Global Reintroduction Perspectives: 2018

Case studies from around the globe

Edited by Pritpal S. Soorae

IUCN/SSC Reintroduction Specialist Group (RSG)

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Published by: IUCN/SSC Reintroduction Specialist Group & Environment Agency-Abu Dhabi

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Citation: Soorae, P. S. (ed.) (2018). *Global Reintroduction Perspectives: 2018. Case studies from around the globe*. IUCN/SSC Reintroduction Specialist Group, Gland, Switzerland and Environment Agency, Abu Dhabi, UAE. xiv + 286pp.

6th Edition

ISBN: 978-2-8317-1901-6 (PDF)
978-2-8317-1902-3 (print edition)

DOI: https://doi.org/10.2305/IUCN.CH.2018.08.en

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Printed by: Arafah Printing Press LLC, Abu Dhabi, UAE

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Reintroduction of *Delissea kauaiensis*, a critically endangered lobeliad, on Kauai, Hawaii, USA

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Introduction

Delissea kauaiensis Lammers is a small tree species in the Campanulaceae family. It is endemic to the island of Kauai in the Hawaiian Islands. In Hawaii, the Campanulaceae represents one of the largest adaptive radiations of species with over 159 endemic taxa recognized in this family. The Hawaiian Campanulaceae is becoming a case study in rare plant management, as over 60% of the taxa in the family are either extinct, endangered or threatened. *D. kauaiensis* was listed as endangered by the United States Fish and Wildlife Service and the State of Hawaii in 1996. It is Red Listed as Critically Endangered by the IUCN. *D. kauaiensis* is restricted to mesic forests in the north-west facing valleys of the island of Kauai. There are currently only seven mature, wild plants known of this species, scattered in four different locations. This project has attempted to establish new populations within the species' original geographic range. The project sites are within the Kuia Natural Area Reserve which is owned and managed by the state government for multiple uses, some of which conflict with conservation of the species. Several fenced exclosures that have been built provide protected areas against feral ungulates for reintroducing this species.

Goals

- Goal 1: Make seed collections of every mature, wild individual of *Delissea kauaiensis*.
- Goal 2: Secure *ex situ* collections of seeds in long-term storage at Lyon Arboretum and the National Tropical Botanical Garden.
- Goal 3: Establish new populations by reintroducing plants into five protected exclosures within the species' natural range.
- Goal 4: Include the maximum genetic diversity possible in each new population.

***Delissea kauaiensis* Lammers**

- Goal 5: Monitor reintroduction sites for threats, population structure, and project success.

Success Indicators

- Indicator 1: Every wild individual is represented in nurseries or seed banks.
- Indicator 2: Reintroduced populations will include a minimum of 50 individuals that are mature and reproductive at each of five sites.
- Indicator 3: Progeny from every wild individual is equally represented within each new population.
- Indicator 4: Seedling recruitment is observed at each of five sites.
- Indicator 5: Minimum of 25 mature, reproductive recruits are established at each of five sites.

Project Summary

Feasibility: *D. kauaiensis* has always been considered rare. Through habitat degradation by feral goats, deer and pigs, this species has been reduced to the seven mature individuals that are currently known. The largest wild site has only four mature individuals and each of the four sites occurs in a different valley making cross-pollination between sites highly unlikely. The state government mandate to manage the area as a multiuse space promotes the continuance of feral game for local hunters at the expense of protecting the wild plants. To address their responsibility to protect the native species, they have built five fenced exclosures around what is considered the best examples of native mesic forest in the reserve. The exclosures vary in size from 1.2 - 80 acres. The first was completed in 2009 and the last one was completed in 2013, but has not had all of its deer eradicated yet. Management of the exclosures includes removing all deer, pigs, and goats and performing invasive plant control. This project intends to establish a single population of the endangered *D. kauaiensis* in each of the five exclosures available. All mature wild individuals, or founders, will be represented in each of the new populations to maintain the maximum potential genetic diversity of the species. Very little research has been done with this species, so much of this project, such as site selection, was based on observations of the habitat where the current wild individuals are found. These sites may not be the ideal locations for the species, but rather are remnants where threats like goats cannot reach them.

Implementation: For the past nine years, the Hawaiian Plant Extinction Prevention Program has been monitoring, collecting from, and managing threats to the wild individuals of this species as well as surveying for more individuals. Two new sites were found during those surveys with single individuals at each site. Eight founders have been collected from, although not all of those founders are still alive today. Seed was both stored and propagated for every individual from which collections were made. In 2010, 124 individuals of *D. kauaiensis* representing a single founder were introduced into a fence exclosure. As propagules representing new founders were collected and grown, they were added to the sites and new sites were established in other exclosures. At present, there are three sites in three different exclosures. Over 500 plants have been planted out in total and seven founders are represented. Not all of the reintroduction sites have all of the founders represented yet, but as propagules of underrepresented founders become available for planting out, they are distributed

between the sites to add genetic diversity. This project is on-going and two of the exclosures slated for reintroduction have not been planted in yet. One has not had all the animals removed yet and another is just awaiting the next batch of plants to be ready for planting.

Steve Perlman collecting founder stock

Post-planting monitoring: Survival of *D. kauaiensis* has been greater than expected, but not all sites fared the same. Within one year of planting, we began to see mature *D. kauaiensis* flowering and fruiting abundantly at our first site. Within two years, we began to see seedlings recruiting into the site. So far these recruited individuals are not mature. At our second site, we had greater mortality, but still saw maturity in the planted individuals by the first year. So far no seedlings have recruited at that site. Our third site was just started in 2016, so it is too early to draw any conclusions about how it will fare. From our first two reintroduction sites, we have learned a few things that have influenced us in choosing our third site. While the wild plants occur in areas with thick canopy, in our reintroduction sites, the plants had better survival in areas that had less canopy cover. In our second site, we had much less survival than our first site and we believe that it was because we introduced those plants before all of the invasive plants had been removed. Removal of strawberry guava (*Psidium cattelianum*) was occurring simultaneously to the reintroduction rather than being completed before the reintroduction.

Major difficulties faced

- This project has been very slow to implement as we have been dependent on the timeline of exclosure construction by conservation partners, and the removal of feral animals and invasive plants before any reintroductions could take place.
- There is very little research that has been done on this species regarding environmental growing requirements, pollination ecology, or genetic diversity, so our decisions have been made with whatever information was available and have had to change as new information became apparent.
- As new individuals become mature or are found, additional collections have been required to have all mature wild individuals represented. We are continually adding more plants to our reintroduction sites to try to equalize under-represented founders.

Major lessons learned

- Using the current habitat of extremely rare species as a guide to choosing reintroduction sites can be misleading. We learned areas within our reintroduction site that had a dense canopy (>75% cover) like that of the wild plants' sites, actually experienced more mortality than the areas with a thinner canopy (25 - 75% cover).
- It is important that the invasive plant species *Psidium cattelianum* be removed prior to any reintroductions. Planting into an area where it was being removed at the same time as the introduction resulted in 19% greater mortality compared to an area where it had been removed prior to planting.

Success of project

Highly Successful	Successful	**Partially Successful**	Failure
		√	

Reason(s) for success/failure:

- Seeds from every mature, wild individual have been collected and are represented in seed storage facilities.
- Only three of the five introduction sites have been planted into at the time of this article.
- Most, but not all, founders are represented at each site.
- One site has documented recruitment of seedlings, but these individuals are not reproductive yet. Some of the sites are still too new to expect recruitment at this time.

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