Delissea rhytidosperma
(No common name)

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: *Delissea rhytidosperma* (No common name)

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Delissea rhytidosperma (No common name)

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 *Delissea rhytidosperma*. 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 PIFWO 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. 1994. Determination of endangered or threatened status for 24 plants from the Island of Kauai, HI; final rule. Federal Register 59(38):9304-9329.
Date listed: February 25, 1994
Entity listed: Species
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 or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, HI; final rule. Federal Register 68(39):9116-9479.

Critical habitat was designated for *Delissea rhytidosperma* in three units totaling 582 hectares (1,437 acres) on Kauai. This designation includes habitat on state and private lands (USFWS 2003).

1.3.4 Review History:

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

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

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

5

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Recovery plan for the Kauai plant cluster. 1995. U.S. Fish and Wildlife Service, Portland, Oregon. 270 pages.
Date issued: September 20, 1995.
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*
__X__ *No*

2.1.2 Is the species under review listed as a DPS?

____ *Yes*
__X__ *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?

__X__ *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?

__X__ *Yes*
____ *No*

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

_X_ *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 is presented in section 2.4. Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is no longer known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Kauai plant cluster (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Delissea rhytidosperma* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on Kauai, and if possible, at least one other island where they now occur or 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 *Delissea rhytidosperma* should be documented on Kauai. 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 *Delissea rhytidosperma* should be documented on Kauai. 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 1.3.3 ("Associated Rulemakings") and in section 2.4 ("Synthesis") below, which also includes any new information about the status and threats of the species.

Status of *Delissea rhytidosperma* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
1994 – listing	6	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1995 – recovery plan	19	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 – critical habitat	11	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	119+	All threats managed	Partially
			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

Delissea rhytidosperma is endemic to Kauai and was historically know from Limahuli Valley, Wainiha Pali, Nonopahu Ridge, Hanapepe Falls, Wahiwa Watershed, Kapa a, Haupu Range and Kipu (Lammers 2005). *Delissea rhytidosperma*, as currently recognized by Lammers (2005), is now extinct in the wild. The population still considered *Delissea rhytidosperma* was known from Hanakapiai Valley on the north coast of Kauai (Lammers 2005; Bender 2006). The Hanakapiai population of was first discovered by in 1999. It disappeared by 2002, due to a combination of goats, rats, and slugs. Both Hanakapiai and Limahuli populations are now extinct in the wild, although 119 plants of the Hanakapiai type has been outplanted in the National Tropical Botanical Garden's Limahuli Preserve. None of these plants have reproduced yet (Perlman 2006; Bender 2006).

Delissea rhytidosperma and *D. kauaiensis* form a complex once found at locations across Kauai. All Kauai populations were classified as *Delissea rhytidosperma* in earlier taxonomic treatments, including when the species was listed (Lammers 1999). Dr. Thomas Lammers reworked the taxonomy of Kauai's *Delissea*, renaming the

three populations at Haupu, Kuia, and Mahanaloa as *Delissea kauaiensis* (Lammers 2005). Lammers informally recommended retaining the name *D. rhytidosperma* for the population of *Delissea* from Hanakapiai Valley (T. Lammers, pers. comm. 2005). This species is of importance because it is likely the closest relative to the population once found in Limahuli Valley, and it appears to possess some distinctive characteristics, as do some of the geographically separate populations of *Delissea kauaiensis* (Bender 2006). A DNA analysis comparing the populations of Kauai *Delissea* has been undertaken under a USFWS grant for candidate species. Results from this study should determine if there are measurable genetic differences between the populations at each of these localities, what the total genetic diversity is for each taxon, and how are these taxa related (Bender 2006).

Delissea kauaiensis is also endemic to Kauai and consists of four plants on Mt. Haupu, two plants in Kuia Valley, and four plants at Mahanaloa Valley (Perlman 2006; Bender 2006). This lineage has been widely propagated and outplanted in Hawaii.

Delissea rhytidosperma grows in mesic forest and the elevation ranges from 260 to 915 meters (853 to 3,000 feet). *Delissea kauaiensis* grows mainly on rocky cliffs and exposures in mesic forest with elevations ranging from 300 to 610 meters (984 to 2,001 feet) (Lammers 2005).

The habitats of *Delissea rhytidosperma* and *D. kauaiensis* have been modified by a combination of pigs (*Sus scrofa*), goats (*Capra hirtus*) and mule deer (*Odocoileus hemionus*) (Factors A and D). Invasive introduced plant species compete with and modify the habitat of *D. rhytodosperma* and *D. kauaiensis* (Factor E) (Perlman 2006; Wood *et al.* 2002). Goats, deer, slugs and rats all eat *Delissea* plants (Factor C) (Perlman 2006; USFWS 1995). They also appear to be affected by diseases transmitted by leafhoppers and spider mites (Factor C) (Bender 2006). Reproductive vigor is limited due to the low numbers of remaining individuals (Factor E) (Wood *et al.* 2002).

Delissea rhytidosperma is been propagated for restoration from seed of the now-extinct Hanakapiai population (Harold Harold L. Lyon Arboretum Micropropagation Laboratory 2006; National Tropical Botanical Garden 2006). Reintroduction of *D. rhytidosperma* to Limahuli Preserve has been very successful, utilizing plants derived from the now-extinct Hanakapiai population of this species. In the National Tropical Botanical Garden's Limahuli Preserve, three groups of plants have been reintroduced, totaling 119 plants. Outplanting will be ongoing at Limahuli (Bender 2006). The Hawaii Department of Forestry and Wildlife had requested seeds for outplanting in the Kuia Natural Area Reserve (Bender 2006). Seeds for this species may now be collected from plants in Limahuli Valley that descended from the small wild population which has now disappeared in Hanakapiai Valley.

Delissea kauaiensis is also being propagated for genetic storage and restoration (Harold L. Lyon Arboretum Micropropagation Laboratory 2006; National Tropical

Botanical Garden 2006; Maui Nui Botanical Gardens 2006). The Hawaii Department of Forestry and Wildlife has outplanted *D. kauaiensis* derived from seed collected from the Kuia population in the Kuia Natural Area Reserve and Waimea Canyon. Because the Mt. Haupu population of this species is so imperiled, 50 individuals from that group have been established in a restoration in Lawai Valley on land owned by the National Tropical Botanical Garden for *ex situ* genetic storage (Bender 2006). Numerous plants of this species have also been planted at the Makauwahi Cave Reserve at Mahaulepu, Kauai, a location close to the known historic range of this species, through collaboration with the National Tropical Botanical Garden, for *ex situ* genetic storage (National Tropical Botanical Garden 2006).

The stabilization and recovery goals for this species have not been met, as no wild individuals remain, outplanted individuals are not yet reproductive, and not all threats are being managed. Therefore, *Delissea rhytidosperma* as originally listed (including the current *Delissea kauaiensis*) meets the definition of endangered as it remains in danger of extinction throughout all of its range.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X__ 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

- Continue seed collection from cultivated individuals.
- Survey suitable habitat within historical range for additional individuals.

- Control invasive introduced plants around outplanted individuals.

- Rodents and slugs should be managed and controlled around outplanted individuals.

- Reintroduce additional populations in protected locations within suitable habitat and historical distribution.

- Delist *Delissea rhytidosperma* and relist as *Delissea rhytidosperma* and *Delissea kauaiensis* in the Federal Register.

5.0 REFERENCES:

Bender, D.W. 2006. National Tropical Botanical Garden, to Hawaii Department of Land & Natural Resources, Division of Forestry & Wildlife. Endangered Species Act Nontraditional Section 6 Grant, Annual Performance Report Grant E-4-CC-1, CCA-5 development of candidate conservation agreement with assurances for conservation management of candidate plant taxa in Limahuli Watershed. 22 pages. Unpublished.

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Lammers, T.G. 2005. Revision of *Delissea* (Campanulaceae-Lobelioideae). Systematic Botany Monographs 73:1-75.

Lammers, T.G. 1999. Campanulaceae (Bellflower Family). Pages 420-488 *in* Wagner, W.L., D.R. Herbst, and S.H. Sohmer (editors). Manual of the flowering plants of Hawaii. Vol. I. University of Hawai'i Press, Bishop Museum Press.

Maui Nui Botanical Gardens. 2006. Report on controlled propagation of species, as designated under the U.S. Endangered Species Act. Unpublished.

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Perlman, S. 2006. National Tropical Botanical Garden, Summary of field notes for *Delissea rhytidosperma* and *Delissea kauaiensis*. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; Final designation or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, HI; final rule. Federal Register 68 (39):9116-9479.

[USFWS] U.S. Fish and Wildlife Service. 1995. Recovery plan for the Kaua'i plant cluster. U.S. Fish and Wildlife Service, Portland, OR. 270 pages.

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Wood, K.R., M. H. Chapin, S. Perlman, and M. Maunder. 2002. Final report on field research conducted under USFWS grant No. 122000G001, Critically endangered Hawaiian plant taxa and conservation collections within the Genetic Safety Net (GSN). National Tropical Botanical Garden, Department of Conservation. Unpublished.

Personal Communications:

Dr. Thomas G. Lammers, Associate Professor and Curator of Herbarium, University of Wisconsin-Oshkosh, September 21, 2005.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Delissea rhytidosperma* (No common name)

Current Classification: E

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ 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, July 2, 2007
Marie Bruegmann, Plant Recovery Coordinator, April 16, 17, and July 2, 2007
Christian Torres-Santana, Fish and Wildlife Biologist, December 22, 2006, April 12 and June 19, 2007

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