

Cyrtrandra limahuliensis
(hai wale)

**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: *Cyrtondra limahuliensis* (hai wale)

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5-YEAR REVIEW
***Cyrtandra limahuliensis* / hai wale**

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 April 29, 2008. The review was based on the final critical habitat designation for *Cyrtandra limahuliensis* and other species from the island of Kauai, as well as a review of current, available information (USFWS 2003). 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 Tamara Sherrill, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Assistant Field Supervisor for Endangered Species and Acting Deputy Field Supervisor before submission to the Field Supervisor for approval.

1.3 Background:

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

USFWS. 2008. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Montana, Oregon, Washington, and the Pacific Islands. Federal Register 73(83): 23264-23266.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1994. Endangered and threatened wildlife and plants; endangered or threatened status for 24 plants from the island of Kauai; final rule. Federal Register 59(38):9304-9329.

Date listed: February 25, 1994

Entity listed: Species

Classification: Threatened

Revised Listing, if applicable

FR notice: N/A

Date listed: N/A

Entity listed: N/A

Classification: N/A

1.3.3 Associated rule makings :

USFWS. 2003. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, Hawaii; final rule. Federal Register 68(39):9116-9479.

Critical habitat was designated for *Cyrtandra limahuliensis* in five units totaling 4,376 hectares (10,813 acres) on Kauai. These designations include habitat on State and private lands (USFWS 2003).

1.3.4 Review History:

Species status review [FY 2009 Recovery Data Call (August 2009)]:
Declining

Recovery achieved:

1 (0-25%) (FY 2007 Recovery Data Call – this is the last year this was reported)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

14

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Recovery plan for the Kauai plant cluster. U.S. Fish and Wildlife Service. Portland, Oregon. 270 pages.

Date issued: September 20, 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
 No

2.1.2 Is the species under review listed as a DPS?

Yes
 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
 No

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

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?

Yes

No

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

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 (Factors A, C, D, and E) affecting this species is presented in section 2.4. 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 recovery plan for the Kauai plant cluster (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Cyrtandra limahuliensis* is a short-lived perennial, that was listed as threatened. To be considered for delisting, a total of eight to ten populations of *Cyrtandra limahuliensis* 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

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section 1.3.3 ("Associated Rulemakings") and in section 2.4 ("Synthesis") below, which also includes any new information about the status and threats of the species.

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

| Date | No. wild individuals | No. outplanted | Delisting Criteria identified in | Delisting Criteria Completed? |
|-------------|-----------------------------|-----------------------|-----------------------------------------|--------------------------------------|
|-------------|-----------------------------|-----------------------|-----------------------------------------|--------------------------------------|

| | | | Recovery Plan | |
|-------------------------------|------------------|---------|------------------------------------------------------------------|-----------|
| 1994 (listing) | 2,800- 3,000 | 0 | All threats managed in all 8-10 populations | No |
| | | | Complete genetic storage | No |
| | | | 8-10 populations with 300 mature individuals each | No |
| | | | Naturally reproducing, stable, and increasing in number | Unknown |
| | | | Sustained for five years | Unknown |
| 1995 (recovery plan) | 10,000 | 0 | All threats managed in all 8-10 populations | No |
| | | | Complete genetic storage | Partially |
| | | | 8-10 populations with 300 mature individuals each | No |
| | | | Naturally reproducing, stable, and increasing in number | Unknown |
| | | | Sustained for five years | Unknown |
| 2003 (critical habitat) | 2,746 – 3,024 | Unknown | All threats managed in all 8-10 populations | No |
| | | | Complete genetic storage | No |
| | | | 8-10 populations with 300 mature individuals each | Unknown |
| | | | Naturally reproducing, stable, and increasing in number | Unknown |
| | | | Sustained for five years | Unknown |
| 2008 | many | 0 | All threats managed | No |

| | | | | |
|-----------------|-----------|--|---------------------------------------------------------|-----------|
| (5-year review) | thousands | | in all 8-10 populations | |
| | | | Complete genetic storage | Partially |
| | | | 8-10 populations with 300 mature individuals each | Unknown |
| | | | Naturally reproducing, stable, and increasing in number | Unknown |
| | | | Sustained for five years | Unknown |

2.3.1 Biology and Habitat

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

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:

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

2.3.1.4 Taxonomic classification or changes in nomenclature:

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.):

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

2.3.1.7 Other:

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:

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

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

Because of a taxonomic change, the species formerly called *Cyrtandra limahuliensis* is now considered *C. kealiae* subsp. *kealiae*, and the species formerly called *C. kealiae* is now known as *C. kealiae* subsp. *urceolata* (Wagner and Lorence 2000). Both species will be discussed here, in order to clarify the change in names and the locations of the subspecies, although only *C. kealiae* subsp. *kealiae* is listed as threatened.

Wagner and Lorence adopted the name *Cyrtandra kealiae* subsp. *kealiae* for the plants with a tubular, funnel shaped calyx, formerly known as *Cyrtandra limahuliensis*, but nomenclaturally should be correctly named *Cyrtandra kealiae* (Wagner 2000). Additional characteristics which distinguish this species from others of the genus *Cyrtandra* are that the leaves are usually hairy, especially on lower surfaces, the usually symmetrical calyx is tubular and encloses the fruit at maturity, and the flowers are borne singly (USFWS 2003). *Cyrtandra kealiae* subspecies *urceolata* is distinguished from *Cyrtandra kealiae* subsp. *kealiae* primarily by its urn shaped calyx which is slightly asymmetrical, and was formerly incorrectly called *C. kealiae* (Wagner 2000)

Cyrtandra comprises at least 600 species distributed throughout the floristic province of Malaysia, where many of the species are locally endemic. In Polynesia and Micronesia, it is present on most island groups. It is among the most successfully dispersing genera of the Pacific (Cronk *et al.* 2005). It has been called a “supertramp” genus; tramp species having high dispersability and supertramp species being adapted to conditions on small and remote islands, which they reach because of their extremely high dispersal abilities. Supertramp species have strong specialist adaptations to island ecologies and most become endemic to a single island (Cronk *et al.* 2005).

Because all oceanic Pacific island species of *Cyrtandra* form a well-defined group, they are believed to have resulted from a single initial colonization into the Pacific, possibly from the eastern rim of Southeast Asia via a northwest-to-southeast stepping stone migration (Cronk *et al.* 2005). The 58 Hawaiian species of *Cyrtandra*, which are morphologically different from each other, have been classified into six distinct sections, each of which was thought to represent a separate introduction event (except section *Apertae*), and one possible additional introduction in section *Crotonocalyces* for *C. kealiae*. This classification was based on shared morphological characteristics within each of these groups of species, because of their morphological similarities to non-Hawaiian species. However, data from a 2005 study implies a single colonization to the Hawaiian Islands, and suggests therefore that all Hawaiian species are descendants of a common ancestor (Cronk *et al.* 2005).

Relatively few hybrids in *Cyrtandra* have been reported, and it is only in the Hawaiian Islands, where different species grow together, that some species have been shown to hybridize. These interspecies hybridization events would have played a part in the adaptive radiation of *Cyrtandra* with implications for its conservation (Cronk *et al.* 2005).

When listed, the taxon now recognized as *Cyrtandra kealiae* subsp. *kealiae* was called *C. limahuliensis*, from the 1990 treatment of the genus. A similar species on Kauai was known as *Cyrtandra kealiae* (Wagner 1990, 1999). In 2000, this taxonomy was officially revised. Both species are now *C. kealiae*, and divided into two subspecies, *Cyrtandra kealiae* subsp. *kealiae*; and *C. subsp. urceolata* (Wagner and Lorence 2000). The type specimen of *C. kealiae* was collected from Kealia, within the range of *C. limahuliensis*, and studies show it is this taxon, leaving the taxon previously known as *C. kealiae* unnamed (Wagner and Herbst 2003). The study of many new collections made from 1990 to 2000, including a number of new localities, showed these two taxa to be more closely related and harder to distinguish than previously thought. Wagner and Lorence confirmed that they were the same species, and that the name *C. limahuliensis* was misapplied when two separate species were recognized in the 1990 treatment. In the 2000 revision, Wagner and Lorence adopted the name *Cyrtandra kealiae* for all plants with the tubular funnel form calyx. Seven other names of Kauai species previously described by Harold St. John were subsumed as synonyms for *C. kealiae*. The taxon with an urn shaped calyx, formerly named *C. kealiae*, they described as *C. kealiae* subsp. *urceolata* (Wagner and Lorence 2000).

Cyrtandra limahuliensis was the name for the species located from Limahuli to Anahola Valleys at 700 to 870 meters (2,297 to 2,854 feet), and at Wahiawa Stream and Mount Kahili. In the 2000 taxonomic revision this

taxon, occurring along streams and gulches, in stunted wet forest at 240 to 900 meters (787 to 2,953 feet) elevation, on the northern side of Kauai in Limahuli and Wailua Valleys, and to the Wahiawa Mountains on the southern side, became *Cyrtandra kealiae* subsp. *kealiae*. Therefore, this species will be referred to as *Cyrtandra kealiae* subsp. *kealiae* for the remainder of this review. It was observed in Hanakapiai in 1999 and Limahuli in 2006 (National Tropical Botanical Garden 2008). In 2003, USFWS reported a total of 13 populations, containing approximately 2,746 to 3,024 individuals on private and State lands. These locations included the Halelea, Kealia, and Lihue-Koloa Forest Reserves, Limahuli Falls, Lumahai Valley, Waipa Valley, Waioli Valley, Kekoiki, Makaleha, the right fork of Wainiha Valley, Kualapa, Blue Hole, Kepalaoa, and Puu Kolo (USFWS 2003).

Botanists from the National Tropical Botanical Garden have observed *Cyrtandra kealiae* subsp. *kealiae* scattered throughout upper Limahuli Valley. It also occurs in lower Limahuli; in Wainiha Valley, below Hinalele Falls; on north facing cliffs and forested slopes below Kekoiki in the back of Waioli Valley; in Waioli's upper east valley between Waiopa and Hihimanu; in Blue Hole at the base of Mt. Waialeale, on the north fork of Wailua River; and in the Iliiliula drainage, south of Kamanu and Kalalea (Tangalin 2008; Wood 2008). Numbers of individuals are difficult to ascertain, as they have not generally been reported for over fifteen years (Hawaii Biodiversity and Mapping Program 2008; National Tropical Botanical Garden 2008). One botanist from the National Tropical Botanical Garden, however, estimates that there are currently many thousands of scattered individuals on Kauai, but has not monitored exact numbers (Perlman 2008).

Cyrtandra kealiae subsp. *urceolata* is known historically from scattered localities in diverse mesic to wet forest, at 210 to 450 meters (689 to 1,476 feet) and rarely to 820 meters (2,690 feet) elevation, in the Wahiawa Mountains, from the northern end of the Hoary Head Mountains (Haupu) in the southeastern part of Kauai, westward in the Wahiawa Mountains, and to Hanapepe and Olokele Valleys (Wagner and Lorence 2000). It was observed in 2008 in Wailua, below Kamanu Ridge, in the headwaters of Waikoko, south of Wailua's north fork and above Wailua Ditch (National Tropical Botanical Garden 2008). Observations of the *C. kealiae* subsp. *urceolata* have been made by National Tropical Botanical Garden's botanists at Haupu, Wahiawa, Kamooloa headwater drainage below Kapalaoa, and Mt. Kahili, all on the southwestern side of Kauai (National Tropical Botanical Garden 2008, 2009).

Cyrtandra kealiae subsp. *kealiae* grows in a natural community of *Metrosideros polymorpha* (ohia) - *Dicranopteris linearis* (uluhe) wet forest.

Associated native species which may occur with it in various locations are *Antidesma platyphyllum* (hame), *Bidens sandvicensis* subsp. *sandvicensis* (kookoolau), *Bobea elatior* (ahakea), *Boehmeria grandis* (akolea), *Broussaisia arguta* (kanawao), *Chamaesyce remyi* (akoko), *Charpentiera elliptica* (papala), *Cibotium glaucum* (hapuu), *Cyanea remyi* (haha), *C. sylvestris* (haha), *Cyrtandra* sp. (hai wale), *Dubautia* sp. (naenae), *Elaeocarpus bifidus* (kalia), *Eugenia reinwardtiana* (nioi), *Freycinetia arborea* (ieie), *Gardenia remyi* (nani), *Gunnera kauaiensis* (ape ape), *Hesperomannia* sp. (no common name [NCN]), *Hibiscus waimeae* (kokio keokeo), *Ilex anomala* (kawau), *Joinvillea ascendens* (ohe), *Kadua affinis* (manono), *Labordia lydgatei* (kamakahala), *Machaerina angustifolia* (uki), *Melicope feddei* (alani), *M. paniculata* (alani), *Myrsine linearifolia* (kolea), *Perrottetia sandwicensis* (olomea), *Pipturus* sp. (mamake), *Pisonia* sp. (papala kepau), *Pittosporum kauaiensis* (hoawa), *Platydesma spathulata* (pilo kea), *Pritchardia* sp. (loulu), *Psychotria mariniana* (kopiko), *Syzygium sandwicense* (ohia ha), *Tetraplasandra oahuensis* (ohe mauka), *Touchardia latifolia* (olona), *Urera glabra* (opuhe), and *Wikstroemia oahuensis* (akia) (National Tropical Botanical Garden 2008; Perlman 2008; USFWS 2003).

Specific locations where *Cyrtandra kealiae* subsp. *kealiae* is located are scattered throughout Limahuli Valley, in the thick understory near streams and in darker side drainages. It occurs also in lower Limahuli (Tangalin 2008) in the upper east drainage between Pali Eleele and Hono O Na Pali. It occurs in wet forest in Wainiha Valley; very back below Hinalele falls with two other *Cyrtandra* species, *C. paludosa* (moa) and *C. cyaneoides* (mapele). Below Kekoiki on north facing cliffs and forested slopes it grows also in wet forest with *Anoectochilus sandvicensis* (jewel orchid), *Cyanea fissa*, *C. hirtella* (haha), *Cyrtandra heinrichii*, a newly discovered species of *Cyrtandra* (haha), *Sadleria squarrosa* (apuu), and *S. pallida* (amau). In the back of Waioli it occurs with some of the species listed above and with numerous ferns in the shrub layer. In Waioli Valley's east side it occurs between Waiopa and Hihimanu and is found with associated native species including *Bonamia menziesii* (NCN), *Cyrtandra pickeringii* (haiwale), *Isodendron longifolium* (aupaka), *Scaevola* sp. (naupaka), and *Lindsaea repens*. In Iliiliula drainage, south of Kamanu and Kalalea, additional species include *Kadua tryblium* (NCN), *Cyanea recta*, *C. remyi* (haha), *Cyrtandra oenobarba* (haiwale), and many ferns in areas of waterfalls with saturated basalt walls (National Tropical Botanical Garden 2008; Perlman 2008).

In Wahiawa, where the two subspecies may overlap, the habitat is *Metrosideros polymorpha* - *Dicranopteris linearis* lowland wet forest with *Antidesma platyphylla*, *Psychotria* sp. (kopiko), *Wikstroemia* sp. (akia), *Cyanea* sp. (haha), *Athyrium sandwichianum* (akolea), *Freycinetia arborea*,

Hesperomannia lydgatei (NCN), *Broussaisia arguta*, *Kadua* sp. (NCN), *Labordia* sp. (NCN), and *Syzygium* sp. (NCN) (National Tropical Botanical Garden 2008).

Where *Cyrtandra kealiae* subsp. *urceolata* occurs in Wailua the native habitat is *Metrosideros polymorpha* wet forest with wet cliff communities, associated with *Cheirodendron* sp., *Pipturus* sp., *Dubautia* sp., *Cyrtandra* sp., *Kadua centranthoides* (NCN), *K. elatior* (uiwi), *K. foggiana* (NCN), *Psychotria* sp., *Melicope* sp., *Machaerina* sp., *Isachne* sp. (ohe), and with ferns *Microlepia* sp. (palapalai), *Asplenium* sp., *Christella* sp. (kikawaio), *Deparia* sp. (NCN), and *Pneumatopteris* (hoio kula) (National Tropical Botanical Garden 2008).

The major threats to this species are habitat degradation by feral pigs (*Sus scrofa*) (Factor A) and landslides (Factor E). Competition from invasive introduced plant species (Factor E) is also a threat, and includes *Blechnum appendiculatum* (NCN), *Buddleia asiatica* (dog tail), *Christella parasitica* (NCN), *Clidemia hirta* (Koster's curse), *Cuphea carthagenensis* (tarweed), *Erechtites valerianifolia* (fireweed), *Deparia petersenii* (NCN), *Erechtites* sp. (fireweed), *Erigeron karvinskianus* (daisy fleabane), *Hedychium flavescens* (yellow ginger), *Lantana camara* (lantana), *Melastoma septemnerium* (NCN), *Musa* sp. (maia, banana), *Nephrolepis* (fish tail fern), *Paspalum conjugatum* (Hilo grass), *Psidium cattleianum* (strawberry guava), *Psidium guajava* (common guava), *Rubus rosifolius* (thimbleberry), *Spathodea campanulata* (African tulip tree), *Sphaeropteris cooperi* (Australian tree fern), and *Youngia japonica* (Oriental hawksbeard) (National Tropical Botanical Garden 2008; USFWS 2003). Climate change may also pose a threat to *Cyrtandra kealiae* subsp. *kealiae* (Factors A and E). However, current climate change models do not allow us to predict specifically what those effects, and their extent, would be for this species.

Seeds of *Cyrtandra kealiae* subsp. *kealiae* collected in 1991 and 1993 are held in long term storage at the National Tropical Botanical Garden (M. Clark, National Tropical Botanical Garden, pers. comm. 2008). There is no other known *ex situ* (at other than its original site, e.g., a nursery or arboretum) collections of this subspecies.

This species is subject to all the same threats to its habitat that other Hawaiian endangered species face. Little is still known about its life cycle and biology or about how to propagate it.

The delisting goals for this species have not been met, as current population information is too vague to assess whether there are eight to ten populations with at least 300 individuals in each population (see Table 1). In addition, all threats are not being managed. Therefore, *Cyrtandra kealiae* subsp.

kealiae meets the definition of threatened as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.3 Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist

Extinction

Recovery

Original data for classification in error

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

- Detailed surveys are needed to assess the current status of the species and the level of impacts from threats.
- Obtain adequate numbers of seeds to test storage viability.
- Propagate for augmentation and *ex situ* plantings.
- Update the listed entity on 50 CFR 17 to match the currently recognized taxonomy.

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Personal Communications

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Cyrtandra limahuliensis* / (hai wale)

Current Classification: _____ T _____

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

Marie Bruegmann, Plant Recovery Coordinator
Marilet A. Zablan, Assistant Field Supervisor for Endangered Species
Jeff Newman, Acting Deputy Field Supervisor

Approved


Field Supervisor, Pacific Islands Fish and Wildlife Office

Date **AUG 27 2010**