

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyrtandra dentata* (Haiwale)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 69 species in Idaho, Washington, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 75(67):17947-17950.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Chelsie Javar, Fish and Wildlife Biologist, PIFWO

Marie Brueggemann, Plant Recovery Coordinator, PIFWO

Jess Newton, Recovery Program Leader, PIFWO

Assistant Field Supervisor for Endangered Species, PIFWO

Methodology used to complete this 5-year 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 April 8, 2010. The review was based on a review of current, available information since the last 5-year review for *Cyrtandra dentata* (USFWS 2007). Bernice Pauahi Bishop Museum 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 Chelsie Javar, Fish and Wildlife Biologist, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before submission to the Field Supervisor for approval.

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/tess_public).

Review Analysis:

Please refer to the previous 5-year review for *Cyrtandra dentata* published on August 2, 2007 (available at http://ecos.fws.gov/docs/five_year_review/doc1133.pdf) and the recovery plan for Oahu plants (USFWS 1998), for a complete review of the species' status, threats, and management efforts. No new threats or significant new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *C. dentata*.

This short-lived shrub is endangered and is endemic to the island of Oahu (USFWS 1998). The current status and trends for *Cyrtandra dentata* are provided in the tables below.

New taxonomic information:

There is widespread interspecific hybridization among natural populations of Hawaii *Cyrtandra* (Smith *et al.* 1996). Wagner *et al.* (1999) concluded that *Cyrtandra dentata* hybridizes with *Cyrtandra laxiflora*. The Natural Resource Specialists with the U.S. Army Makua program have had difficulty identifying *Cyrtandra* in the field to species level if the plants do not contain reproductive material (U.S. Army Garrison 2007).

New threats:

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 (PICCC) has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

New management actions:

- Ungulate exclosure:
 - In 2008, a large management unit fence was completed around most of the individuals of *Cyrtandra dentata* in the Kapuna and Keawapilau sections of the Pahole to Kapuna to West Makaleha population unit (U.S. Army Garrison 2008).
 - As of 2010, the Kahanahaiki population unit was fenced (U.S. Army Garrison 2010).
- Ungulate control –As of 2010, the Kahanahaiki population unit remained ungulate-free (U.S. Army Garrison 2010).
- Ecosystem-altering invasive plant species control – In 2010, weeds were controlled around individuals of *Cyrtandra dentata* in the Kahanahaiki and Pahole to West Makaleha population units (U.S. Army Garrison 2010).
- Predator / herbivore control – In 2010, rats (*Rattus* spp.) were controlled within the Kahanahaiki population unit (U.S. Army Garrison 2010).
- Threats research:
 - In 2010, slugs were not controlled around individuals of *Cyrtandra dentata* because the U.S. Army is awaiting the review of Sluggo[®] by the Hawaii Department of Agriculture to implement slug control in natural areas in the absence of endemic tree snail species (U.S. Army Garrison 2010).
 - In 2010, predation was observed on immature fruit of *Cyrtandra dentata* and motion-sensing cameras were deployed to further investigate the source of predation (U.S. Army Garrison 2010); the population unit was not specified.

- Captive propagation protocol development – The U.S. Army began seed bank studies in 2003 and two seed collections of *Cyrtandra dentata* have been tested after two years of storage. Results of the study suggested that *C. dentata* seeds can be stored dry at 4 degrees Celsius or -18 degrees Celsius for at least two years with no decrease in viability (U.S. Army Garrison 2006). As a result, seed collection efforts for *C. dentata* were increased in two of the population units containing this species.
- Captive propagation for genetic storage and reintroduction:
 - In 2010, there were 52,562 seeds of *Cyrtandra dentata* in storage at the Center for Conservation Research and Training Seed Storage Laboratory (2010).
 - In 2010, the Pahole Rare Plant Facility had five individuals of *Cyrtandra dentata* growing in their nursery (Pahole Rare Plant Facility 2010).
- Population viability monitoring:
 - In 2007, the Kawaiiki population unit was re-monitored for *Cyrtandra dentata* (U.S. Army Garrison 2007).
 - Staff of the U.S. Army Garrison developed protocols for more intensive monitoring of *Cyrtandra dentata* in the Kahanahaiki population unit. In June 2010, additional monitoring data collected included baseline stage class transition data from a subset of individuals within the Kahanahaiki population unit. In July 2010, a subset of 10 mature individuals of *C. dentata* was tagged. These individuals will be tracked for a year to determine the mean fecundity for a mature individual at the Kahanahaiki population unit. Monitoring results within the Kahanahaiki population unit showed a decline of mature individuals; however age-class definitions were modified from previous monitoring protocols and thus may have affected the monitoring results.
 - In 2010, only the Kahanahaiki and the Pahole to West Makaleha population units were monitored by staff of the U.S. Army Garrison (2010). The Pahole to West Makaleha population unit showed no change in the population of *Cyrtandra dentata*.
- Surveys / inventories:
 - In 2007, two new individuals of *Cyrtandra dentata* were discovered by a Natural Resource Specialist from the U.S. Army in Central Makaleha. These individuals fell outside any current population unit designation and extended the range of this taxon further east (U.S. Army Garrison 2007).
 - In 2007, the Kawaiiki population unit was surveyed for *Cyrtandra dentata* (U.S. Army Garrison 2007).

Synthesis:

In 2010, there were a total of 676 wild mature, 800 wild immature, and 277 seedling *Cyrtandra dentata* at the following locations: Kahanahaiki population unit had 65 mature and 142 immature individuals; Kawaiiki population unit had 15 mature, 31 immature, and 39 seedlings; Opaepala had 16 mature and 12 immature; Pahole to Kapuna to West

Makaleha had 577 mature, 615 immature, and 238 seedlings; and central Makaleha population unit had 3 mature individuals (U.S. Army Garrison 2010).

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for plants from the island of Oahu (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial.

Cyrtandra dentata is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on the island of Oahu. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have only been partially met, as currently there are only two populations containing 50 or more mature individuals within the Kahanahaiki and the Pahole to Kapuna to West Makaleha population units (Table 1) and all threats are only being partially managed throughout all of the populations (Table 2). Therefore, *Cyrtandra dentata* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Captive propagation for genetic storage and reintroduction:
 - Continue to collect seeds from tagged individuals, keeping close track of the maternal source for use in *ex situ* propagation.
 - Continue to collect seeds from all existing populations and send to at least two or three different venues for propagation.
- Reintroduction / translocation implementation – Reintroduce the species back into its known historical range.
- Ungulate exclosures:
 - Continue to construct fenced exclosures around existing and reintroduced populations to provide protection from feral ungulates.
 - Monitor fenced exclosures for evidence of breaching by feral ungulates.
- Ungulate control – Continue to protect all populations against disturbances from feral ungulates.
- Ecosystem-altering invasive plant species control – Continue to control invasive introduced plant species around all populations.
- Predator / herbivore control – Continue to implement effective control methods for rodents.
- Surveys / inventories – Continue to conduct thorough surveys of all suitable habitats where *Cyrtandra dentata* was historically seen.

- Threats research:
 - Continue to conduct studies to develop and implement control methods for slugs around all known populations.
 - Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.
- Fire protection – Develop and implement a fire management plan for all populations of *Cyrtandra dentata*.
- Population biology research – Study *Cyrtandra dentata* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Alliance and partnership development – Work with the U.S. Army, Hawaii Division of Forestry and Wildlife, and other land managers to continue planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

Table 1. Status *Cyrtandra dentata* from listing through current 5-year review.

Date	No. wild indivs	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (listing)	<50	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 (recovery plan)	<70	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	136	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2007 (5-yr review)	721	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2012 (5-yr review)	676	0	All threats managed in all 3 populations	Partially (see Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially

Table 2. Threats to *Cyrtandra dentata* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Degradation of habitat	A, D	Ongoing	Partially: The Kahanahaiki population unit is fenced and ungulate-free; Individuals within the Kapuna and Keawapilau sections of the Pahole to Kapuna to West Makaleha are fenced
Established ecosystem-altering invasive plant species	A	Ongoing	Partially: Weeds controlled at Kahanahaiki and Pahole to West Makaleha population units
Rodent predation or herbivory – Rats	C	Ongoing	Partially: Rats controlled only at Kahanahaiki
Slugs herbivory	C	Ongoing	No: Threats research using Sluggo®
Fire	E	Ongoing	No
Established invasive plant species competition	E	Ongoing	Partially: Weeds controlled at Kahanahaiki and Pahole to West Makaleha population units
Climate change	A, E	Increasing	No

References:

See previous 5-year review for a full list of references (USFWS 2007). Only references for new information are provided below.

Center for Conservation Research and Training Seed Storage Laboratory. 2010. Seed bank inventory. Honolulu, Hawaii. Microsoft Access database. Unpublished.

Harold L. Lyon Arboretum. 2010. Micropropagation database. Honolulu, Hawaii. Unpublished.

Pahole Rare Plant Facility. 2010. Controlled propagation report to U.S. Fish and Wildlife Service. Unpublished.

Smith, J.F., C.C. Burke and W.L. Wagner. 1996. Interspecific hybridization in natural populations of *Cyrtandra* (Gesneriaceae) on the Hawaiian Islands: evidence from RAPD markers. *Plant Systematics and Evolution* 200:61-77.

U.S. Army Garrison. 2006. 2006 status reports for the Makua implementation plan and the draft Oahu implementation plan. Schofield Barracks, Hawaii, U.S. Army

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- [USFWS] U. S. Fish and Wildlife Service. 1998. Recovery plan for Oahu plants. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pages + appendices. Available online at <<http://www.fws.gov/pacificislands/recoveryplans.html>>.
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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Cyrtandra dentata* (Haiwale)

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:

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