

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Kokia cookei* (koki‘o, Cooke’s kokio)

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 for 76 species in Hawaii, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573, February 12, 2016.

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 (USFWS) beginning in August 2017. The review was based on a review of current, available information since the last 5-year review for *Kokia cookei* (USFWS 2014). 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 reviews for *Kokia cookei* published in the Federal Register on January 18, 2008 and March 27, 2014 (available at https://ecos.fws.gov/docs/five_year_review/doc1844.pdf and https://ecos.fws.gov/docs/five_year_review/doc4399.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’ biological status since listing to warrant a change in the Federal listing status of *K. cookei*.

This long-lived perennial tree in the Malvaceae (mallow) family is endangered and is endemic to Moloka‘i. There are no known wild individuals, only grafted or propagated individuals exist in *ex situ*, *inter situ*, or reintroduced populations. The current status and trends for *Kokia cookei* are provided in the tables below.

New Status Information:

- In 2014, the 5-year review reported individuals in captive propagation at Waimea Arboretum, Lyon Arboretum, Amy Greenwell Ethnobotanical Garden, Leeward Community College, Ho‘olawa Farms, and Maui Nui Botanical Garden. In 2012, two individuals had been outplanted on Moloka‘i in a living garden (*inter situ*) collection. Currently, there are still no known wild individuals. There are 10 propagated individuals outplanted on east Maui, and one individual remains in the *inter situ* collection on Moloka‘i (PEPP 2017a, b).
- In 2016, critical habitat was designated in two units (lowland dry ecosystem) on Moloka‘i for *Kokia cookei* (613 ac; 248 ha) (81 FR 17790, March 30, 2016).

New Threats:

- None reported.

New Management Actions:

- Surveys and monitoring—The Plant Extinction Prevention Program (PEPP) co-manages reintroductions of *Kokia cookei* (PEPP 2013, 2014, 2015, 2016, 2017a).
- Captive propagation for genetic storage and reintroduction—
 - Currently, the 2017 PEPP Statewide *ex situ* report indicates that seven of the eight founders from grafted material are represented in collections on east Maui, and two founders are represented in a reintroduction (seven individuals) on Moloka‘i (PEPP 2017b).
 - The Lyon Arboretum Micropropagation Laboratory reports 39 containers of propagules representing at least five individuals from plants at Fleming Arboretum on east Maui (Lyon Arboretum 2017).
 - The National Tropical Botanical Garden (NTBG) reports one seed from self-pollinated individual from the living collections (NTBG 2013, 2014, 2015, 2017).
 - Maui Nui Botanical Garden (MNBG) reported one grafted scion from material stored at Lyon Arboretum representing one wild individual in 2013, but they currently do not have any material (MNBG 2013, 2018).
 - The Olinda Rare Plant Facility (ORPF) reports one potted plant propagated from an individual at Fleming Arboretum, and five potted plants from plants from an *inter situ* collection on Moloka‘i (ORPF 2018).
 - The Pahole Rare Plant Facility (PRPF) on O‘ahu reports one plant in storage since 2013 (PRPF 2013, 2018).
 - Waimea Valley Arboretum reports seven plants representing one individual (Waimea Valley Arboretum 2017).
 - Fleming Arboretum reports five individuals (one mature, four seedlings) grown from a plant propagated at Waimea Arboretum, and two grafted individuals from material at ORPF (Fleming Arboretum 2018).
 - PEPP monitors *inter situ* and *ex situ* plants on east Maui and Moloka‘i (PEPP 2014, 2015, 2016, 2017a). Currently, PEPP reports that there are 10 individuals on east Maui at Fleming Arboretum and eight *inter situ* individuals on Moloka‘i (PEPP 2014, 2015, 2016, 2017a).

- Stochastic events—Build resiliency and redundancy—With focused propagation efforts *inter situ* plants on Moloka‘i are producing viable seeds. Efforts will continue with the east Maui reintroductions and will hopefully produce similar results (PEPP 2016).

Synthesis:

Currently, there are 17 to 18 *inter situ* or *in situ* individuals of *Kokia cookei* on east Maui and Moloka‘i. All wild individuals on Moloka‘i are believed to be extirpated. Genetic representation is complete for these individuals. Hand-pollination, seed collection, propagation, and reintroductions are ongoing.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for *Kokia cookei* (USFWS 1998), 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.

Kokia cookei is a long-lived perennial tree. 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 a nursery or seed bank) collections. In addition, a minimum of three 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 25 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met as there are no populations of at least 25 individuals, and, although genetic representation is complete (Table 1), all threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Kokia cookei* 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 2018.

- Population viability and monitoring—Continue monitoring outplanted individuals.
- Ungulate monitoring and control—Continue to construct and maintain exclusion fences to protect *K. cookei* from the impacts of feral ungulates.

- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species around all populations.
- Fire destruction or degradation of habitat—Develop and implement fire prevention management plans for reintroduction areas on east Maui and Moloka‘i.
- Captive propagation for genetic storage and reintroduction—
 - Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.
 - Continue to increase numbers of grafted individuals.
 - Continue pollination trails to produce viable seeds.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historical range that is being managed for known threats to this species.
- Rodent predation or herbivory—Implement effective methods to control rats at known populations.
- Invertebrate predation or herbivory—Implement effective methods to control slugs at known populations.
- 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 *Kokia cookei* from listing through current 5-year review.

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1979 (listing)	0	0	1,000 cloned individuals in 8 field populations and 5 cultivated collections (80–100 individuals each)	No
1998 (recovery plan)	0	0	1,000 cloned individuals in 8 field populations and 5 cultivated collections (80–100 individuals each)	No
2003 (critical habitat)	0	0	1,000 cloned individuals in 8 field populations and 5 cultivated collections (80–100 individuals each)	No

2008 (5-year review)	0	0	1,000 cloned individuals in 8 field populations and 5 cultivated collections (80–100 individuals each)	No
2014 (5-year review)	0	2	1,000 cloned individuals in 8 field populations and 5 cultivated collections (80–100 individuals each)	No
2016 (critical habitat)	0	8	1,000 cloned individuals in 8 field populations and 5 cultivated collections (80–100 individuals each)	No
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2018 (5-year review)	0	17–18	All threats managed in all three populations	No
			Complete genetic storage	Yes
			Reproduction (<i>i.e.</i> viable seeds, seedlings) at all three populations	No
			Three populations with 25 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 *Kokia cookei* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, reintroductions within exclosures
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, some nonnative plant control
Fire destruction or degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	None
Rodent predation or herbivory	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Lack of adequate hunting regulations	D	Ongoing	None
Stochastic events—Reduced viability due to low numbers	E	Ongoing	Partial, hand-pollination, seed collection, propagation, and reintroduction ongoing

References:

See the previous 5-year reviews for a full list of references (USFWS 2008, 2014). Only references for new information are provided below.

Fleming Arboretum. 2018. T& E species activity report. 3 pp.

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

Lyon Arboretum. 2017. Micropropagation and seed conservation laboratory databases.

[MNBG] Maui Nui Botanical Garden. 2013. Controlled propagation report.

[MNBG] 2018. Controlled propagation report.

[NTBG] National Tropical Botanical Garden. 2013. Controlled propagation report.

[NTBG] 2014. Controlled propagation report.

[NTBG] 2015. Controlled propagation report.

- [NTBG] 2017. Controlled propagation report.
- [ORPF] Olinda Rare Plant Facility. 2018. Controlled propagation report.
- [PRPF] 2013. Pahole Rare Plant Facility. Controlled propagation report.
- [PRPF] 2018. Controlled propagation report.
- [PEPP] Plant Extinction Prevention Program. 2013. PEPP annual report fiscal year 2013 (July 1, 2012-June 30, 2013). 207 pp.
- [PEPP] 2014. PEPP annual report fiscal year 2014 (July 1, 2013-June 30, 2014). 185 pp.
- [PEPP] 2015. PEPP annual report fiscal year 2015 (July 1, 2014-June 30, 2015). 179 pp.
- [PEPP] 2016. Plant Extinction Prevention Program FY 2016 annual report (Oct 1, 2015-Sep 30, 2016), US FWS CFDA Program #15.657; Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F14AC00174, December 24, 2016, UH Manoa, PCSU, PEPP. 237 pp.
- [PEPP] 2017a. Plant Extinction Prevention Program FY 2017 annual report (Oct 1, 2016-Sep 30, 2017), US FWS CFDA program #15.657; Endangered species conservation-recovery implementation funds, Cooperative Agreement F14AC00174, December 12, 2017, UH Manoa, PCSU, PEPP. 235 pp.
- [PEPP] 2017b. Statewide species totals *ex situ*, excel table.
- [USFWS] U.S. Fish and Wildlife Service. 2014. *Kokia cookei* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/five_year_review/doc4399.pdf.
- [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. Department of the Interior, Federal Register 81 (61): 17790–18110, March 30, 2016.
- Waimea Valley Arboretum. 2017. Controlled propagation report.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Kokia cookei* (koki‘o, Cooke’s kokio)

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