5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea rivularis* (ʻōhā)

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, Hawaiʻi

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 *Cyanea rivularis* (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/6421*).

Review Analysis:

Please refer to the previous 5-year reviews for *Cyanea rivularis* (as *Delissea rivularis* in 2010) published in the Federal Register on August 27, 2010, and September 13, 2017 (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1630.pdf* and *https://ecos.fws.gov/docs/tess/species_nonpublish/2423.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 *C. rivularis*.

This short-lived perennial shrub in the Campanulaceae (bellflower) family is endangered and is known from the island of Kauaʻi. The status and trends for *Cyanea rivularis* are provided in the tables below.

New Status Information:

- *Cyanea rivularis* was previously known from 17 to 18 wild individuals in the upper reaches of Hanakāpīʻai valley (Nagendra 2018, p. 7; PEPP 2017). Nine individuals were reported in 2016, and only three individuals were observed in 2018 (Walsh 2016; Perlman and Spork 2018).

New Threats:

- None reported.

New Management Actions:

- Surveys and monitoring—Fence monitoring and repairs are conducted by the National Tropical Botanical Garden (NTBG) in upper Limahuli Preserve (Nagendra et al. 2020, 18 pp.).
- Feral ungulate control—Hunts for feral pigs are conducted just outside the fenced area of upper Limahuli to reduce the pressure on fencing (Nagendra et al. 2020, 18 pp.).
- Nonnative plant control—Nonnative plant control is ongoing in the upper Limahuli fenced restoration area (Nagendra et al. 2020, 18 pp.).
- Rodent control—Rat trapping is conducted in upper Limahuli (Nagendra et al. 2020, 18 pp.).
- Insect and disease control—Fungicide and insecticide applications are conducted as necessary (Nagendra 2018, p. 7).
- Collection and captive propagation—
  - Eleven founders are represented in collections (Nagendra 2018, p. 15).
  - Lyon Arboretum reported 36 explants in a collection representing one founder at Hanakoa (Lyon Arboretum 2022). In 2006, four founders from Hanakoa were represented by collection and storage of 2,028 seeds. Between 2010 and 2016, 14,725 seeds were collected and stored representing six founders from Hanakāpīʻai (Lyon Arboretum 2022).
  - The Kōkeʻe Mid-Elevation Nursery (KMEN) reported propagation of four plants representing two founders from the wild population at Hanakāpīʻai (KMEN 2019).
  - In 2020 and 2021, NTBG reported storage of 900 seeds representing one plant in a living collection at upper Limahuli and propagation of five plants representing the same individual (NTBG 2020, 2021).
- Reintroduction and augmentation—
  - Of the 133 previously reintroduced plants at upper and lower Limahuli, 46 currently survive (Edmonds 2018).
  - In 2018, two plants were reintroduced to into fenced habitat in upper Limahuli that is similar to the habitat of the wild population at Hanakāpīʻai (Nagendra 2018, p. 2). These are in addition to the eight plants reintroduced at the ULP Weatherport in 2016, five of which are currently surviving (Nagendra 2018, p. 8). It was found that reintroduced plants produce viable seeds (Nagendra 2018, p. 7).

- KMEN reported reintroduction of one plant representing one founder within an exclosure at North Bog (KMEN 2019).
- In 2021, the State's Division of Forestry and Wildlife was awarded funding for the Plant Extinction Prevention Program to implement restoration of resilient populations of *Cyanea rivularis* on Kauai (USFWS 2021, in litt.). The main objectives of this 3-year project are threat control and establishment of five in situ populations. Threat control actions include exclusion of feral ungulates by improvements to two existing fences, rodent and slug controls to be established before outplanting begins, and invasive nonnative plant control at the sites. Translocation efforts (beginning in the second year) consist of propagation of 2,500 seedlings representing all known founders (11), establishment of the five populations of 500 individuals each, and monitoring for project success with adaptive management if required.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 (listing)	15–20	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 (recovery plan)	35–40	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	40	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No

2010 (5-year review)	19–22	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially, 1,000s of seeds in storage, some plants in storage at NTBG and Lyon Arboretum
			3 populations with 50 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2017 (5-year review)	9	60	All threats managed in all 3 populations	Partially, upper Limahuli fencing project
			Complete genetic storage	Partially
			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	Unknown
			3 populations with 50 mature individuals each	No
2022 (5-year review)	3	133 total as of 2018, 46 survive	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			Natural reproduction at all 3 populations	Unknown, seeds are viable
			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 *Cyanea rivularis* 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	Partial, fence monitoring and maintenance at upper Limahuli
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, nonnative plant control at upper Limahuli
Flooding and landslide degradation and destruction	A	Ongoing	None
Climate change degradation and destruction of habitat, including hurricanes	A	Ongoing	None
Predation and herbivory by rodents	C	Ongoing	Partial, rodent control at upper Limahuli
Predation and herbivory by invertebrates—slugs	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, seed storage, propagation, and reintroduction ongoing

Synthesis:
Currently there are three wild individuals of *Cyanea rivularis* on Kauaʻi. Four founders at Hanakoa and six founders at Hanakāpīʻai are represented in collections. Reintroduced individuals and plants in living collections are protected from feral ungulates by fencing. Nonnative plant control and rodent control are ongoing in this fenced area. A habitat restoration project has been awarded funding and is ongoing and supports reintroduction of *C. rivularis*.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Kauaʻi Islandwide Recovery Plan (USFWS 2021) and have been updated according to the draft revised recovery objective guidelines developed by the Hawaiʻi 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.

Cyanea rivularis 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 only three wild individuals (Table 1). Ten founders from two populations are represented by propagation and seed collections. Of the 133 total plants reintroduced, 46 survive, but recruitment is not reported. In addition, all threats are not being managed (Table 1, Table 2). Therefore, *Cyanea rivularis* 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 to survey for populations of *Cyanea rivularis* in areas of potentially suitable habitat and assess and identify protected sites for reintroduction.
- Ungulate monitoring and control—
  - Protect remaining wild individuals against browsing and disturbance from feral ungulates to prevent imminent extinction.
  - Continue to construct and maintain exclosures around all populations.
- Nonnative invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species and those that compete with *C. rivularis* at all wild and reintroduced 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—
  - Continue to implement effective control measures for feral pigs and rats.
  - Develop and implement effective control methods for slugs.
- Captive propagation for genetic storage and reintroduction—Continue to collect material for genetic storage and propagation for reintroduction and maintain viable *ex situ* collections.
- 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, low numbers, and hurricanes.
- 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:

Edmonds, M. 2018. Hawai‘i Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Cyanea rivularis*, Pacific Islands Fish and Wildlife Office.

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[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.

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.

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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.

[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.

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Perlman, S. and M. Spork. 2018. Hawai‘i Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp.

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[PEPP] Plant Extinction Prevention Program. 2017 Plant Extinction Prevention Program FY 2017 Annual Report (Oct 1, 2016-Sep 30, 2017), Coop Agreement: F14A00174, U.S. Fish and Wildlife Service CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, 235 pp.

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[USFWS] 2021. Kaua‘i Islandwide Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 65 pp. + appendices.

[USFWS] 2021, in litt. Restoring resilient populations of *Cyanea rivularis* on Kauai, Hawaii, October 1, 2020—September 30, 2021, annual report. Grant No. F21AC00485, CFDA15.657. 10 pp.

Walsh, S. 2016. *Cyanea rivularis.* The IUCN Red List of Threatened Species 2016:e.T78777626A115496448. *http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T78777626A78777631.en.*

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Cyanea rivularis* (ʻōhā)

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**

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