Cyrtandra munroi
(haʻiwale)

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: *Cyrtandra munroi* / ha‘iwale

TABLE OF CONTENTS

5-YEAR REVIEW
***Cyrtandra munroi* (ha'iwale)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Endangered Species Program, Division of Recovery, Jesse D`Elia, (503) 231-2071

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (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 of the U.S. Fish and Wildlife Service (USFWS), beginning on March 16, 2009. The review was based on final critical habitat designations for *Cyrtandra munroi* and other species from the islands of Lanai and Maui (USFWS 2003a, b) as well as a review of current, available information. The National Tropical Botanical Garden provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Samuel Aruch, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Lead and the Assistant Field Supervisor for Endangered Species before submission to the Deputy Field Supervisor for approval.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2009. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 103 species in Hawaii. Federal Register 74(49):11130-11133.

1.3.2 Listing history

Original Listing
FR notice: [USFWS] U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; determination of threatened or endangered status for 15 plants from the island of Maui, Hawaii; final rule. Federal Register 57(95):20772-20788.
Date listed: May 15, 1992
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. 2003a. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, Hawaii; final rule. Federal Register 68(6):1220-1274.

USFWS. 2003b. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, Hawaii; final rule. Federal Register 68(93):25934-26165.

Critical habitat was not designated for *Cyrtandra munroi* on the island of Lanai (USFWS 2003a). Critical habitat was designated for *Cyrtandra munroi* in three units totaling 997 hectares (2,466 acres) on the island of Maui. This designation includes habitat on State and private lands (USFWS 2003b).

1.3.4 Review History:

Species status review [FY 2010 Recovery Data Call (September 2010)]: Improving

Recovery achieved:
1 (0-25%) (FY 2007 Recovery Data Call – most recent year reported)

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 Lanai plant cluster.
Date issued: September 29, 1995.
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 criteria?

__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 (Listing Factors A, C, D, and E) affecting this species is presented in section 2.3.2 and Table 2. Listing Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the Lanai plant cluster recovery plan (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Cyrtandra munroi* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced, weeding, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on islands where they now occur 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. There are three populations with less than 50 individuals each on Lanai and seven out of eight populations on Maui have less than 50 individuals. In addition, all threats are not being managed.

For downlisting, a total of five to seven populations of *Cyrtandra munroi* should be documented on islands where they now occur 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 *Cyrtandra munroi* should be documented on islands where they now occur 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

Cyrtandra munroi was originally listed as endangered in 1992 (USFWS 1992).

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

No new information.

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:

Cyrtandra munroi occurs on Lanai and West Maui. On Lanai, 20 individuals were seen in 2001 below Puu Alii, above Waiapaa at 863 meters (2,830 feet) elevation (Wood 2009). At Waiapaa Gulch, later in 2001, a few individuals were seen at 869 meters (2,850 feet) elevation (Perlman 2009). Hank Oppenheimer, Maui Nui Coordinator for the Plant Extinction Prevention Program, saw a single individual in each of the upper Hauola drainage basins in 2007 and in Honoumi Gulch (East Kunoa) in 2006 (Oppenheimer 2009).

A single individual was observed in Honolua Valley on West

Maui at about 549 meters (1,800 feet) elevation in 1998 (Oppenheimer 2009). In 2001, 50 mature individuals and 50 seedlings were observed on Maui at Makamakaole Gulch above Camp Maluhia at 372 meters (1,220 feet) elevation (National Tropical Botanical Garden 2009a; Wood 2009). In 2005, about 25 to 40 individuals were seen in a subgulch, and 10 individuals were seen in a second subgulch (Perlman 2009). In 2004, at Honokohau on West Maui, there were a few individuals flowering, on the north side of the stream at 573 meters (1,880 feet) elevation (Perlman 2009). In the Lahaina District of West Maui, in the Kahana Valley (Puu Kukui watershed area, property of Maui Land and Pineapple Company Inc.) over 100 scattered individuals were observed, as well as a small population in Kahana Iki Gulch with about 10 individuals in 1998 (Oppenheimer 2009). In the same area, less than 15 individuals were seen in a small gulch in 1999, the area was revisited in 2001, and only four individuals were reported (National Tropical Botanical Garden 2009c). Also in the Lahaina District, in a small tributary of Hahakea Stream, two individuals of *Cyrtandra munroi* were observed in 2000 (National Tropical Botanical Garden 2009c). In 2002, a single individual was seen at Haena Nui Gulch, in the Kapunakea Preserve in West Maui at 853 meters (2,800 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). During the same year, multiple individuals were seen in the same preserve at Hanakaoo Gulch at 884 to 960 meters (2,900 to 3,150 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). Oppenheimer observed several individuals above Haena Nui Gulch in 2005 (Oppenheimer 2009).

The current estimated census for *Cyrtandra munroi* is fewer than 100 individuals in at least 8 populations on Maui and 2 individuals in 2 populations on Lanai.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No new information

2.3.1.4 Taxonomic classification or changes in nomenclature:

No new information

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.):

See section 2.3.1.2 above.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

On Lanai, *Cyrtandra munroi* occurs at Puu Alii in *Metrosideros polymorpha* (ohia) – *Dicranopteris linearis* (uluhe) forest with *Boehmeria grandis* (akolea), *Carex meyenii* (no common name [NCN]), *Coprosma foliosa* (pilo), *Diplazium sandwichianum* (hoio), *Diospyros sandwicensis* (lama), *Dodonaea viscosa* (aalii), *Doodia kunthiana* (okupukupu), *Dubautia plantaginea* (naenae), *Freycinetia arborea* (ie ie), *Leptecophylla tameiameiae* (pukiawe), *Melicope molokaiensis* (alani), *M volcanica* (alani), *Microlepia strigosa* (palapalai), *Myrsine lanaiensis* (kolea), *Peperomia tetraphylla* (ala ala wai nui), *Perrottetia sandwicensis* (olomea), *Pipturus* sp. (mamake), *Pisonia* sp. (papala kepau), *Pittosporum confertiflorum* (hoawa), *Pouteria sandwicensis* (alaa), *Psychotria mariniana* (kopiko), *Osteomeles anthyllidifolia* (ulei), *Sadleria* sp. (amau), *Streblus pendulinus* (aiai), *Tetraplasandra hawaiiensis* (ohe), and *T. oahuensis* (ohe mauka) (National Tropical Botanical Garden 2009a; Perlman 2009; Wood 2009).

Cyrtandra munroi occurs on West Maui at Makamakaole Gulch, above Camp Maluhia, with *Alyxia stellata* (maile), *Antidesma platyphyllum* (hame), *Broussaisia arguta* (kanawao), *Charpentiera ovata* (papala), *Clermontia kakeana* (haha), *Dicranopteris linearis*, *Diplazium sandwichianum*, *Dodonaea viscosa*, *Freycinetia arborea*, *Ilex anomala* (kawau), *Kadua affinis* (manono), *K. acuminata* (au), *Metrosideros* sp., *Microsorum spectrum* (peahi), *Myrsine lessertiana*, *Pipturus argutus* (mamake), *Psychotria kaduana* (kopiko kea), *P. mariniana, Selaginella arbuscula* (lepe lepe a moa), and *Xylosma hawaiiense* (ae) (Perlman 2009; Wood 2009).

At Honokohau Gulch, West Maui, the habitat is mesic to wet transitional riparian *Metrosideros polymorpha* forest with

Cibotium sp. (hapuu), *Antidesma* sp., *Clermontia micrantha* (oha wai), *Cyanea lobata* (haha), *C. macrostegia* (haha), *C. scabra* (haha), *Cyrtandra filipes* (hahala), *C. grayi* (keokeo haiwale), *C. hashimotoi* (keokeo haiwale), *Dubautia scabra* (*naenae*), *Hesperomannia* sp., *Isachne* sp., *Labordia* sp. (kamakahala), *Melicope peduncularis* (alani), *Nothocestrum longifolium* (aiea), *Pipturus albidus*, *Psychotria mariniana*, *P. mauiensis* (opiko), *Touchardia latifolia* (olona), *Vandenboschia davallioides* (palai hihi), *Wikstroemia oahuensis* (akia), and *Xylosma hawaiiense* (National Tropical Botanical Garden 2009a; Oppenheimer 2009; Perlman 2009).

In Kahana Valley, West Maui, associated native species include *Metrosideros polymorpha* var. *glaberrima* (ohia), *Pipturus albidus*, *Boehmeria grandis*, *Cyrtandra grayi*, *Christella cyatheoides* (kikawaio), *Dryopteris sandwicensis* (NCN), and *Tectaria cicutaria* (button fern) (National Tropical Botanical Garden 2009c).

On the south side of Hahakea Stream, near the gulch bottom, on a steep shady slope, *Cyrtandra munroi* occurs with *Broussaisia arguta*, *Cheirodendron trigynum* subsp. *trigynum* (olapa), *Coprosma foliosa*, *Cyrtandra grayi*, *Dryopteris sandwicensis*, *Ilex anomala*, *Metrosideros polymorpha* var. *glaberrima*, *Perrottetia sandwicensis*, *Pipturus albidus*, and *Sadleria souleyetiana* (amau) (National Tropical Botanical Garden 2009c).

In the Kapunakea Preserve, *Cyrtandra munroi* occurs in mesic and wet native forest with *Metrosideros polymorpha*, *Touchardia latifolia*, *Cheirodendron trigynum*, *Perrottetia sandwicensis*, and *Cyrtandra grayi* (Hawaii Biodiversity and Mapping Program 2009).

2.3.1.7 Other:

No new information.

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:

Threats that modify habitat include feral axis deer (*Axis axis*) and mouflon sheep (*Ovis musimon*) on Lanai, and invasive introduced plants such as *Ageratina riparia* (spreading mist flower), *Cinnamomum camphora* (camphor tree), *Leptospermum scoparium* (tea tree), *Morella faya* (fire tree), *Psidium cattleianum* (strawberry guava), *Rubus rosifolius* (thimbleberry), and *Tibouchina herbacea* (glory bush) (National Tropical Botanical Garden 2009a; Oppenheimer 2009; Wood 2009).

Feral pigs (*Sus scrofa*) and landslides are a threat on West Maui, as are invasive introduced plants such as *Aleurites moluccana* (kukui), *Blechnum appendiculatum* (NCN), *Buddleia asiatica* (dog tail), *Clidemia hirta* (Koster's curse), *Cordyline fruticosa* (ti), *Ficus* sp. (banyan), *Lantana camara* (lantana), *Melinis minutiflora* (molasses grass), *Oplismenus hirtellus* (basketgrass), *Paspalum conjugatum* (Hilo grass), *Psidium cattleianum*, *P. guajava* (common guava), *Rubus argutus* (blackberry), *R. rosifolius*, *Schinus terebinthifolius* (Christmas berry), and *Tibouchina herbacea* (National Tropical Botanical Garden 2009a; Oppenheimer 2009; Perlman 2009; Wood 2009).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Not a threat.

2.3.2.3 Disease or predation:

On Maui, rats (*Rattus* spp.) and slugs (unidentified species) have been reported to consume the leaves and seeds of various *Cyrtandra* species (Perlman 2009).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

No new information.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

The introduced invasive plant species discussed in section 2.3.2.1 above are also a threat to *Cyrtandra munroi* because they compete with the species for water, light, and nutrients.

Climate change may also pose a threat to this species. However,

current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

Populations located in Honokohau Gulch, Honolua Valley, and Kahana Valley are within fenced areas that are intensively managed for ungulates (Maui Land and Pineapple Company Inc. 2010).

In 1997, Oppenheimer sent seeds and cuttings from Kahana Valley to Lyon Arboretum seed bank, currently there are 565 seeds in storage (Center for Conservation and Research Training Seed Laboratory 2009; Oppenheimer 2009). One hundred fifty plants are in cultivation at the National Tropical Botanical Garden Nursery (National Tropical Botanical Garden 2009b).

2.4 Synthesis

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Lanai plant cluster (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Cyrtandra munroi* is a short-lived perennial, and to be considered for stabilization, which is the first step in recovering the species, 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 islands where they now occur or occurred historically. For the species to be considered stable, each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stability goals have not been met. There are two populations with less than 50 individuals each on Lanai and only one out of the eight populations on Maui contain more than 50 individuals (Table 1) and all threats are not being managed (Table 2). Therefore, *Cyrtandra munroi* meets the definition of endangered as it remains in danger of extinction throughout its range.

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

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	<30	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1995 (recovery plan)	30+	0	All threats managed in all 3-5 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	<100	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2010 (5-year review)	<100	0	All threats managed in all 3 populations	Partially (Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No: < 100 individuals in 8 populations on Maui, only 1 with more than 50 individuals, and 2 individuals in 2 populations on Lanai

Table 2. Threats to *Cyrtandra munroi*.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – habitat modification and herbivory	A, D	Ongoing	Partially: plants located in Honokohau gulch, Honolua Valley, and Kahana Valley are within fenced areas that are intensively managed for ungulates
Rats – herbivory	C	Ongoing	No
Slugs - herbivory	C	Ongoing	No
Landslides	A, E	Ongoing	No
Invasive introduced plants	A, E	Ongoing	No
Climate change	A, E	Increasing	No
Small population size	A, E	Ongoing	Partially: seeds and propagules collected

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

- Monitor known populations and collect any available seeds.
- Maintain or build fences around existing populations to protect from the negative impacts of ungulates.
- Collect seeds and/or cuttings from each population for genetic storage and reintroduction.
- Control invasive introduced plant species around known populations.
- Control rats in the vicinity of these populations.
- Develop and implement methods to control slugs.
- Propagate to augment the existing populations.
- Establish additional populations within protected suitable habitat.
- Work with Hawaii Division of Forestry and Wildlife and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Cyrtandra munroi* (ha'iwale)

Pre-1996 DPS listing still considered a listable entity? N/A

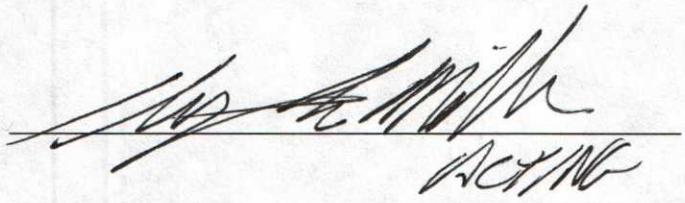
Recommendation resulting from the 5-year review:

_____ Delisting
_____ Reclassify from Endangered to Threatened status
_____ Reclassify from Threatened to Endangered status
__X__ No Change in listing status

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:
Chelsie Javar, Fish and Wildlife Biologist
Marie Bruegmann, Plant Recovery Coordinator
Jess Newton, Recovery Program Lead
Assistant Field Supervisor for Endangered Species

Field Supervisor, Pacific Islands Fish and Wildlife Office



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