 2008). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Island Team Manager, Plant Recovery Coordinator, followed by the Recovery Program Lead. 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 (http://ecos.fws.gov/tess_public).

Review Analysis:

Please refer to the previous 5-year review for *Kanaloa kahoowawensis* published on January 18, 2008 (available at http://ecos.fws.gov/docs/five_year_review/doc1843.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 *K. kahoowawensis*.

This short-lived perennial is endangered and occurs only on the island of Kahoolawe (USFWS 2008). The current status and trends for *Kanaloa kahoowawensis* are provided in the tables below.

New status information:

In 2010, only a single mature wild individual remained on Kahoolawe and two individuals are in captive propagation on Maui (Plant Extinction Prevention Program [PEPP] 2010). The large captive propagated individual located at the National Tropical Botanical Garden on Kauai died (USFWS 2010). It was cultivated from plant material collected in 1992. The National Tropical Botanical Garden (2013) was able to propagate material from the plant that died and currently has a single individual in captive propagation (USFWS 2010).

Overall, the number of wild individuals for *Kanaloa kahoowawensis* remained stable with only a single wild individual currently known and as stated in the previous 5-year review (USFWS 2008). There are four individuals in captive propagation on Kauai and Maui.

New threats:

- Climate change destruction 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 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 *Kanaloa kahoowawensis* is highly vulnerable to the impacts of climate change and is noted as the ten most vulnerable plant species to climate change. Therefore, additional management actions are needed to conserve this taxon into the future.
- Disease monitoring and control – The Olinda Rare Plant Facility reported downy mildew as a threat to the single individual in captive propagation (USFWS 2010). Powdery mildew was also reported as a threat to *K. kahoowawensis* at Maui Nui Botanical Gardens (2012).
- Invertebrate herbivory or predation – Olinda Rare Plant Facility reported spider mites as a threat to the single individual in captive propagation (USFWS 2010).

New management actions:

- Captive propagation for genetic storage and reintroduction
 - The National Tropical Botanical Garden (2013) has a single individual in captive propagation.
 - The Maui Nui Botanical Gardens (2013) has a single individual of *K. kahoowawensis* in captive propagation. Efforts to transplant this individual into a larger planter box (4x8x8 feet) began in 2013. Plant tissues were sent to Lyon Arboretum Micropropagation Laboratory for genetic storage; however efforts failed to successfully maintain the genetic tissue in micropropagation. Staff from the Micropropagation Laboratory plan to visit the Gardens in July 2013 to obtain additional plant tissue for micropropagation efforts.
 - Harold L. Lyon Arboretum conducted a new type of tissue culture propagation technique for *K. kahoowawensis* using leaf cuttings (KIRC 2013).
 - There are approximately 56 propagules of *K. kahoowawensis* in captive propagation at the Harold L. Lyon Arboretum Micropropagation Laboratory (2013).

- Olinda Rare Plant Facility (2013) has a single individual in captive propagation.
- Alliance and partnership development – In 2012, the Plant Extinction Prevention Program initiated partnership development to work with Kahoolawe Island Reserve Commission (KIRC) to assist with and carry out conservation actions for *K. kahoolawensis* (PEPP 2012).
- Strategic planning – In 2012, a management plan for *Kanaloa kahoolawensis* and a memorandum of understanding with cooperating agencies involved in the propagation, management, and restoration of *K. kahoolawensis* was approved by the KIRC Commissioners (KIRC 2012).
- Predator / herbivore monitoring and control – Traps were used to control mice in the vicinity of the wild individual (KIRC 2012; USFWS 2010).
- Population viability monitoring and analysis
 - The Plant Extinction Prevention Program (2010) monitored the two individuals of *K. kahoolawensis* in captive propagation on Maui.
 - The single individual in captive propagation at the Olinda Rare Plant Facility reported producing fruits, but viability of the seeds was not reported (USFWS 2010).
 - In 2010, the single individual in captive propagation located at Maui Nui Botanical Gardens (2012) flowered twice and they were reported to be male flowers. Pollen was bagged and collected to be used for cross pollination with another individual of *K. kahoolawensis* in captive propagation on Maui.
 - In April and May 2013, Ken Wood and the Kahoolawe Island Reserve Commission visited the wild individual (KIRC 2013). The plant appeared to be drought-stressed with very little green leaves visible during that time of year.
- Existing population management and restoration
 - KIRC developed a management plan for removal of introduced feral predators, including cats, from Kahoolawe (KIRC 2011).
 - In 2013, Ken Wood and KIRC visited and irrigated the last individual of *K. kahoolawensis* with 37 gallons of water in April and 49 gallons of water in May (KIRC 2013).
- Disease monitoring and control – Maui Nui Botanical Gardens (2012) reported an outbreak of powdery mildew on *K. kahoolawensis* in captive propagation. Several fungicides were used to treat and control the powdery mildew.
- Reintroduction / translocation – Assess the viability of reintroduction onto Kauai, Oahu, and possibly Maui, if material becomes available.
- Listing and critical habitat designation – Five units of unoccupied and occupied areas of critical habitat for *K. kahoolawensis* was proposed in the coastal and lowland dry ecosystems on Kahoolawe (USFWS 2012). The final rule for critical habitat designations has not been published at the time of this review.

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the addendum to the recovery plan for multi-island plant cluster (USFWS 2002), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Kanaloa kahoolawensis* is a short-lived perennial, and to be considered stable, this species 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 total of three populations should be documented on islands where it now occurs 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 stabilization goals for this species have not been met, as no population has more than 50 mature individuals (Table 1) and all threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Kanaloa kahoowaleensis* 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 genetic storage and reintroduction
 - Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.
 - Evaluate genetic resources currently in storage to determine the need to place additional genetic resources in long-term storage due to this species' vulnerability to climate change.
- Invasive plant monitoring and control – Eradicate invasive introduced plant species within the vicinity of the last known wild individual.
- Predator / herbivore monitoring and control – Continue controlling rodents within the vicinity of the last known wild individual and at captive propagation facilities to enable seed production.
- Population viability monitoring and analysis – Continue monitoring wild and captive propagated individuals.
- Disease monitoring and control – Continue controlling powdery mildew outbreaks at captive propagation facilities.
- Climate change adaptation strategy – Research the suitability of habitat for reintroducing this species in the future due to the impacts of climate change.
- Alliance and partnership development – Continue initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

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

| Date | No. wild indivs | No. outplanted | Stability Criteria identified in Recovery Plan | Stability Criteria Completed? |
|------------------------------------|------------------------|-----------------------|---|--------------------------------------|
| 1999 (listing) | 2 | 0 | All threats managed in all 3 populations | No |
| | | | Complete genetic storage | Yes |
| | | | 3 populations with 50 mature individuals each | No |
| 2002 (recovery plan) | 1 | 0 | All threats managed in all 3 populations | No |
| | | | Complete genetic storage | Yes |
| | | | 3 populations with 50 mature individuals each | No |
| 2003 (critical habitat) | 1 | 0 | All threats managed in all 3 populations | Partially |
| | | | Complete genetic storage | Yes |
| | | | 3 populations with 50 mature individuals each | No |
| 2008 (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 |
| 2012 (critical habitat – proposed) | 1 | 0 | All threats managed in all 3 populations | Partially |
| | | | Complete genetic storage | Yes |
| | | | 3 populations with 50 mature individuals each | No |
| 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 |

Table 2. Threats to *Kanaloa kahoowawensis* and ongoing conservation efforts.

| Threat | Listing factor | Current Status | Conservation/ Management Efforts |
|--|-----------------------|-----------------------|---|
| Introduced cats – degradation of habitat and trampling | A, E | Ongoing | Partially, KIRC plans to control cats on Kahoolawe |
| Native seabirds – degradation of habitat and trampling | A, E | Ongoing | None |
| Invasive introduced plants | A, E | Ongoing | None |
| Unrestricted collecting | B | Ongoing | None |
| Rodent predation or herbivory – rats and mice | C | Ongoing | Partially, traps deployed for mice |
| Invertebrate predation or herbivory | C | Ongoing | None |
| Disease | C | Ongoing | Yes, cultivated individuals controlled with fungicide |
| Drought | E | Ongoing | Partially, watered wild individual |
| Low numbers | E | Ongoing | Yes, captive propagation for genetic storage |
| Climate change | A, E | Increasing | None |

References:

See previous 5-year review for a full list of references (USFWS 2008). 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.

Harold L. Lyon Arboretum Micropropagation Laboratory. 2013. Micropropagation database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

[KIRC] Kahoolawe Island Reserve Commission. 2011. Kahoolawe Island Reserve year in review, FY 2011, July 2010 to June 2011. Available online at <<http://kahoolawe.hawaii.gov/plans/KIRC%20YIR%202011.pdf>>. Accessed on February 12, 2014.

[KIRC] Kahoolawe Island Reserve Commission. 2012. Kahoolawe Island Reserve Commission meeting minutes, Thursday, April 26, 2012. Available online at <<http://kahoolawe.hawaii.gov/agendas/Minutes%20042612.pdf>>. Accessed on February 12, 2014.

- [KIRC] Kahoolawe Island Reserve Commission. 2013. Kahoolawe Island Reserve Commission, restoration summary, April-May 2013. Available online at <<http://kahoolawe.hawaii.gov/downloads/Restoration%20Status%20Update%20Apr%20May%202013.pdf>>. Accessed on February 12, 2014.
- Maui Nui Botanical Gardens. 2012. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 15 pages. Unpublished.
- Maui Nui Botanical Gardens. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 12 pages. Unpublished.
- National Tropical Botanical Garden. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 30 pages. Unpublished.
- Olinda Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 5 pages. Unpublished.
- [PEPP] Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010). 122 pages. Unpublished.
- [PEPP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pages. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 2002. Addendum to the recovery plan for the multi-island plants. U.S. Fish and Wildlife Service, Portland, Oregon. viii + 125 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2008. *Kanaloa kahoowawensis* 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 14 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2010. Maui nui task force meeting notes, 2010-09-09. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 11 pages. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 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; proposed rule. Federal Register 77(112):34464-34775.

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

Pre-1992 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

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