

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Delissea rhytidosperma* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.

Lead Region/Field Office:

Interior Region 12/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, Conservation & Restoration 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 or USFWS) beginning in October 2021. The review was based on a review of current, available information since the last 5-year review for *Delissea rhytidosperma* (USFWS 2017). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration 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 (<https://ecos.fws.gov/ecp/species/1452>).

Review Analysis:

Please refer to the previous 5-year reviews for *Delissea rhytidosperma* published in the Federal Register on January 18, 2008, and September 13, 2017 (available at https://ecos.fws.gov/docs/tess/species_nonpublish/1151.pdf and https://ecos.fws.gov/docs/tess/species_nonpublish/2429.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 *D. rhytidosperma*.

This short-lived perennial shrub in the Campanulaceae (bellflower) family is listed as endangered and is known from the island of Kaua‘i. The status and trends for *Delissea rhytidosperma* are provided in the tables below.

New Status Information:

- In 2017, there were only two known wild individuals of *Delissea rhytidosperma* reported (USFWS 2017). However, there is a 2019 report that these individuals were not relocated in a survey in 2014 and that this species is possibly extinct in the wild (Wood et al. 2019, p. 8). Seeds were collected from several founders from three populations, and *ex situ* and *inter situ* sites maintained for genetic storage and propagation. Fruit collections were made as recently as 2021 (Lyon Arboretum 2022, PEPP 2021).

New Threats:

- None reported.

New Management Actions:

- Surveys and inventories—The National Tropical Botanical Garden (NTBG) surveyed Hā‘upu and was not able to locate any individuals of *Delissea rhytidosperma* (Wood 2020, Appendix 1, 20 pp., in DeMotta 2020, 17 pp.). In addition, some plants at Hā‘upu previously identified as *D. rhytidosperma* were later determined to be *D. kauaiensis* (USFWS 2008). The location is an area of sympatry for both species (Lammers 2005).
- Habitat restoration—The NTBG was awarded funding to conduct rare plant collections and restore habitat at Limahuli Preserve (Nagendra et al. 2020). Restoration activities include nonnative plant control, rat trapping, fence repairs, and pig hunts. All of these actions may benefit individuals of *D. rhytidosperma* in the area.
- Collection and captive propagation—
 - Seeds were collected and stored from reintroduced plants in 2019-2020 (Nagendra et al. 2020, pp. 6, 8).
 - The Lyon Arboretum Micropropagation Laboratory reported propagation of 35 explants representing one founder from Hā‘upu (Lyon Arboretum 2022). Between 2001 and 2020, the Arboretum’s Seed Conservation Laboratory reported collection and storage of 13,439 seeds from two founders at Hā‘upu (Lyon Arboretum 2022). One *inter situ* population at Wailua is represented by a collection of 22,005 seeds from 18 plants, and 11 plants (sourced from Hā‘upu and Limahuli) in several living collections are represented by collection and storage of 217,791 seeds (Lyon Arboretum 2022).
 - In 2019, the Kōke‘e Mid-Elevation Nursery (KMEN) reported propagation of 45 individuals representing four founders from Hā‘upu and Limahuli. In 2020, 77 individuals were propagated (KMEN 2020).
 - Between 2017 and 2019, NTBG reported collection and storage of more than 13,000 seeds representing five first- and second-generation plants in living collections and propagation of more than 125 individuals representing six of those plants (NTBG 2020). From 2020 to 2021, NTBG reported collection and storage of more than 38,000 seeds representing first- and second-generation individuals from two plants in living collections and one wild plant from Limahuli: and propagation of 158 plants representing those same

individuals (NTBG 2021). Also in 2020, there were 18 individuals added to a living collection in Limahuli Preserve (Nagendra et al. 2020, pp. 13–14)

- Reintroduction and augmentation—
 - In 2020, NTBG reported recruitment observed from plants sourced from Hanakāpīʻai and Limahuli Preserve (NTBG 2020). In 2021, 30 individuals were reintroduced (Nagendra 2021a, p. 15). In addition, 13 individuals were reintroduced as part of the Lower Limahuli Preserve spring-fed stream restoration project (Nagendra 2021b, p. 6).
 - In 2021, the Plant Extinction Prevention Program (PEPP) reintroduced 43 individuals to an *inter situ* site at Wailua (PEPP 2021).
- Population biology research—At the Hawaii Rare Plant Genetics Workshop in 2022, Scott Heintzman and Susan Deans of Kauaʻi’s Plant Extinction Prevention Program presented information explaining the current taxonomy and sympatry among *Delissea rhytidosperma* and *D. kauaiensis* occurring at Hāʻupu, Kauaʻi. Progeny from this location display intermediate characteristics between the two taxa, indicating that hybridization may have occurred, or that these plants may not be separate species. There is a need for taxonomic resolution between these individuals as well as other *Delissea* found at other locations to support their conservation and management.

Table 1. Status and trends of *Delissea rhytidosperma* from listing through current 5-year review.

Date	No. wild individuals	No. outplanted	Stability criteria identified in Recovery Plan	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	Partially
1995 (recovery plan)	10 mature	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2003 (critical habitat)	11	ca 200	All threats managed in all 3 populations	No

			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2008 (5-year review)	0	ca 200	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2017 (5-year review)	2	ca 100 in 2015; total 136	All threats managed in all 3 populations	No
			Complete genetic storage	Yes
			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	Partially
			3 populations with 50 mature individuals each	No
2022 (5-year review)	0	ca 65	All threats managed in all 3 populations	Partially, management at Limahuli Preserve
			Complete genetic storage	Yes, all plants extirpated; several founders in storage
			Natural reproduction at all 3 populations	Partially, recruitment at Limahuli
			3 populations with 50 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 *Delissea rhytidosperma* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat and herbivory by feral ungulates	A, C	Ongoing	None
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	None
Landslide destruction and degradation of habitat	A	Ongoing	None
Climate change degradation and destruction of habitat, including hurricanes	A	Ongoing	None
Predation and herbivory by rodents	C	Ongoing	None
Predation and herbivory by invertebrates—slugs, leafhoppers, spider mites	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, seed collection, propagation, and reintroduction

Synthesis:

Currently there are no wild individuals of *Delissea rhytidosperma* on Kaua‘i. Collection, propagation, and reintroduction are ongoing, representing several founders from the last known populations. An area of reintroduction and living collections, Limahuli Preserve, is fenced and managed to control feral ungulates and nonnative plants. There is one *inter situ* population producing thousands of seeds for storage, and 11 plants in private gardens also producing thousands of seeds. Approximately 65 individuals have been reintroduced since 2017, and some recruitment is observed.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Kaua‘i Islandwide Recovery Plan (USFWS 2021) 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.

Delissea rhytidosperma is a short-lived perennial shrub. 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 three populations should be documented on Kaua‘i where the species occurs or occurred historically and these populations must be naturally reproducing (i.e., viable seeds, seedlings) with a minimum of 50 mature, reproducing individuals.

The preventing extinction goals for this species have not been met. Currently, there are no wild individuals; however, these plants are represented in collections (Table 1). One area is fenced and feral ungulates and nonnative plants are managed. There are no reintroduced populations totaling 50 mature, reproducing individuals; only two reintroduced plants have been observed recruiting. However, all threats such as rodent and invertebrate predation, and habitat disturbance including landslides, are not being managed (Table 1, Table 2). Therefore, *Delissea rhytidosperma* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

No new threats and no significant new information regarding the species' biological status have been reported since the last 5-year review in 2017. Thus, the following recommendations for future actions are reiterated or updated for the 5-year review for 2022.

- Surveys and inventories—Continue surveys of suitable habitat within historical range for additional individuals of *Delissea rhytidosperma*.
- Ungulate monitoring and control—Continue to construct and maintain exclosures around all populations for protection against habitat disturbance and herbivory by feral ungulates.
- Nonnative invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species and those that compete with *D. rhytidosperma* at all populations.
- Climate change adaptation strategy—Research suitability of habitat for viability of species, including where to conduct translocations in the future due to impacts of climate change.
- Predator and herbivore monitoring and control—
 - Determine and implement effective control methods for slugs
 - Implement effective control methods for rodents.
 - Determine the level of threat of disease transmission by leafhoppers and spider mites and the need for effective control.
- Captive propagation for genetic storage and reintroduction—Continue to collect material for maintenance of genetic stock and for propagation for reintroduction.

- Reintroduction and augmentation—Continue to reintroduce individuals into protected suitable habitat.
- Build resiliency and redundancy—Increase numbers of individuals and populations through historic range to reduce impacts of landslides and hurricanes.
- Population biology research—
 - Study *D. rhytidosperma* populations to determine viable population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
 - Hā‘upu is an area of sympatry for *D. rhytidosperma* and *D. kauaiensis* (Heintzman and Deans 2022, in litt.). Further genetic studies are needed to support the conservation and management of these species through the propagation and reintroduction of progeny that will maximize genetic diversity and create healthy, resilient populations.
- 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 species.

References:

[HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.

Heintzman, S. and S. Deans 2022, in litt. Plant Genetics Workshop, January 10-11, 24, and February 14, 2022, in litt.)

[KMEN] Kōke‘e Mid-Elevation Nursery. 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.

[KMEN] 2020. 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.

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

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.

Nagendra, U., A. Ramelb, and K. Jensen. 2020. Limahuli Preserve rare plant conservation collections and habitat restoration project, National Tropical

- Botanical Garden, FWS Agreement #F18AC00508, October 1, 2019-September 30, 2020. 18 pp.
- Nagendra, U. 2021a. Limahuli Preserve rare plant conservation collections and habitat restoration project, National Tropical Botanical Garden, FWS Agreement # F18AC00508, December 21, 2021. 21 pp.
- Nagendra, U. 2021b. Lower Limahuli Preserve spring-fed stream restoration project. National Tropical Botanical Garden, FWS Agreement # F18AC00509, December 21, 2021. 12 pp.
- [NTBG] National Tropical Botanical Garden. 2020. 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.
- [NTBG] 2021. 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.
- [PEPP] Plant Extinction Prevention Program. 2021. Fiscal year 2021 interim performance report (October 1, 2020-September 30, 2021) cooperative agreements F18AC00502 and F19AC00532, US Fish and Wildlife Service CFDA Program #15.657, Endangered species conservation—recovery implementation funds, University of Hawaii at Manoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program.
- [USFWS] U.S. Fish and Wildlife Service. 2008. *Delissea rhytidosperma* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/tess/species_nonpublish/1151.pdf.
- [USFWS] 2017. *Delissea rhytidosperma* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/tess/species_nonpublish/2429.pdf.
- [USFWS] 2020. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.
- [USFWS] 2021. Kaua‘i Islandwide Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 65 pp. + appendices.
- Wood, K.R., H. Oppenheimer, and M. Keir. 2019. A checklist of endemic Hawaiian vascular plant taxa that are considered possibly extinct in the wild., May 2019. 17 pp.

Wood, K.R. 2020. Appendix 1, 20 pp. *In* DeMotta, M. 2020, National Tropical Botanical Garden- USFWS Partners Program, Mt. Hā'upu Conservation Project, Service Award #F18AC00511, Interim Performance and Financial Report, Oct 1, 2019-Sept 30, 2020. 17 pp.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Delissea rhytidosperma*
(no common name)

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

For Field Supervisor, Pacific Islands Fish and Wildlife Office

Date _____