5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Kadua parvula* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 167 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 87(90):28031–28034, May 10, 2022.

Lead Region/Field Office:

Region 1/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, Recovery Program 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 2023. The review was based on a review of current, available information since the last 5-year review for *Kadua parvula* (USFWS 2019). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Recovery Program 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/ecp/species/5966*).

Review Analysis:

Please refer to the previous 5-year reviews for *Kadua parvula* published in the Federal Register on January 18, 2008, and August 12, 2013, as *Hedyotis parvula*, and September 30, 2019, as *Kadua parvula* (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1169.pdf*, *https://ecos.fws.gov/docs/tess/species_nonpublish/2080.pdf*, and *https://ecos.fws.gov/docs/tess/species_nonpublish/2873.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. parvula*.

This short-lived perennial shrub in the Rubiaceae (coffee) family is endangered and is known from the island of Oʻahu. The status and trends for *Kadua parvula* are provided in the tables below.

New Status Information:

- In 2019, there were approximately 71 mature and 149 immature individuals of *Kadua parvula* in the Waianae mountains of Oʻahu (USFWS 2019). Currently, numbers continue to decline with 52 mature and 13 immature wild individuals in two populations at Hālona and Mākua (Army Natural Resources Program of Oʻahu [ANRPO] 2023a, p. 114, appendices, p. 311; ANRPO 2021, p. 198; Plant Extinction Prevention Program [PEPP] 2019–2023). The largest population Mākua (ʻŌhikilolo) with 43 mature individuals(PEPP 2019–2023; ANRPO 2023a appendices, p. 311). More than 280 individuals have been reintroduced at ʻĒkahanui, Palikea-Hālona, and Mākua (ANRPO 2023a appendices, p. 311).
- Almost 200 founders from two populations are represented in seed collections, propagation, and translocations(ANRPO 2023b).

New Threats:

- None reported.

New Management Actions:

- Surveys and monitoring—ANRPO monitors wild and translocated populations of *Kadua parvula* and recently coordinated a cooperative survey with the State's Plant Extinction Prevention Program (PEPP) to monitor *Kadua parvula* at Hālona (ANRPO 2023a, p. 114).
- Feral ungulate monitoring and control—ANRPO controls ungulates at Mākua-ʻŌhikilolo and ʻĒkahanui, with partial control at Hālona (ANRPO 2023a appendices, p. 355).
- Invasive nonnative plant monitoring and control—ANRPO conducts nonnative invasive plant control at the translocated populations at ʻĒkahanui, and partial control at Hālona-Palikea and Mākua-ʻŌhikilolo (ANRPO 2020, p. 108, appendices, p. 360; ANRPO 2021, p. 53, appendices, p. 188; ANRPO 2022, p. 60; ANRPO 2023a, p. 71, appendices, p. 355).
- Collection and propagation for genetic storage and reintroduction—
    - In 2011, the Lyon Seed Conservation Laboratory reported storage of more than 13,000 seeds collected from a cultivated plant at the Pahole rare plant facility (Lyon Arboretum 2022).
    - In 2023, ANRPO reported collection and storage of more than 65,000 seeds representing 189 founders for wild and reintroduced plants at Hālona and Mākua (ANRPO 2023b). In addition, 11 propagules in the ANRPO plant facility represent nine founders from Hālona (ANRPO 2023b).
    - ANRPO has met Interim Stabilization genetic storage goals of collecting adequately from at least 50 individuals in both populations (Mākua-ʻŌhikilolo and Hālona) (ANRPO 2023a appendices, p. 394).

- Seed storage testing by ANRPO indicates that the recollection interval could be changed from every 15 years to every 20 years (ANRPO 2021 appendices, p. 513). Additional testing will be conducted in 2027.
- In the 1990s, the National Tropical Botanical Garden (NTBG) collected and stored an uncounted number of seeds from several populations of *K. parvula* at Mākua and the Wai‘anae mountains (NTBG 2022). The viability of these collections is uncertain.
- In 2020, the Pahole Rare Plant Facility propagated one individual from an unspecified source (PRPF 2020).

- Translocation and augmentation—
  - ANRPO established translocated populations at Mākua-‘Ōhikilolo, ‘Ēkahanui, and Hālona-Palikea (ANRPO 2021 appendices, pp. 188, 349; ANRPO 2022 appendices, pp. 168, 173–174, 187). More than 600 individuals were reintroduced (ANRPO 2023b). Currently, these populations total 142 mature and 139 immature individuals (ANRPO 2023a appendices, p. 311).
  - ANRPO conducts adaptive management in selection and maintenance of outplanting sites for *K. parvula*. In 2020, the translocation site at ‘Ēkahanui was expanded to include steep terrain with native overstory for easier access and nonnative plant control for a better success rate (ANRPO 2020, p. 108, appendices, p. 360).

Table 1. Status and trends of *Kadua parvula* from listing through current 5-year review. Table 1a shows progress according to Interim Stabilization Goals; Table 1b shows progress according to Preventing Extinction Goals.

Table 1a.

Date	No. wild individuals	No. Outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1991 (listing)	0	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2008 (5-year review)	263	0	All threats managed in all 3 populations	Partial
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	Partial, 2 populations >50 individuals

2013 (5-year review)	197 mature 216 immature 5 seedlings 413 total	0	All threats managed in all 3 populations	Partial
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	Partial, 2 populations >50 individuals

Table 1b.

Date	No. wild individuals	No. outplanted	*Preventing Extinction Targets identified by HPPRCC	*Preventing Extinction Targets Completed?
2019 (5-year review)	71 mature 149 immature 220 total	>140	All threats managed in all 3 populations	Partial, for 2 populations
			Complete genetic storage	Yes
			Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations	No
			3 populations with 50 mature individuals each	Partial, 2 populations >50 individuals
2024 (5-year review)	52 mature 13 immature	>600 reintroduced, >280 total remain	All threats managed in all 3 populations	Partial, most plants fenced, nonnative plant control for 1 reintroduced population, partial for 2
			Complete genetic storage	Yes

			Natural reproduction at all 3 populations	Unknown, none reported
			3 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 stage after Preventing Extinction).

Table 2. Threats to *Kadua parvula* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate destruction and degradation of habitat	A	Ongoing	Partial, fencing and ungulate management for all but 2 subpopulations
Established ecosystem altering invasive plant species destruction and degradation of habitat and competition	A, E	Ongoing	Partial, control within fenced areas
Climate change degradation or loss of habitat	A	Ongoing	None
Fire destruction and degradation of habitat	A	Ongoing	Partial, fire management plan and coordinated fire response efforts
Small populations	E	Ongoing	Partial, seed collection, propagation, and translocations

Synthesis:
Currently, there are approximately 52 mature and 13 immature wild individuals of *Kadua parvula* in two populations. One wild population is not are protected from the negative effects of feral ungulates by fencing. Nonnative plant control is ongoing directly for three subpopulations. Over 100 founders from two populations are represented in seed collections and propagation. Translocation is ongoing.

Stabilizing (interim), and downlisting and delisting criteria are provided in the Recovery Plan for the O‘ahu Plants (USFWS 1998) and preventing extinction targets have been added and criteria 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.

Kadua parvula is a short-lived perennial shrub. 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 O‘ahu where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings) with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for *Kadua parvula* have not been met. The number of wild individuals continues to decline. Fencing provides protection from feral ungulates at all but two subpopulations (Table 1, Table 2). Nonnative invasive plant control is conducted for three subpopulations (Table 1, Table 2). Not only Preventing Extinction but Interim Stabilization genetic storage goals have been met, with over 100 founders from two populations represented in seed collections and propagation (Table 1). Recruitment has not been reported. Wildfire is an increasing threat to this species and habitat (Table 2). The effects of climate change are not addressed (Table 2). Therefore, *K. parvula* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
No significant new information regarding the species’ biological status has been reported since the last 5-year review in 2019. Thus, the following recommendations for future actions are updated or reiterated for the 5-year review for 2024.

- Surveys and monitoring—Continue to conduct surveys in suitable and historical habitat for additional populations and monitor known populations.
- Ungulate monitoring and control—Continue to fence and monitor all populations to provide protection against 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 *Kadua parvula*, at all populations.
- Fire monitoring and control—Continue to implement fire management plans and coordinate fire response efforts.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for its recovery.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
- Reintroduction and augmentation—Continue to augment and establish new populations, using adaptive management, within suitable and historical habitat that is being managed for known threats to this species.

- Build resiliency, redundancy, and representation—Increase species' viability through habitat restoration, threat control, and reintroduction and translocation to reduce impacts of climate change and wildfires.
- Alliance and partnership development—Continue to work with ANRPO, the State's Native Ecosystems Protection and Management division, and other land managers and partners to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

References:

[ANRPO] Army Natural Resources Program of Oʻahu. 2020. 2020 Status report for the Mākua and Oʻahu Implementation Plans. Office of the Vice President for Innovation and Research, University of Hawaii. 214 pp. + appendices, 516 pp.

[ANRPO] 2021. 2021 Status report for the Mākua and Oʻahu Implementation Plans. Office of the Vice President for Innovation and Research, University of Hawaii. 207 pp. + appendices, 623 pp.

[ANRPO] 2022. 2022 Status report for the Mākua and Oʻahu Implementation Plans. Office of the Vice President for Innovation and Research, University of Hawaiʻi. 228 pp. + appendices, 690 pp.

[ANRPO] 2023a. Status report for the Mākua and Oʻahu Implementation Plans. Prepared by Army Natural Resources Program, Oʻahu, Office of the Vice President for Innovation and Research, University of Hawaiʻi. 255 pp. + appendices, 534 pp.

[ANRPO] 2023b. 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.

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

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. 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.

[PRPF] Pahole Rare Plant Facility. 2020. 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. 2019–2023. Plant Extinction Prevention Program fiscal years 2019 to 2023 interim performance report (October 1, 2018-September 30, 2023). U.S. Fish and Wildlife Service CFDA Program $15.657 Endangered Species Conservation—Recovery Implementation Funds, Cooperative Agreement: F18AC00502 (Final performance report), University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit. 105 pp.

[USFWS] U.S. Fish and Wildlife Service. 1998. Recovery Plan for the O‘ahu Plants. Portland. 207 pp. + appendices.

[USFWS] 2008. *Hedyotis parvula*. 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc/1169.pdf.*

[USFWS] 2013. *Hedyotis parvula*. 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc/2080.pdf.*

[USFWS] 2019. *Kadua parvula*. 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc/2973.pdf.*

[USFWS] 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 167 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 87(90): 28031–28034, May 10, 2022.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Kadua parvula* (no common name)

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**

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