

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Canavalia molokaiensis* (‘āwikiwiki)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawaii, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewers:

Cheryl Phillipson, Biologist, PIFWO

Lauren Weisenberger, Plant Recovery Coordinator, PIFWO

Gregory Koob, 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 August 2017. The review was based on a review of current, available information since the last 5-year review for *Canavalia molokaiensis* (USFWS 2011). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Gregory Koob, 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 review for *Canavalia molokaiensis* published in the Federal Register on August 2, 2011 (available at https://ecos.fws.gov/docs/five_year_review/doc3806.pdf) for a complete review of the species’ status, threats, and management efforts. We are not aware of any significant new information regarding the species’ status to warrant a change in the Federal listing status of *C. molokaiensis*.

This short-lived perennial vine in the Fabaceae (pea) family is endangered and endemic to Moloka‘i. The current status and trends for *Canavalia molokaiensis* are provided in the tables below.

New Status Information:

- In 2011, there were 10 populations of *Canavalia molokaiensis* totaling approximately 175 individuals on Molokaʻi. Currently, there are three populations of 5 to 10 individuals each at Kalaupapa, Kūpāʻia, and Puaʻahala (Bakutis 2018, in litt.), and three individuals observed at Kua Gulch in 2013 (PEPP 2013). There are no new reports on the current status of other populations at Mokomoko Gulch (3 to 6 individuals) and Waiʻaleʻia stream (10 individuals) since 2009 (Tangalin 2009, in litt.), or for two individuals at Wailau since 2005.
- In 2016, the Service revised critical habitat for *Canavalia molokaiensis*, and 14 critical habitat units were designated in four ecosystems (coastal, lowland mesic, lowland wet, and wet cliff) on Molokaʻi (24,945 ac, 10,099 ha) (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 Hawaiʻi 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 *Canavalia molokaiensis* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.761 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions are needed to conserve this taxon into the future.

New Management Actions:

- Ungulate monitoring and control—In 2016, the Hawaiʻi Department of Land and Natural Resources, Division of Forestry and Wildlife and The Nature Conservancy (for the East Molokaʻi Watershed Partnership) submitted a draft Environmental Assessment for the proposed Pākuʻi Watershed Project. The proposed project's goal is the construction of a 5.5-mile fence, which, in conjunction with the existing Kapualei Extension fence, will enclose the Pakui Unit and protect 2,080 ac of vital watershed on southeast Molokaʻi. If completed, the fence would provide protection from ungulates to the occurrences of *Canavalia molokaiensis* and other rare plant species at Puaʻahala and Kua Gulch.
- Captive propagation for genetic storage and reintroduction—
 - NTBG has 316 seeds in storage from eight collections taken between 1992 and 2009 from all known populations (NTBG 2018).
 - Kalaupapa National Historical Park (KNHP) has several individuals in storage and hundreds of seeds from several occurrences in the park (KNHP 2014).
- Stochastic events—Build resiliency and redundancy—KNHP reintroduced 15 individuals at Kūkaʻiwaʻa and five individuals at Waihānau in 2014 (KNHP 2014).

Synthesis:

Currently, there are three populations totaling between 18 and 33 individuals on Moloka‘i, and three additional populations (totaling 18 individuals) that have not been visited within the last 10 years. Seed collections from outplanted or greenhouse material are ongoing. 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 *Canavalia molokaiensis* is highly vulnerable to the effects of climate change. The current and historic occurrences of this species are well-represented; however, much of the collected material is more than 10 years old. Outplanting efforts are ongoing, with 20 individuals reintroduced into Kalaupapa National Historical Park.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Moloka‘i 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.

Canavalia molokaiensis is a short-lived perennial vine with vegetative reproduction. To prevent extinction, which is the first step 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 in a nursery or seed bank) collections. In addition, a minimum of six populations should be documented on Moloka‘i. Each of these populations must be naturally reproducing (*i.e.*, viable seeds, seedlings, saplings) and increasing in number, with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met as there are no populations of at least 50 reproducing individuals, genetic representation is incomplete (Table 1), and all threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Canavalia molokaiensis* 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 2011. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2018.

- Surveys and inventories—Survey for additional populations of *Canavalia molokaiensis* in areas of potentially suitable habitat.

- Ungulate monitoring and control—Construct and maintain fenced exclosures to protect individuals from the negative impacts of feral ungulates. Protect all occurrences against browsing and habitat disturbances from feral ungulates.
- Invasive plant monitoring and control—
 - Control established ecosystem-altering nonnative invasive plant species around all populations.
 - Control invasive nonnative species that compete with the species around all populations.
- Captive propagation for genetic storage and reintroduction—Continue propagation efforts for maintenance of genetic stock.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species.
- 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 this species.
- Alliance and partnership development—Work with the Hawai‘i Division of Forestry and Wildlife and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	ca 50	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
1996 (recovery plan)	< 100	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	> 50	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2011 (5-year review)	175	76	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2016 (critical habitat)	170	20	All threats managed in all three populations	No
			Complete genetic storage	Partially

			Three populations with 50 mature individuals each	No
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2018 (5-year review)	18–33 (-51)	0	All threats managed in all six populations	No
			Complete genetic storage	Partially
			Reproduction (<i>i.e.</i> viable seeds, seedlings) at all three populations	No
			Six 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 after Preventing Extinction).

Table 2. Threats to *Canavalia molokaiensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, some individuals in KHNP
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, some individuals in KHNP
Climate change degradation or loss of habitat	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	Partial, some individuals in KHNP
Stochastic events—Reduced viability due to low numbers	E	Ongoing	Partial—Propagation, seed storage, and reintroduction efforts are ongoing

References:

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

Bakutis, A. 2018, in litt., Email regarding status of Molokai plant species, 11 JAN 2018.

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. Hawai'i Cooperative Studies Unit, University of Hawai'i at Hilo, Hawai'i. 134 pp.

[HPPRCC] Hawai'i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.

[KNHP] Kalaupapa National Historical Park. 2014. Controlled propagation report.

[NTBG] National Tropical Botanical Garden. 2018. Controlled propagation report.

[PEPP] Plant Extinction Prevention Program. 2013. PEPP annual report fiscal year 2013 (July 1, 2012-June 30, 2013). 207 pp.

[TNC] The Nature Conservancy, Molokai Program. 2016. Draft environmental assessment for the Pāku'i Watershed project. 553 pp.

[USFWS] U.S. Fish and Wildlife Service. 2011. *Canavalia molokaiensis* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/five_year_review/doc3806.pdf.

[USFWS] 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawaii, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573, February 12, 2016.

[USFWS] 2016. Endangered and threatened wildlife and plants; designation and nondesignation of critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; final rule. Federal Register 81 (61): 17790–18110, March 30, 2016.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Canavalia molokaiensis* ('āwikiwiki)

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