

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Kokia kauaiensis* (koki‘o)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.

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 or USFWS) beginning in October 2021. The review was based on a review of current, available information since the last 5-year review for *Kokia kauaiensis* (USFWS 2017). 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 (<https://ecos.fws.gov/ecp/species/8488>).

Review Analysis:

Please refer to the previous 5-year reviews for *Kokia kauaiensis* published in the Federal Register on August 27, 2010, and September 13, 2017 (available at https://ecos.fws.gov/docs/tess/species_nonpublish/1615.pdf and https://ecos.fws.gov/docs/tess/species_nonpublish/2457.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. kauaiensis*.

This long-lived perennial tree in the Malvaceae (mallow) family is listed as endangered and is known from the island of Kaua‘i. The status and trends for *Kokia kauaiensis* are provided in the tables below.

New Status Information:

- In 2020, there were 17 wild individuals of *Kokia kauaiensis* on Kaua‘i (Heintzman et al. 2020). In 2021, a total of 12 immature individuals were counted at Pa‘aiki, bringing the overall total to 19 (Plant Extinction Prevention Program [PEPP] 2021).

New Threats:

- None reported.

New Management Actions:

- Surveys and inventories—The Plant Extinction Prevention Program (PEPP) and the National Tropical Botanical Garden (NTBG) survey for and monitor populations of *Kokia kauaiensis* (Perlman 2019; Kishida et al. 2018; PEPP 2017; KPEPP 2021).
- Rodent control—In 2020, PEPP set rat traps to protect individuals of *K. kauaiensis* on Kaua‘i (PEPP 2020, p. 7).
- Captive propagation for genetic storage and reintroduction—
 - In 2018, PEPP reported seed collections representing founders at Ku‘ia (Miloli‘i) (PEPP 2017).
 - In 2019, NTBG reported collection and storage of 55 seeds representing one founder at Pa‘aiki, two founders from Kalalau, and one founder from Ku‘ia and 45 seeds were collected from one individual in a living collection. In addition, 73 plants representing one founder each from Pa‘aiki, east and west Kalalau, and Pōhakulele were added to the living collection at the Limahuli garden and 17 individuals representing two founders from Kalalau and one founder from Ku‘ia were added to the living collection at the Southshore garden (NTBG 2019). Also in 2019, four plants were propagated from one plant in a living collection at McBryde garden, representing one founder from Kalalau (NTBG 2021).
 - In 2006, the Lyon Arboretum Seed Conservation Laboratory reported storage of 220 seeds representing one founder from Kalalau, and in 2017, storage of 33 seeds representing one founder from Ku‘ia. There are also 144 seeds collected from one or more plants located on private land (Lyon Arboretum 2022).
 - In 2019, the Kōke‘e Mid-Elevation Nursery (KMEN) reported propagation of one individual for reintroduction at Mahanaloa (KMEN 2019).
- Reintroduction and augmentation—Between 2017 and 2018, PEPP reintroduced two immature *K. kauaiensis* into a fenced area at Mahanaloa, and 15 individuals into a fenced area at upper Mahanaloa. A survey showed that of the six reintroductions in 2016 within the Nu‘alolo enclosure, five survive (Kishida and Perlman 2017; Kishida et al. 2018a, b).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified by Recovery Plan	Stability Criteria Completed?
1996 (listing)	145–170	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
1998 (recovery plan)	105–150	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2003 (critical habitat)	166–171	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2010 (5-year review)	45–50	36	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals	No
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2017 (5-year review)	28	101	All threats managed in all 3 populations	No
			Complete genetic storage	Partially

			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	Unknown
			3 populations with 25 mature individuals each	No
2022 (5-year review)	19	22	All threats managed in all 3 populations	Partially, all reintroductions within exclosures; nonnative plant control
			Complete genetic storage	Partially, ca 5 founders from 4 populations represented
			Natural reproduction at all 3 populations	No
			3 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 stage after Preventing Extinction).

Table 2. Threats to *Kokia kauaiensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Destruction and degradation of habitat and herbivory by feral ungulates	A, C	Ongoing	Partially, reintroductions within exclosures
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partially, nonnative plant control within exclosures
Landslide destruction and degradation	A	Ongoing	None
Fire destruction and degradation	A	Ongoing	None
Climate change degradation and destruction of habitat, including hurricanes	A	Ongoing	None
Rodent predation and herbivory	C	Ongoing	Partially, some control at one location

Invertebrate predation and herbivory	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, seed collection, propagation, reintroduction, and living collections established

Synthesis:

Currently, there are 19 wild individuals of *Kokia kauaiensis* on Kauaʻi. The species has declined in total population size since listing in 1996 by at least 87% (from at least 145 trees to 19). NTBG and PEPP monitor the areas where this species occurs and confirm a continued rapid decline in numbers. One population is protected by strategic fencing. Collections, propagation, and reintroduction into protected areas are ongoing. At least five founders from four populations are represented in collections.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Kauaʻi Islandwide Recovery Plan (USFWS 2021) and have been updated according to the draft revised recovery objective guidelines developed by the Hawaiʻi 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 kauaiensis is a long-lived perennial tree. 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 that are well managed. In addition, a minimum of a total of three populations should be documented on Kauaʻi where this species now occurs or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings) with a minimum of 25 mature, reproducing individuals per population.

The preventing extinction goals for *Kokia kauaiensis* have not been met. Numbers of known wild individuals continue to decline. There are no populations totaling 25 mature individuals (Table 1). There are at least five founders from four populations represented in collections with propagation and reintroduction ongoing (Table 1, Table 2); however, threats including landslides, fire, insects, and hurricanes are not being addressed (Table 2). Therefore, *K. kauaiensis* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

No new threats and no significant new information regarding the species' biological status have been reported since the last 5-year review in 2017. Thus, the following recommendations for future actions are reiterated or updated for the 5-year review for 2022.

- Surveys and inventories—Continue to survey current and historical range of *Kokia kauaiensis* for a thorough assessment of the species.
- Ungulate monitoring and control—Maintain exclosures where *K. kauaiensis* occurs to provide protection from the negative impacts of feral ungulates.
- Nonnative invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species and those that compete with *K. kauaiensis*.
- Rodent control—Continue to implement effective control for rats at all populations.
- Invertebrate predation and herbivory control—Investigate level of threat from invertebrate predation and herbivory and determine if implementation of effective controls is necessary.
- Climate change adaptation strategy—Research suitability of habitat for viability of species, including where to conduct translocations in the future due to impacts of climate change.
- Captive propagation for genetic storage and reintroduction—Continue to collect seeds and propagative materials from representatives of all populations for storage and for maintenance of genetic stock.
- Reintroduction and augmentation—Continue to augment wild populations and establish new populations within protected and managed suitable habitat.
- Build resiliency and redundancy—Increase numbers of individuals and populations to reduce impacts of landslides, fire, insects, hurricanes, and low numbers.
- Population biology research—
 - Study populations of *K. kauaiensis* to determine causes of rapid decline. Monitor growth and survival rates of wild and reintroduced individuals.
 - Determine viable population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Alliance and partnership development—Continue to work with partners and other land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

References:

- [HPPRCC] Hawai'i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.
- Heintzman, S., B. Nyberg, and K. Wood. 2020. *Kokia kauaiensis*. The IUCN Red List of Threatened Species 2020: e.T30934A83802016.
<https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T30934A83802016.en>.

- [KMEN] Kōkeʻe Mid-Elevation Nursery. 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, Hawaiʻi.
- Kishida, W. and S. Perlman. 2017. Hawaiʻi Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Kokia kauaiensis*, Pacific Islands Fish and Wildlife Office.
- Kishida, W., S. Perlman, M. Clark, L. Arnold, K. Woodward, and S. Kashiwa. 2018a. Hawaiʻi Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Kokia kauaiensis*, Pacific Islands Fish and Wildlife Office.
- Kishida, W., S. Perlman, and R. Agurauja. 2018b. Hawaiʻi Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Kokia kauaiensis*, Pacific Islands Fish and Wildlife Office.
- Lyon Arboretum. 2022. 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, Hawaiʻi.
- [NTBG] National Tropical 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, Hawaiʻi.
- [NTBG] 2021. 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, Hawaiʻi.
- Perlman, S. 2019. Hawaiʻi Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct

- 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Kokia kauaiensis*, Pacific Islands Fish and Wildlife Office.
- [PEPP] Plant Extinction Prevention Program. 2017. Plant Extinction Prevention Program FY 2017 Annual Report (Oct 1, 2016-Sep 30, 2017), Coop Agreement: F14A00174, U.S. Fish and Wildlife Service CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, 235 pp.
- [PEPP] 2020. Plant Extinction Prevention Program, fiscal year 2020 interim performance report (October 1, 2019-September 30, 2020) cooperative agreement F18AC00502 (interim report), F19AC00532 (interim report), US Fish and Wildlife Service CFDA Program #15.657, Endangered species conservation—recovery implementation funds, University of Hawaii at Manoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program. 70 pp.
- [PEPP] Plant Extinction Prevention Program. 2021. Fiscal year 2021 interim performance report (October 1, 2020-September 30, 2021) cooperative agreements F18AC00502 and F19AC00532, US Fish and Wildlife Service CFDA Program #15.657, Endangered species conservation—recovery implementation funds, University of Hawaii at Manoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program.
- [USFWS] U.S. Fish and Wildlife Service. 2010. *Kokia kauaiensis* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/tess/species_nonpublish/1615.pdf.
- [USFWS] 2017. *Kokia kauaiensis* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/tess/species_nonpublish/2457.pdf.
- [USFWS] 2020. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.
- [USFWS] 2021. Kaua‘i Islandwide Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 65 pp. + appendices.

U.S. FISH AND WILDLIFE SERVICE

SIGNATURE PAGE for 5-YEAR REVIEW of *Kokia kauaiensis*
(koki'o)

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 _____