5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyrtandra munroi* (ha‘iwale)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 77 Species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86(120):33726–33728, June 25, 2021.

Lead Region/Field Office:

Region 1/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, Recovery 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) beginning in October 2022. The review was based on a review of current, available information since the last 5-year review for *Cyrtandra munroi* (USFWS 2018). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Recovery 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 (*http://ecos.fws.gov/ecp/species/3347*).

Review Analysis:

Please refer to the previous 5-year reviews for *Cyrtandra munroi* published in the Federal Register on August 2, 2011, and October 22, 2018 (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1761.pdf* and *https://ecos.fws.gov/docs/tess/species_nonpublish/2629.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. munroi*.

This short-lived perennial shrub in the Gesneriaceae (African violet) family is endangered and is known from Lāna‘i and Mauna Kahālāwai (west Maui). The status and trends for *Cyrtandra munroi* are provided in the tables below.

New Status Information:

- Currently there are three mature and five immature wild individuals of *Cyrtandra munroi* at Waiʻalalā (although some plants may be hybrids with *C. grayana*) and two individuals at Lānaʻihale on Lānaʻi (Maui Plant Extinction Prevention Program [Maui PEPP] 2019). The status of populations at Kunoa (1 individual), Kapōhaku gulch (15 individuals), and Waiʻapaʻa-Waiakaʻiole (20 individuals) is unknown. On Mauna Kahālāwai (west Maui), there is 1 individual at Wahikuli-Hāhākea, 2 individuals at Hāʻena Nui Gulch, 1 individual at Kahana, 8 individuals at Honokōwai, and 2 to 3 individuals at Kauaʻula (National Tropical Botanical Garden 2018; PEPP 2022). The current status of a large population of more than 50 individuals at Makamakaʻole on Mauna Kahālāwai is unknown.
- Currently, there are two founders (wild plants) from Waiʻalalā, Lānaʻi, and two founders from Mauna Kahālāwai (Honokōhau and Honokōwai), represented in *ex situ* storage and propagation.

New Threats:

- Hybridization—Hybridization of *Cyrtandra munroi* with *C. grayana* at Waiʻalalā on Lānaʻi is reported as a new threat to this species (Maui PEPP 2019; Pūlama Lānaʻi 2021). Hybridization may lead to the loss of species diversity, local adaptations, and genetic representation of *C. munroi* (Todesco et al. 2016, pp. 892, 901–902).

New Management Actions:

- Monitoring and surveys—The Maui Plant Extinction Prevention Program (Maui PEPP) and Pūlama Lānaʻi monitor populations of *Cyrtandra munroi* on Lānaʻi and Maui (Maui PEPP 2019).
- Monitoring and control of rodents—Currently, Pūlama Lānaʻi monitors populations of *C. munroi* on Lānaʻi and reports partial control at current and historic locations (Pūlama Lānaʻi 2021).
- Collection and captive propagation for genetic storage and translocation—
    - In 2020, the Olinda Rare Plant Facility (ORPF) reported propagation and storage of six individuals representing one founder of *Cyrtandra munroi* at Waiʻalalā, Lānaʻi (ORPF 2023).
    - In 2021, the Lyon Arboretum Micropropagation Laboratory reported storage of 22 explants representing one founder of *Cyrtandra munroi* at Honokōhau, on Mauna Kahālāwai (Lyon Arboretum 2022). The Lyon Arboretum Seed Conservation Laboratory reported storage of 2,013 seeds representing two founders at Waiʻalalā, Lānaʻi collected in 2019, and 1,974 seeds from one founder at Honokōwai collected in 2013 (Lyon Arboretum 2022).
    - In 2021, Pūlama Lānaʻi reported collection of three fruit representing two founders at Waiʻalalā for storage and propagation at Lyon Arboretum (Pūlama Lānaʻi 2021).
    - The Maui Plant Extinction Prevention Program reported collection of seeds from two founders of *C. munroi* at Waiʻalalā, Lānaʻi for storage at Lyon Arboretum (Maui PEPP 2019).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	1 (Maui) 20 (Lānaʻi)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2011 (5-year review)	<100 (Maui) 2 (Lānaʻi)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2018 (5-year review)	several dozen to few 100s (Maui) few (Lānaʻi)	0	All threats managed in all 3 populations	Partially, ungulate and nonnative plant management
			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2023 (5-year review)	14-15 (Maui) 3–5 (Lānaʻi)	0	All threats managed in all 3 populations	Partially

			Complete genetic storage	Partially
			Natural reproduction at all 3 populations	Unknown
			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 *Cyrtandra munroi* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, 2 populations on Lāna‘i and 2 populations on Maui within exclosures
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant management on Lāna‘i
Landslides and flooding destruction and degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Predation and herbivory by feral ungulates	C	Ongoing	Partial, 2 populations on Lāna‘i and 2 populations on Maui within exclosures
Predation and herbivory by rodents	C	Ongoing	Partial, rodent control at two Lāna‘i populations
Predation and herbivory by invertebrates	C	Ongoing	None
Hybridization	E	Ongoing	None
Reduced viability due to small populations	E	Ongoing	Partial, seed collection and propagation ongoing

Synthesis:
Currently there are three mature and five immature wild individuals of *Cyrtandra munroi* in two populations on Lāna‘i; however, some of these individuals may be hybrids. There

are 14 to 15 wild individuals at four locations on Mauna Kahālāwai (west Maui). The status of 86 other individuals at four other locations is unknown. Rodents are controlled at current and historic locations on Lāna‘i. Only two founders from Lāna‘i and two founders from Maui are represented in *ex situ* genetic storage collections .There are no current translocation efforts. Hybridization with *C. grayana* at Wai‘alalā on Lāna‘i is reported as a new threat to this species.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Lāna‘i Plant Cluster Recovery Plan (USFWS 1995) 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.

Cyrtandra munroi 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 a total of three populations of each subspecies should be documented on Lāna‘i and Maui where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings) with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. Fewer than 10 wild individuals remain on Lāna‘i and some of these individuals may be hybrids. Fourteen to 15 wild individuals are known on Mauna Kahālāwai; however, the number of individuals remaining at four other locations is unknown (Table 1). There are no populations totaling at least 50 reproducing individuals and no translocations are ongoing. All threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Cyrtandra munroi* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
Hybridization of *Cyrtandra munroi* with *C. grayana* on Lāna‘i is reported as a threat. No other new information regarding the species’ biological status has been reported since the last 5-year review in 2018. Thus, the following recommendations for future actions are added or reiterated for the 5-year review for 2023.

- Surveys and population monitoring—Continue to monitor the wild populations and survey for additional populations of *Cyrtandra munroi* in areas of potentially suitable habitat.

- Ungulate monitoring and control—Continue to construct and maintain exclosures to protect individuals from the negative impacts of feral ungulates.
- Invasive nonnative plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species within and around all populations of *C. munroi*.
- Climate change adaptation strategy—Research suitability of habitat for translocation of this species in the future due to the impacts of climate change.
- Predator and herbivore monitoring and control—
    - Implement effective control methods for rodents within the vicinity of all known populations of *C. munroi.*
    - Develop and implement effective control methods for slugs at all known populations of *C. munroi*.
- Captive propagation for genetic storage and translocation—
    - Continue collection of genetic resources for storage, propagation, and translocation to protected suitable habitat within historical range.
    - Evaluate genetic resources currently in storage to determine the need to place additional materials into long-term storage due to these subspecies' vulnerability to climate change.
- Translocation and augmentation—Continue to augment populations and reintroduce individuals into suitable habitat that is being managed for known threats to both subspecies.
- Build resiliency, redundancy, and representation—Begin translocation of individuals into suitable habitat that is being managed for known threats to this species to reduce impacts of landslides, flooding, and hybridization.
- Hybridization—Research the genetic composition of possible hybrid plants and determine the status of the populations and the need for separation of genetic resources.
- 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 taxon.

References:

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

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.

[Maui PEPP] Maui Plant Extinction Prevention Program. 2019. Monthly plant species monitoring report. Excel data table.

[NTBG] National Tropical Botanical Garden. 2018. NTBG database herbarium record detail for *Cyrtandra munroi*, PTBG 1000068135, Specimen ID 079839, West

Maui, slopes of Helu, on south slope Kauaula valley, 2-3 individuals. H. Oppenheimer, 18 OCT 2018.

[ORPF] 2023. 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] 2022. Plant Extinction Prevention Program fiscal year 2022 interim performance report (October 1, 2021-September 30, 2022), Cooperative Agreement F19AC00532 (Interim report), U.S. Fish and Wildlife Service CFDA Program #15.657 Endangered Species Conservation—Recovery Implementation Funds, University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program. 50 pp.

Pūlama Lāna‘i. 2021. Threatened and Endangered species report for Division of Forestry and Wildlife. Tab 2, population site monitoring, Tab 3, nursery accessions, Tab 4, individual plants and collections. Excel data table, 4 tabs.

Todesco, M., M.A. Pascual, G.L. Owens, K.L. Ostevik, B.T. Moyers, S. Hubner, S.M. Heredia, M.A. Hahn, C. Caseys, D.G. Bock, and L.H. Rieseberg. 2016. Hybridization and extinction. Evolutionary Applications 9: 892–908.

[USFWS] U.S. Fish and Wildlife Service 1995. Lanai plant cluster Recovery Plan. Portland. 136 pp. + appendices.

[USFWS] 2011. *Cyrtandra munroi* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/1761.pdf.*

[USFWS] 2018. *Cyrtandra munroi* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/2629.pdf*.

[USFWS] 2021. Endangered and Threatened wildlife and plants; initiation of 5-year status reviews for 77 Species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86(120): 33726–33728, June 25, 2021.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Cyrtandra munroi* (haʻiwale)

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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