Delissea subcordata
(Oha)

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 subcordata* (Oha)

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Delissea subcordata (Oha)

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 Hawaii Biodiversity and Mapping Program provided most of the updated information on the current status of *Delissea subcordata*. 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. 1996. Determination of endangered status for twenty-five plant species from the island of Oahu, Hawaii; final rule. Federal Register 61:53089-53108.
Date listed: October 10, 1996
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 nondesignations of critical habitat for 101 plant species from the island of Oahu, HI: final rule. Federal Register 68(116):35950-36406.

Critical habitat was designated for *Delissea subcordata* in 6 units totaling 2,300 hectares (3,746 acres) on Oahu. 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)]: Improving

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 Oahu plants. 1998. U.S. Fish and Wildlife Service, Portland, Oregon. 362+ pages
Date issued: August 10, 1998
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*
__X__ *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 not considered a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Oahu plants (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Delissea subcordata* 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 Oahu, where the species now occurs 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 subcordata* should be documented on Oahu where it now occurs or 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 *Delissea subcordata* should be documented on Oahu where it now occurs or 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.

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

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
1996 – listing	70-80	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 – recovery plan	Fewer than 80	3	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 – critical habitat	Fewer than 70	Unknown	All threats managed in all 3 populations	Unknown
			Complete genetic storage	Unknown
			3 populations with 50 mature individuals each	No
2007 – 5-yr review	40	275	All threats managed all 3 populations	Partially
			Complete genetic storage	Partially
			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 subcordata has been recorded historically from the Waianae and Koolau Mountain Ranges of Oahu. It is currently known to be extant only in the Waianae Mountains, and current taxonomy includes only populations in the Waianae Mountains. Currently, 28 mature individuals, one immature individual, and 11 seedlings of *D. subcordata* are known from nine populations in the Waianae Mountains of Oahu. In addition, 275 individuals have been outplanted since 1999 within three of these nine populations, but these plants are not yet mature (U.S.

Army 2006a; J. Lau, Hawaii Biodiversity and Mapping Program, pers. comm. 2007).

Delissea subcordata is usually found growing on north-facing gulch slopes, and sometimes in gulch bottoms. It occurs in mesic forests dominated by *Diospyros sandwicensis* (lama), *Metrosideros polymorpha* (ohia lehua), and/or *Acacia koa* (koa). Common native associated species of *Delissea subcordata* include *Diospyros hillebrandii* (lama), *Pisonia* spp. (papala kepau), and *Pouteria sandwicensis* (alaa). *Delissea subcordata* grows either under the forest canopy or in sunny openings in the forest (Makua Implementation Team 2003).

In 2005, a revision of the genus *Delissea* was published which split *D. subcordata* into three species (Lammers 2005). One of the species is a more narrowly circumscribed *D. subcordata*, known only from historical records from the Koolau Mountains. Three specimens collected in the Waianae Mountains by Wayne Takeuchi in 1986 and 1987 represent the new species *D. takeuchii*. According to Takeuchi, the populations represented by his specimens are no longer extant (Lammers 2005). All other specimens from the Waianae Mountains formerly representing *D. subcordata* are referred to the new species *D. waianaeensis*. Included under *D. waianaeensis* are the five extant *Delissea* populations discussed above.

Habitat modification by feral goats and pigs is still considered to be a threat to this species (Factors A and D) (U.S. Army 2006a). Currently, a few of the surviving wild *Delissea subcordata* are protected from ungulates in large, multi-acre fences while most, but not all, of the other individuals are protected with small enclosures (U.S. Army 2006a). Public hunting does not adequately control the numbers of goats and pigs to eliminate this threat. Therefore, additional large-scale ungulate exclosures and ungulate control are still needed.

Species like *Delissea waianaeenis* that are endemic to small portions of one island, and limited to a few populations and individuals, are inherently more vulnerable to extinction than widespread species because of the higher risks posed by genetic bottlenecks, random demographic fluctuations and localized catastrophes such as hurricanes, landslides or drought (Factor E). In addition, *D. waianaeenis* continues to be threatened by habitat degradation and competition from introduced invasive plant species (Factor E), fire (Factor E), rat and slug predation (Factor C), and military training (Factor E) (Makua Implementation Team 2003; U.S. Army 2005, 2006a). All of these threats will have to be addressed before the stabilization goals of this species can be met.
Four populations of *Delissea waianaeenis* are scheduled to be managed for interim stability by the U.S. Army, as defined in the recovery criteria. The rest of the *D. waianaeenis* populations will be collected from for genetic storage. One of the populations selected to be managed is the population in the northern Waianae Mountains that extends from Kahanahaiki Valley in the Makua Military Reservation into Pahole Natural Area Reserve. The other three populations

scheduled to be managed long-term are in Honouliuli Preserve in the southern Waianae Mountains, in the gulches of Kaluaa, Ekahanui, and North Palawai. A few of the surviving wild plants of *D. subcordata* are protected from ungulates in these large, multi-acre fences in Kahanahaiki Valley and Pahole Gulch in the population on Makua Military Reservation and Pahole Natural Area Reserve. The population's other two individuals in Kapuna Gulch are still unprotected, but will be included within a larger area scheduled to be fenced. The other *D. subcordata* population located within a large fenced area is the population in Kaluaa Gulch. Most of the other sites with naturally occurring *D. waianaeenis* have been enclosed within small fenced exclosures built specifically for the protection of the *D. subcordata* plants. These sites include the two North Palawai Gulch sites (which will be managed for stability), the two Ekahanui Gulch sites, and the Mohiakea Gulch site. The *D. subcordata* plants at Kealia and Palikea Gulch remain unprotected (U.S. Army 2006a).

The U.S. Army is helping to address the threat inherent with small number of populations and small population sizes through genetic storage. Propagation for genetic storage and reintroduction is occurring in the Army's baseyard, the University of Hawaii's Lyon Arboretum Micropropagation and Seed Storage Laboratories, National Tropical Botanical Garden, the state of Hawaii's Division of Forestry and Wildlife's Pahole Rare Plant Facility, and at Waimea Valley Park. These organizations and agencies are working together to store genetic material long-term against stochastic events and to supply the Army with plants for reintroductions (U.S. Army 2006a; Makua Implementation Team 2003).

In summary, the stabilization and recovery goals for this species have not been met, as only 28 mature individuals are known in the wild, the outplanted individuals are not yet reproducing, and not all threats are being managed. Therefore, *Delissea waianaeenis* 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*
_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

- Complete full genetic storage of all populations.
- Fence remaining unfenced populations to protect from ungulates.
- Control invasive plant species within and around remaining populations.
- Control rats around remaining individuals.
- Continue research to develop efficient and effective methods of slug control.
- Survey for surviving plants of the other two species, *Delissea takeuchii* and *D. subcordata*. For the extant *D. waianaeensis*, survey for new populations in suitable habitat, and revisit sites where recorded plants have died, since new plants could possibly germinate from seed banks at these sites.
- Study *Delissea subcordata* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Update the listed entity on 50 CFR 17 to match the currently recognized taxonomy.

5.0 REFERENCES

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

Makua Implementation Team. 2003. Implementation Plan for the Makua Military Reservation, Island of Oahu. Prepared for U.S. Army Garrison, Hawaii, May 2003. Unpublished.

[U.S. Army] U.S. Army Garrison, Hawaii. 2005. 2005 Status Report, Makua implementation plan, island of Oahu. September 2005. Unpublished.

[U.S. Army] U.S. Army Garrison, Hawaii. 2006a. 2006 Status Reports for the Makua Implementation Plan and the Draft O`ahu Implementation Plan. October 2006. Unpublished.

[U.S. Army] U.S. Army Garrison, Hawaii. 2006b. Rare plant database, Dec. 6, 2006. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 1996. Determination of endangered status for twenty-five plant species from the island of Oahu, Hawaii; final rule. Federal Register 61:53089-53108.

[USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, Hawaii; final rule. Federal Register 68(116):35949-35998.

Personal Communications

Lau, Joel Q.C., Botanical Specialist, Hawaii Biodiversity and Mapping Program. January 2007.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Delissea subcordata* (Oha)

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, June 24, 2007
Marie Bruegmann, Plant Recovery Coordinator, June 5 and 29, 2007
Fred Amidon, Fish and Wildlife Biologist, April 30, 2007

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