

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea humboldtiana* (haha)

Current Classification: Endangered

Federal Register Notice 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.

Lead Region/Field Office:

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

Name of Reviewer(s):

Marie Bruegmann, Plant Recovery Coordinator, PIFWO

Jess Newton, Recovery Program Lead, 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 March 16, 2010. The review was based on final critical habitat designation for *Cyanea humboldtiana* and other species from the island of Oahu (USFWS 2003), 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 Tamara Sherrill, 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 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).

Application of the 1996 Distinct Population Segment (DPS) Policy:

This Policy does not apply to plants.

Review Analysis:

Please refer to the final critical habitat designation for *Cyanea humboldtiana* published in the Federal Register on June 17, 2003 (USFWS 2003) for a complete review of the species' status (including biology and habitat), threats, and management efforts. No new threats and no 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. humboldtiana*.

Cyanea humboldtiana was listed as endangered in 1996 (USFWS 1996). *Cyanea humboldtiana* was known historically from 17 populations in the Koolau Mountains of Oahu, from the central portion to the southern end. By the time the recovery plan was written in 1998, three populations containing a total of 125 to 225 individuals were known (USFWS 1998). In 2003, when critical habitat was designated, between 133 and 239 individuals were known from 9 populations at Konahuanui summit, Moanalua Kaneohe summit, Wailupe summit, Poamoho Trail, Opaepala Gulch, Maakua Gulch, Kaluanui, and Lulumahu Gulch (USFWS 2003). Steve Perlman of the National Tropical Botanical Garden reports observing 11 populations, most of which were last seen in the 1980s (Perlman 2009). Three of those were seen in the 1990s; including one in the Manana Trail summit area, from Elaeao to Waimano Trail, which was seen in 1995 (Perlman 2009; Wood 2009). Only two populations were seen since then, in 2001: on the Hawaiiiloa Trail, several scattered individuals were seen at 652 to 664 meters (2,140 to 2,180 feet) elevation near the summit in Pia Gulch, and one individual was seen at 689 meters (2,260 feet) elevation at Puu Pauao from the Poamoho Trail summit area to the Peahinaia Trail summit. An additional population was reported at the Puu Kalena summit in 1992 (Perlman 2009; Wood 2009). Mashuri Waite from the Botany Department at University of Hawaii at Manoa reported seeing a few scattered individuals of *Cyanea humboldtiana* in Konahuanui in 2008 and 2009 (Mashuri Waite, University of Hawaii, pers. comm. 2009).

The U.S. Army Environmental staff reports the presence of *Cyanea humboldtiana* within four management areas in the Koolau Mountains (U.S. Army Garrison, Hawaii 2008). In the Poamoho management unit two individuals of *Cyanea humboldtiana* were seen by Joel Lau in 1999, one at 585 meters (1,920 feet) and one at 591 meters (1,940 feet) elevation. Two individuals were seen at Poamoho in 2002 (U. S. Army Environmental Center 2009). In 2000, a population of five individuals located at 671 to 792 meters (2,200 to 2,600 feet) elevation at the summit and headwaters of the south fork of Helemano Stream (U.S. Army Garrison, Hawaii 2008) were observed and a single individual was seen in 2006 (U.S. Army Environmental Center 2009). Another population occurs at the summit area above the North Fork of North Kaukonahua Stream (U.S. Army Garrison, Hawaii 2008).

In Helemano and Opaepala management unit *Cyanea humboldtiana* occurs at 732 to 823 meters (2,400 to 2,700 feet) elevation in the summit and headwaters of Helemano and Opaepala Streams (U.S. Army Garrison, Hawaii 2008).

In the Waiawa management unit *Cyanea humboldtiana* occurs at 549 to 831 meters (1,800 to 2,725 feet) elevation within the complex gulch and ridge system of the upper central Koolau Mountains. One individual was seen in Waiawa in 2003 (U.S. Army Environmental Center 2009).

In the Koloa management unit at 610 to 732 meters (2,000 to 2,400 feet) elevation observations have been made in 1997 (three individuals), 1999 (two individuals), 2005 (18 individuals), 2007 (two individuals), and in 2009 (two individuals) (U.S. Army Environmental Center 2009).

In addition, newer observations include a single mature individual in 2007 at Waiele Gulch near Kainapuaa; a single mature individual in 2008 at Waimano; and eight individuals at Opaepala Stream in 2007 (U.S. Army Environmental Center 2009; U.S. Army Garrison, Hawaii 2008). Observations in 2009 include a single mature plant located above Maunawili at about 732 meters (2,400 feet) elevation near Puu Lanipo. Another single mature individual was seen at about 732 meters (2,400 feet) elevation in Waialae Nui Gulch (Matt Keir, U.S. Army Garrison, pers. comm. 2009). Based on observations made since 2003, as of 2000, there are at least 22 individuals of *Cyanea humboldtiana* in scattered populations on Oahu, none of which contain more than 8 individuals. An additional population in the Moanalua-Kaneohe summit area contained 100 to 200 individuals in 1991 (USFWS 1998; Hawaii Biodiversity and Mapping Program 2010), but the current status of that population is unknown and has very likely declined to levels similar to other populations located on Oahu.

Cyanea humboldtiana is typically found in wet *Metrosideros polymorpha* (ohia) – *Dicranopteris linearis* (uluhe) lowland shrubland and wet forest. Associated native plant species are *Acacia koa* (koa), *Bobea elatior* (ahakea), *Broussaisia arguta* (kanawao), *Cheirodendron trigynum* (olapa), *Cibotium chamissoi* (hapuu), *Clermontia kakeana* (haha), *C. oblongifolia* (oha wai), *C. persicifolia* (oha wai), *Coprosma longifolia* (pilo), *Cyanea acuminata* (haha), *C. st.-johnii* (haha), *Cyrtandra cordifolia* (kanawao keokeo), *C. garnotiana* (hahala), *C. paludosa* (moa), *Diplazium sandwichianum* (hoio), *Dubautia laxa* (naenae pua melemele), *Gardenia mannii* (nanu), *Hibiscus arnottianus* var. *punaluuensis* (kokio keokeo), *Ilex anomala* (kawau), *Kadua affinis* (manono), *Labordia hedyosmifolia* (kamakahala), *L. hosakana* (kamakahala), *Lobelia oahuensis* (no common name [NCN]), *Machaerina angustifolia* (uki), *Melicope christophersenii* (alani), *Myrsine lessertiana* (kolea lau nui), *Phyllostegia grandiflora* (kapana), *Pipturus albidus* (mamake), *Pittosporum confertiflora* (hoawa), *Pouteria sandwicensis* (alaa), *Pritchardia martii* (loulou hiwa), *Psychotria mariniana* (kopiko), *Sadleria cyatheoides* (amau), *S. squarrosa* (apuu), *Scaevola mollis* (naupaka kuahiwi), *Syzygium sandwicensis* (ohia ha), *Tetraplasandra gymnocarpa* (ohe ohe), *T. oahuensis* (ohe mauka), *Trematolobelia singularis* (NCN), *Vaccinium* sp. (ohelo), *Viola oahuensis* (NCN), *Wikstroemia oahuensis* (akia), *Zanthoxylum oahuense* (ae), and various ferns (Perlman 2009; USFWS 2003; Wood 2009).

The major threats to *Cyanea humboldtiana* are habitat degradation by feral pigs (*Sus scrofa*) and competition with the invasive introduced plant species *Axonopus fissifolius* (narrow-leaved carpet grass), *Clidemia hirta* (Koster's curse), *Erigeron karvinskianus* (daisy fleabane), *Psidium cattleianum* (strawberry guava), *Pterolepis glomerata* (NCN), and *Rubus rosifolius* (thimbleberry), and reduced reproductive vigor due to the small number of remaining populations. The Konahuanui summit population is also threatened by trampling by hikers (USFWS 2003; Wood 2009).

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.

In addition to all of the other threats, species like *Cyanea humboldtiana* that are endemic to small portions of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes, landslides, flooding, and disease outbreaks. The extent of these natural processes on this single island endemic are exacerbated by anthropogenic threats, such as habitat loss for human development or predation by introduced species (USFWS 2010).

Propagules of *Cyanea humboldtiana* are in storage at Lyon Arboretum (Harold L. Lyon Arboretum 2009). There are no plants being cultivated or seed being stored for this species at any other facility. The species occurs in Helemano, an area being monitored and managed for threats such as ungulates and competition from introduced invasive plant species for several endangered plants by the U.S. Army (U.S. Army Garrison, Hawaii 2009).

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. *Cyanea humboldtiana* 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 not been met (Table 1), as no population has more than 50 mature individuals and all threats are not being managed (Table 2). Therefore, *Cyanea humboldtiana* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Survey to determine the current status of all wild and reintroduced populations.
- Implement seed collection for propagation and storage for all populations.
- Work with Hawaii Division of Forestry and Wildlife, U.S. Army Garrison, and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Develop a plan for conserving the species' genetic diversity in *ex situ* collections and in reintroduced populations.
- Control invasive introduced plant species around all populations.

- Fence all populations to provide protection against the negative impacts of feral ungulates.
- Continue reintroducing individuals into protected suitable habitat within historical range.
- Investigate techniques to improve natural recruitment.
- Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

References:

- Harold L. Lyon Arboretum. 2009. Micropropagation database report. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.
- Hawaii Biodiversity and Mapping Program. 2010. Records for *Cyanea humboldtiana* from program database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.
- Perlman, S. 2009. Notes on *Cyanea humboldtiana*. National Tropical Botanical Garden, Kalaheo, Hawaii. 6 pages. Unpublished.
- U.S. Army Environmental Center. 2009. *Cyanea humboldtiana* observation report 2. U.S. Army Garrison, Honolulu, Hawaii. One page. Unpublished.
- U.S. Army Garrison, Hawaii. 2008. Final implementation plan for Oahu training areas: Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawaihoa Training Area, Kahuku Training Area, and Dillingham Military Reservation. Directorate of Public Works Environmental Division, Schofield Barracks, Hawaii. 624 pages. Available online at http://www.botany.hawaii.edu/faculty/duffy/DPW/2008_OIP/2008_OIP2.pdf.
- U.S. Army Garrison, Hawaii. 2009. 2009 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 711 pages. Available online at <http://www.botany.hawaii.edu/faculty/duffy/DPW.htm>.
- [USFWS] U.S. Fish and Wildlife Service. 1996. Endangered and threatened wildlife and plants; determination of endangered status for twenty-five plant species from the island of Oahu, Hawaii; final rule. Federal Register 61(198):53089-53108.
- [USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for Oahu plants. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pages, plus appendices.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, Hawaii; final rule. Federal Register 68(116):35949-36406.

[USFWS] U.S. Fish and Wildlife Service. 2010. Maui Nui task force meeting notes. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 14 pages. Unpublished.

Wood, K.R. 2009. Notes on *Cyanea humboldtiana*. National Tropical Botanical Garden, Kalaheo, Hawaii. 2 pages. Unpublished.

Personal Communications

Keir, Matt. 2009. U.S. Army Garrison, Honolulu, Hawaii. E-mail to Margaret A. Clark, National Tropical Botanical Garden, dated November 19, 2009. Subject: *Cyanea humboldtiana*.

Waite, Mashuri. 2009. Ph.D. candidate student, University of Hawaii Botany Department, Honolulu, Hawaii. E-mail to Margaret Clark, National Tropical Botanical Garden, dated November 10 and 11, 2009. Subject: *Cyanea humboldtiana*.

Table 1. Status of *Cyanea humboldtiana* from listing through 5-year review.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 (listing)	100-220	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Unknown
1998 (recovery plan)	125-225	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	133-239	Unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Unknown
			3 populations with 50 mature individuals each	Unknown
2010 (5-year review)	22+	0	All threats managed in all 3 populations	Partially (Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

Table 2. Threats to *Cyanea humboldtiana* habitat.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – habitat modification and herbivory	A, D	Ongoing	Partially: only populations in Helemano are fenced and controlled for ungulates
Trampling by hikers	E	Ongoing	No
Small population size	E	Ongoing	Partially: propagules in storage
Invasive introduced plants	A, E	Ongoing	Partially: only populations in Helemano have weed control
Climate change	A, E	Increasing	No

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

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
- No Change in listing status

Field Supervisor, Pacific Islands Fish and Wildlife Office



Date 02/11