

## 5-YEAR REVIEW

### Short Form Summary

**Species Reviewed:** *Kadua cordata* ssp. *remyi* (kopa)

**Current Classification:** Endangered

#### **Federal Register Notice announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 77 Species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86(120):33726–33728, June 25, 2021.

#### **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 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 October 2022. The review was based on a review of current, available information since the last 5-year review for *Kadua cordata* ssp. *remyi* (USFWS 2018). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Recovery 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/ecp/species/6016>).

#### **Review Analysis:**

Please refer to the previous 5-year reviews for *Kadua cordata* ssp. *remyi* (previously known as *Hedyotis schlechtendahlia* var. *remyi*) published in the Federal Register on January 18, 2008; March 27, 2014; and October 23, 2018 (available at [https://ecos.fws.gov/docs/tess/species\\_nonpublish/1168.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/1168.pdf), [https://ecos.fws.gov/docs/tess/species\\_nonpublish/2189.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/2189.pdf), and [https://ecos.fws.gov/docs/tess/species\\_nonpublish/2636.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/2636.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. cordata* ssp. *remyi*.

This short-lived perennial shrub in the Rubiaceae (coffee) family is endangered and is endemic to Lāna‘i. The status and trends for *Kadua cordata* ssp. *remyi* are provided in the tables below.

New Status Information:

- As of 2021, no wild or translocated individuals of *Kadua cordata* ssp. *remyi* remained (Maui Plant Extinction Prevention Program [PEPP] 2021).
- Currently, at least two founders (wild plants) are represented in *ex situ* storage and propagation. The last remaining wild plant was male.

New Threats:

- None reported.

New Management Actions:

- Monitoring and surveys—Maui PEPP and Pūlama Lāna‘i monitor the populations (Maui PEPP 2018-2021; Pūlama Lāna‘i 2019).
- Ungulate monitoring and control—All sites with wild and translocated plants are fenced (Pūlama Lāna‘i 2021).
- Collection and propagation for genetic storage and translocation—
  - In 2019, the Olinda Rare Plant Facility (ORPF) reported propagation of 14 plants representing 1 or 2 founders from Hulopo‘e Gulch (ORPF 2019). In 2023, an additional plant was propagated representing another founder (ORPF 2023).
  - The Lyon Arboretum’s Seed Conservation Laboratory reported continued storage of 74 seeds collected in 2010 from one founder at Hulopo‘e (Lyon Arboretum 2022).
  - In 2023, PEPP withdrew stored seeds of *Kadua cordata* ssp. *remyi* from the National Tropical Botanical Garden which were then germinated at the ORPF and are now at the seedling stage (Oppenheimer 2023, pers. comm.). The intent is to maintain males and females in the living collection for future seed production.
- Reintroductions, augmentations, translocation—In 2021, Pūlama Lāna‘i reported that two of the five translocated plants at ‘Āwehi remained (Pūlama Lāna‘i 2021). Later that year, none remained (Maui PEPP 2021).

**Table 1. Status and trends of *Kadua cordata* ssp. *remyi* from listing through current 5-year review.**

<b>Date</b>	<b>No. wild individuals</b>	<b>No. outplanted</b>	<b>Stability Criteria identified in Recovery Plan</b>	<b>Stability Criteria Completed?</b>
1999 (listing)	6	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)	0	175	All threats managed in all 3 populations	No
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2014 (5-year review)	2	3	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
<b>Date</b>	<b>No. wild individuals</b>	<b>No. outplanted</b>	<b>*Preventing Extinction Criteria identified by HPPRCC</b>	<b>*Preventing Extinction Criteria Completed?</b>
2018 (5-year review)	1	0	All threats managed in all 3 populations	No
			Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2023 (5-year review)	0	5, none remain	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			Natural reproduction at all 3 populations	No
			3 populations with 100 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 cordata* ssp. *remyi* and ongoing conservation efforts.**

<b>Threat</b>	<b>Listing factor</b>	<b>Current Status</b>	<b>Conservation/ Management Efforts</b>
<b>Degradation and destruction of habitat by feral ungulates</b>	A	Ongoing	Partial, fencing and ungulate removal
<b>Established ecosystem altering invasive plant species degradation of habitat</b>	A	Ongoing	Partial, nonnative plant control within exclosures
<b>Drought and erosion destruction and degradation of habitat</b>	A	Ongoing	None
<b>Fire destruction and degradation of habitat</b>	A	Ongoing	None
<b>Climate change degradation or loss of habitat including hurricanes</b>	A	Ongoing	None
<b>Predation and herbivory by feral ungulates</b>	C	Ongoing	Partial, fencing and ungulate removal
<b>Predation and herbivory by invertebrates</b>	C	Ongoing	None
<b>Reduced viability due to low numbers</b>	E	Ongoing	Partial, seed storage, propagation and small-scale translocation

**Synthesis:**

Currently there are no known wild or translocated individuals of *Kadua cordata* ssp. *remyi* on Lāna‘i. Areas where individuals occurred are provided protection by fencing and nonnative plant control. Seed collections, propagation, and translocations and augmentations are ongoing; however, translocations have been unsuccessful. Current efforts focus on representing both males and females in the living collection for production of seeds for storage and propagation.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Addendum to the Recovery Plan for the Multi-Island Plants (U.S. Fish and Wildlife Service 2002) 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.

*Kadua cordata* ssp. *remyi* is a short-lived perennial shrub with a dioecious or subdioecious breeding system. 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 Lāna‘i 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 100 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are no known wild or translocated individuals remaining (Table 1). Plants and seeds are secured in *ex situ* storage (Table 1). All threats including drought, fire, predation by nonnative invertebrates, and climate change are not being addressed (Table 2). Therefore, *Kadua cordata* ssp. *remyi* 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 2018. Thus, the following recommendations for future actions are updated or reiterated for the 5-year review for 2023.

- Surveys and inventories—Continue to survey for additional populations of *Kadua cordata* ssp. *remyi* in areas of potentially suitable habitat.
- Ungulate monitoring and control—Continue to maintain exclosures and remove ungulates from fenced areas to protect individuals from the negative impacts of browsing by ungulates.
- Invasive nonnative plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species, and those that compete with *K. cordata* ssp. *remyi*, within and around exclosures.
- Drought monitoring and control—Monitor and provide translocated individuals with supplemental watering if required.
- Fire prevention and control—Develop and implement a fire management plan for all populations.
- Climate change adaptation strategy—Research suitability of habitat for translocation of this species in the future due to the impacts of climate change.
- Predator and herbivore monitoring and control—
  - Protect all occurrences against browsing by feral ungulates.
  - Identify unknown invertebrate damaging wild individuals and develop and implement effective control methods if necessary.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for translocation.

- Translocation and augmentation—Continue to translocate individuals into suitable habitat within historic range that is being managed for known threats to this species.
- Build resiliency, redundancy, and representation—Continue translocation of individuals into suitable habitat that is being managed for known threats to this species to reduce impacts of drought, fire, and predation by invertebrates.
- 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 taxon.

**References:**

[HPPRCC] Hawai‘i 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, Hawai‘i.

[Maui PEPP] Maui Plant Extinction Prevention Program. 2018-2022. Species monitoring reports, 2018-2022. Excel data tables.

[ORPF] Olinda Rare Plant Facility. 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, Hawai‘i.

[ORPF] 2023. 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.

Oppenheimer, H. 2023, pers. comm. Maui Plant Extinction Prevention Program, Hawaii Rare Plant Recovery Group meeting notes regarding status of *Kadua cordata* ssp. *remyi*. 10 APR 2023.

Pūlama Lāna‘i. 2019. Consolidated annual report for 2016, 2017, 2018 to the US Fish & Wildlife Service as required by the Memorandum of Understanding dated January 26, 2015, between USFWS & Pūlama Lāna‘i, 8 pp.

Pūlama Lāna‘i. 2021. Threatened and Endangered species report for Division of Forestry and Wildlife. Tab 2, population site monitoring, Tab 3, nursery accessions, Tab 4, individual plants and collections. Excel data table, 4 tabs.

[USFWS] 2008. *Hedyotis schlechtendahlia* var. *remyi* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI.  
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[USFWS] 2014. *Hedyotis schlechtendahlia* var. *remyi* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI.  
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[https://ecos.fws.gov/docs/tess/species\\_nonpublish/2620.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/2620.pdf).

[USFWS] 2021. Endangered and Threatened wildlife and plants; initiation of 5-year status reviews for 77 Species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86(120): 33726–33728, June 25, 2021.

**U.S. FISH AND WILDLIFE SERVICE**  
SIGNATURE PAGE for 5-YEAR REVIEW of *Kadua cordata* ssp. *remyi* (kopa)

**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**

\_\_\_\_\_ Date \_\_\_\_\_