

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Hedyotis schlechtendahliana* var. *remyi* (kopa)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; 5-year status reviews of 46 species in Idaho, Oregon, Washington, Nevada, Montana, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 77(44):13248-13251.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Chelsie Javar-Salas, Plant Biologist, PIFWO
Maui nui and Hawaii Island Team Manager, PIFWO
Marie Bruegmann, Plant Recovery Coordinator, PIFWO
Recovery Program Lead, PIFWO
Kristi Young, Programmatic Deputy Field Supervisor, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on March 6, 2012. The review was based on a review of current, available information since the last 5-year review for *Hedyotis schlechtendahliana* var. *remyi* (USFWS 2008). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Island Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

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 *Hedyotis schlechtendahliana* var. *remyi* published on January 18, 2008 (available at http://ecos.fws.gov/docs/five_year_review/doc1815.pdf) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of *H. schlechtendahliana* var. *remyi*.

This short-lived perennial is endangered and endemic to the island of Lanai (USFWS 2002). The current status and trends for *Hedyotis schlechtendahliana* var. *remyi* are provided in the tables below.

New status information:

In 2009, only a single individual of *Hedyotis schlechtendahliana* var. *remyi* was reported on Lanai (Plant Extinction Prevention Program [PEPP] 2009). In 2010, a single new individual was discovered in the vicinity of the wild plant increasing the number of wild individuals to two (PEPP 2010).

Overall *H. schlechtendahliana* var. *remyi* has increased from no individual reported in the last 5-year review to two individuals (PEPP 2011). This increase in numbers resulted from concentrated surveys near current and historical locations.

New taxonomic information:

The 2012 supplement to the *Manual of the Flowering Plants of Hawaii* (Wagner *et al.* 2012) accepts the change from the genus *Hedyotis* to the currently accepted *Kadua*, and recognizes *Hedyotis schlechtendahliana* var. *remyi* as *Kadua cordata* ssp. *remyi*. In 2012, USFWS proposed to revise the taxonomic status for this species when it proposed to revise critical habitat designations on Maui, Lanai, Kahoolawe, and Molokai (USFWS 2012). The proposed change will recognize *Hedyotis schlechtendahliana* var. *remyi* with the new name of *Kadua cordata* ssp. *remyi*. The range of the species has not changed with this taxonomic revision. The recognition and official taxonomic change by USFWS of *K. cordata* ssp. *remyi* will be finalized in the final rule for critical habitat designations on Maui, Lanai, Kahoolawe, and Molokai. The species will be recognized as *K. cordata* ssp. *remyi* for the remainder of this review.

New threats:

- Climate change destruction 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 Hawaii 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 *Kadua cordata* is minimally vulnerable to the impacts of climate change. The assessment was not conducted on the subspecies level but rather evaluated at the species level, which could change this subspecies' vulnerability to climate change.
- Stochastic events – Drought mortality or reduced viability – Drought is a threat to this species (PEPP 2009, 2012).
- Invertebrate predation or herbivory – An unknown invertebrate was reported as a threat to this species (PEPP 2010, 2012).

New management actions:

- Captive propagation for genetic storage and reintroduction
 - The Harold L. Lyon Arboretum Micropropagation Lab (2013) has eight propagules of *K. cordata* ssp. *remyi* in captive propagation.
 - There are 64 seeds in storage at the Harold L. Lyon Arboretum Seed Conservation Laboratory (2013).

- Immature seed capsules from one of the two known wild individuals were bagged to prevent damage from insects and collected after reaching maturity (PEPP 2012). Seeds were sent to Lyon Arboretum Micropropagation Laboratory.
- The Olinda Rare Plant Facility (2013) has 21 propagules in their nursery.
- Reintroduction / translocation – Three out of the eight individuals of *K. cordata* ssp. *remyi* outplanted in 2007 survived (PEPP 2010).
- Surveys / inventories
 - A survey conducted by the Plant Extinction Prevention Program discovered a single individual near the existing wild plant (PEPP 2010).
 - A survey was conducted near a historical site containing two individuals in the early 1990's; no new individuals were discovered (PEPP 2012).
- Population viability monitoring and analysis – The Plant Extinction Prevention Program (2009, 2010, 2012) monitored the wild and outplanted population of *K. cordata* ssp. *remyi*.
- Ungulate monitoring and control – A fenced enclosure was constructed on Lanai (PEPP 2009).
- Invasive plant monitoring and control – Weed control was conducted by the Plant Extinction Prevention Program (2010, 2012).
- Listing and critical habitat designation – Three units of unoccupied and occupied areas of critical habitat for *K. cordata* ssp. *remyi* were proposed in the lowland mesic and lowland wet ecosystems on Lanai (USFWS 2012). The final rule for critical habitat designations has not been published at the time of this review.

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the addendum to the recovery plan for multi-island plants (USFWS 2002), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Kadua cordata* ssp. *remyi* is a short-lived perennial, and to be considered stable, this species must be managed to control threats (e.g. fenced) and be represented in an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on Lanai. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have not been met, as currently no population of 50 mature individuals exists (Table 1) and all threats are not sufficiently managed throughout its range (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:

- Surveys / inventories – Continue surveying geographical and historical range for a current assessment of the species' status.
- Ungulate monitoring and control – Maintain fencing to exclude browsing by deer.
- Captive propagation for genetic storage and reintroduction – Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.

- Reintroduction / translocation – Continue to augment current natural populations to increase numbers of individuals.
- Fire monitoring and control – Develop and implement a fire management plan for all populations.
- Invasive plant monitoring and control – Continue control of invasive introduced plant species within enclosures.
- Population viability monitoring and analysis – Continue to monitor wild and outplanted populations.
- Threats – predator / herbivore control research – Identify unknown invertebrate damaging remaining wild individuals.
- 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 *Kadua cordata* ssp. *remyi* from listing through current 5-year review.

Date	No. wild indivs	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1999 (listing)	6	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2002 (recovery plan)	13	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	8	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2007 (5-year review)	0	0	All threats managed in all 3 populations	No
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2012 (critical habitat – proposed)	2	3	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2014 (5-yr review)	2	3	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

Table 2. Threats to *Kadua cordata* ssp. *remyi* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, small exclosures constructed
Invasive introduced plants	A, E	Ongoing	Partially, weed control conducted
Invertebrate herbivory or predation	C	Ongoing	None
Drought	E	Ongoing	None
Fire	E	Ongoing	None
Low numbers	E	Ongoing	Partially, captive propagation for genetic storage and reintroduction
Climate change	A, E	Increasing	None

References:

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

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. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 141 pages.

Harold L. Lyon Arboretum Micropropagation Laboratory. 2013. Micropropagation database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Harold L. Lyon Arboretum Seed Conservation Laboratory. 2013. Seed storage database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Olinda Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 5 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2009. Annual report for Plant Extinction Prevention Program, fiscal year 2009 (July 1, 2008-June 30, 2009). 115 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010). 122 pages. Unpublished.

- [PEPP] Plant Extinction Prevention Program. 2011. Plant Extinction Prevention Program annual report, fiscal year 2011 (July 1, 2010-June 30, 2011). 200 pages. Unpublished.
- [PEPP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pages. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 2002. Addendum to the recovery plan for Multi-island plants. U.S. Fish and Wildlife Service, Portland, Oregon. viii + 125 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2008. *Hedyotis schlechtendahliana* var. *remyi* 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 12 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; listing 38 species on Molokai, Lanai, and Maui as endangered and designating critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; proposed rule. Federal Register 77(112):34464-34775.
- Wagner, W.L., D.H. Herbst, N. Khan, and T. Flynn. 2012. Hawaiian vascular plant updates: a supplement to the manual of the flowering plants of Hawaii and Hawaii's ferns and fern allies, version 1.3. Available online at http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/Hawaiian_vascular_plant_updates_1.3.pdf>. Accessed February 11, 2014.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Hedyotis schlehtendahlana* var.
***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
- X No Change in listing status

Appropriate Listing/Reclassification Priority Number, if applicable:

for **Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office**

Maui M Buegmann

Date 2014-03-27