

Hedyotis schlechtendahlia var. *remyi*
(Kopa)

**5-Year Review
Summary and Evaluation**

**U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii**

5-YEAR REVIEW

Species reviewed: *Hedyotis schlechtendahliana* var. *remyi* (Kopa)

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5-YEAR REVIEW
***Hedyotis schlechtendahliana* var. *remyi* (Kopa)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

Region 1, Jesse D'Elia, Chief, Division of Recovery, (503) 231-2071

Lead Field Office:

Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor for Endangered Species, (808) 792-9400

Cooperating Field Office(s):

N/A

Cooperating Regional Office(s):

N/A

1.2 Methodology used to complete the 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) between June 2006 and June 2007. The National Tropical Botanical Garden provided most of the updated information on the current status of *Hedyotis schlechtendahliana* var. *remyi*. They also provided recommendations for conservation actions that may be needed prior to the next five-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator. These comments were incorporated into the draft five-year review. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before final approval.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

USFWS. 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1999. Final listing, endangered status for 10 plant taxa from Maui Nui, Hawaii; final rule. Federal Register 64(171):48307-48324.

Date listed: September 3, 1999

Entity listed: variety

Classification: Endangered

Revised Listing, if applicable

FR notice: N/A

Date listed: N/A

Entity listed: N/A

Classification: N/A

1.3.3 Associated rulemakings:

USFWS. 2003. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, HI; final rule. Federal Register 68(6):1220-1274.

Critical habitat was not designated for *Hedyotis schlechtendahliana* var. *remyi* on Lanai because we believed there was a higher likelihood of beneficial conservation activities occurring on this private land without the designation of critical habitat than there would be with a critical habitat designation. In addition, exclusion of the private land on Lanai that had been proposed as critical habitat would not lead to the extinction of the species (USFWS 2003).

1.3.4 Review History:

Species status review [FY 2006 Recovery Data Call (September 2006)]:

Declining

Recovery achieved:

1 (0-25%) (FY 2006 Recovery Data Call)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

6

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Addendum to the recovery plan for the Multi-Island plants. 2002. U.S. Fish and Wildlife Service, Portland, Oregon. viii + 125 pages.

Date issued: September 19, 2002

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

Yes
 No

2.1.2 Is the species under review listed as a DPS?

Yes
 No

2.1.3 Was the DPS listed prior to 1996?

Yes
 No

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

Yes
 No

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

Yes
 No

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

Yes
 No

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

Yes
 No

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

Yes
 No

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

Yes
 No

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Factors A, C, D and E) affecting this species are presented in section 2.4. Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

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 ten years), or a long-lived perennial. *Hedyotis schlechtendahlia* var. *remyi* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (e.g., fenced, introduced invasive plant controlled, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on Lanai, where the species occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Hedyotis schlechtendahlia* var. *remyi* should be documented on Lanai, where it occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Hedyotis schlechtendahlia* var. *remyi* should be documented on Lanai, where it occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section I.C.5 ("Associated Rulemakings") and in section II.D ("Synthesis") below, which also includes any new information about the status and threats of the species.

Table 1. Status of *Hedyotis schlehtendahliana* var. *remyi* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	Stability 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-yr review	0	0	All threats managed	No
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

2.3.1.4 Taxonomic classification or changes in nomenclature:

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

2.3.1.7 Other:

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

Hedyotis schlechtendahlia subsp. *remyi* was known historically from four populations on Lanai (Wagner *et al.* 1999). The populations and numbers of individuals within populations of *H. schlechtendahlia* subsp. *remyi* have declined to the point that no plants are currently known to exist in the wild. The historically known locations are: Waiopaa drainage, Hulopoe Gulch, the ridge below Puu Aalii, and Kapohaku drainage, all on Lanai (Hawaii Biodiversity and Mapping Program 2005). No plants have been observed in the wild since 2001 (Wood 2003; Perlman 2006). While it is possible it may

be found again in the wild, it may be unlikely, given the steady disappearance of known individuals and populations (Hawaii Biodiversity and Mapping Program 2005; Wood 2003; Perlman 2006). *Hedyotis schlehtendahlia* subsp. *remyi* is currently maintained only in controlled propagation at National Tropical Botanical Garden on Kauai (National Tropical Botanical Garden 2006a and b).

Kadua remyi was originally described by Hillebrand to include this variety (1888). Fosberg moved all Hawaiian species to the genus *Hedyotis*, with the Lanai populations distinguished as variety *remyi* of *H. schlehtendahlia* (Wagner *et al.* 1999; USFWS 1999). Terrell *et al.* (2005) moved Hawaiian species back in the genus *Kadua*, and the currently recognized taxonomic treatment includes the Lanai populations as *Kadua cordata* subsp. *remyi*.

Kadua cordata var. *remyi* has typically been found growing on or near wind-swept ridges in lowland mesic shrub land at about 800 to 1000 meters (2,400 to 3,000 feet) elevation (Hawaii Biodiversity and Mapping Program 2005; Perlman 2006; Wood 2003).

The primary threat to this species has been habitat degradation by axis deer (*Axis axis*) (Factors A and D) (Perlman 2006). The species is also threatened by introduced invasive plants (Factor E) (Wood 2003; S. Perlman, National Tropical Botanical Garden, pers. comm. 2006; USFWS 2002). Herbivory (Factor C) and trampling (Factor A) by axis deer (*Axis axis*) (USFWS 2002) are also threats. The area is threatened by fire because of use by hunters, recreational hikers, and campers (Factor E) (S. Perlman, pers. comm. 2006). In addition, species like *Kadua cordata* var. *remyi* that are endemic to small portions of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by genetic bottlenecks, random demographic fluctuations, random environmental events or reduced reproductive vigor (Factor E). A potential threat includes unrestricted collecting or excessive visits by individuals interested in seeing rare plants (USFWS 2002).

While there is no evidence that this species still exists in the wild, individuals of *Kadua cordata* var. *remyi* are in the National Tropical Botanical Garden Nursery, awaiting an appropriate outplanting site. Conservation measures have been attempted, with seeds collected in 1992, and cuttings taken in 1997, 1999 and 2001. Cuttings were taken at Kaiholena Gulch, by Steve Perlman in May 1999 (National Tropical Botanical Garden 2006a) but did not survive. Cuttings were taken again in January 2001, at Kaiholena and Hulopoe (National Tropical Botanical Garden 2006a) and 32 plants from these rooted cuttings remain in the National Tropical Botanical Garden Nursery (National Tropical Botanical Garden 2006b). Seeds from first generation crosses of open pollinated plants in nursery are in storage at National Tropical Botanical Garden (National Tropical Botanical Garden 2006a).

The stabilization and recovery goals for this species have not been met and the taxon is only known in controlled propagation. Therefore, *Hedyotis schlehtendahlia* var. *remyi* (*Kadua cordata* subsp. *remyi*) meets the definition of endangered as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist

Extinction

Recovery

Original data for classification in error

No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: _____

Reclassification (from Endangered to Threatened) Priority Number: _____

Delisting (regardless of current classification) Priority Number: _____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS:

- Clone plants at National Tropical Botanical Gardens for propagation at the Olinda Rare Plant Facility on Maui, which is at more suitable elevation for the variety, for backup genetic storage.
- Conduct further surveys within the suitable historical range for this variety.
- Study horticultural requirements of this subspecies.
- Evaluate the small fenced enclosure at Awehi, Lanai, as a potential outplanting site.
- Work with landowners to continue deer removal efforts and invasive plant species control on Lanai, including in the lower elevation historical habitat for this variety.
- Protect historical habitat from fire, ungulates, and invasive introduced plant species for future reintroductions.
- Update the listed entity on 50 CFR 17 to match the currently recognized taxonomy.

5.0 REFERENCES:

Hawaii Biodiversity and Mapping Program 2005. Program Database. Unpublished.

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National Tropical Botanical Garden. 2006a. Provenance report [web application] <<http://ntbg.org/conservation/rpts/prov.pl>>. Accessed April 21, 2006.

National Tropical Botanical Garden. 2006b. Report on controlled propagation of species, as designated under the U.S. Endangered Species Act. Unpublished.

Perlman, S. 2006. National Tropical Botanical Garden, summary of field notes from April 30, 1991 to April 16, 2004. Compiled in 2006. Unpublished.

Terrell, E.E., H.E. Robinson, W.L. Wagner, and D.H. Lorence. 2005. Resurrection of genus *Kadua* for Hawaiian Hedyotidoneae (Rubiaceae), with emphasis on seed and fruit characters and notes on South Pacific species. *Systematic Botany* 30(4):818-833.

[USFWS] U. S. Fish and Wildlife Service USFWS. 2003. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, HI; final rule. *Federal Register* 68(6):1220-1274.

[USFWS] U.S. Fish and Wildlife Service. 2002. Addendum to the recovery plan for Multi-Island plants. Portland, OR. viii + 125 pages.

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Wagner, W.L., D. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawai'i, Revised Edition. University of Hawai'i Press, Bishop Museum Press, Special Publication. 97: 1-1918.

Wood, K.R. 2003. Current Status of *Hedyotis schlechtendahliana* var. *remyi*. Unpublished

Personal Communications:

Steve Perlman, Field Botanist, National Tropical Botanical Garden, June 5, 2006.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Hedyotis schlechtendahlia* var. *remyi* (Kopa)

Current Classification: _____ E _____

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

Marilet A. Zablan, Recovery Program Leader and Acting Assistant Field Supervisor for Endangered Species, June 24, 2007

Marie Brueggemann, Plant Recovery Coordinator, February 5, March 19 and 26, May 24, and June 29, 2007

Christian Torres-Santana, Fish and Wildlife Biologist, December 21, 2006, March 23, 2007

Approve  Date 1/18/08
Lead Field Supervisor, Fish and Wildlife Service