

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea acuminata* (haha)

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 58 species in Washington, Oregon, California, and Hawaii. Federal Register 75(226):71726-71729.

Lead Region/Field Office:

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

Name of Reviewer(s):

Chelsie Javar, Plant Biologist, PIFWO

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Recovery Program Lead, PIFWO

Kristi Young, Programmatic Deputy Field Supervisor, 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 January 31, 2012. The review was based on a review of current, available information since the last five-year review for *Cyanea acuminata* (haha) (USFWS 2009). The National Tropical Botanical Garden provided an initial draft of portions of the five-year review and recommendations for conservation actions needed prior to the next five-year review. The document was reviewed by the Plant Biologists, Islands Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

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 five-year review for *Cyanea acuminata* published on July 21, 2009 (available at http://ecos.fws.gov/docs/five_year_review/doc1123.pdf) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of *C. acuminata*.

This short-lived perennial shrub is endangered and occurs on Oahu. The current status and trends for *Cyanea acuminata* are provided in the tables below.

New status information:

- The total number of individuals in 2012 was 458, including all mature (291) and immature (167) individuals (M. Keir, Oahu Army Natural Resource Program [OANRP], pers. comm. 2012). This is a decrease from the 2011 total of 662 plants, 367 mature and 295 immature (U.S. Army Garrison 2011).
- Since the last 5-year review, National Tropical Botanical Garden (NTBG) staff visited two populations of *Cyanea acuminata* in the Koolau Mountains on Oahu. At Puu Pauao, at 701 meters (2,300 feet) elevation on east facing slopes in the back of Punaluu Valley, five individuals were observed south of the Poamoho Trail. Not all of the area was surveyed, and there are likely more individuals scattered in the area. The observed individuals had orange fruit, but no flowers were seen (Perlman 2011). Collections were not made as landowner permission had not been obtained (S. Perlman, NTBG, pers. comm. 2012).
- A second population was found growing along streams in the Kaluanui drainage, above Castle Trail at about 689 meters (2,260 feet) elevation. Twenty-five to 75 individuals were scattered in the area. Here flower buds were observed (Perlman 2011).
- OANRP staff reports a 24 percent increase at Kaala from 2008 to 2011, with no change in those years in two additional populations (U.S. Army Garrison 2011).
- Three new sites in Kaluanui were discovered fairly recently, one in 2009 and two in 2011, that contained a total of 271 individuals (113 mature and 108 immature individuals and 50 seedlings) (U.S. Army Garrison 2011).
- A new plant was observed in 2010 in the Koloa area, but was not seen again in 2011 (OANRP 2011).

The total number of mature and immature individuals is 458, of which 291 are mature (M. Keir, OANRP, pers. comm. 2012), approximately double the 215 to 245 individuals reported in the last five-year review, although only half of the newly reported number are mature.

New threats:

- Climate change - Climate change may 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) funded climate modeling that will help resolve these spatial limitations. High spatial resolution climate outputs are expected to be available sometime in 2013.
- Slug herbivory – Slugs were observed as a threat to the population in the Kaluanui drainage (Perlman 2011).

New management actions:

- Captive propagation for genetic storage and reintroduction

- Three populations have had some seed collected and stored, but the seed may have been immature (L. Weisenberger, OARNP, pers. comm. 2012).
- Three plants are growing in OARNP the nursery (L. Weisenberger, pers. comm. 2012).
- Ungulate exclosures
 - The OARNP's Kaala management unit on Oahu is strategically fenced with no ungulate sign since 2010. A fence line to extend the Waianae Kai section has been surveyed, and will be constructed when a formal agreement with State of Hawaii is signed (U.S. Army Garrison 2011).
 - Planning has begun to construct a fence to protect most of the known plants in the Makaleha to Mohiaka area (U.S. Army Garrison 2010).
- Invertebrate control research – Quantified research demonstrated significant invertebrate impact on survival of *Cyanea* species (Joe and Daehler 2008). State of Hawaii permitted use of the pesticide Sluggo, was obtained in 2012 allowing for control and eradication of slugs in natural areas. Prior to having the ability to use Sluggo in the State of Hawaii, existing slug control methods (e.g. traps baited with beer, copper barriers) were highly labor intensive and of limited efficacy (Joe 2011).
- Predator / herbivore control – Oahu Army Natural Resource Program staff is developing more effective methods for rat control (Mosher *et al.* 2010).

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Oahu plants (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Cyanea acuminata* is a short-lived perennial, and to be considered stable, 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 Oahu. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

For downlisting, a total of five to seven populations of *Cyanea acuminata* should be documented on Oahu. 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.

For delisting, a total of eight to ten populations of *Cyanea acuminata* should be documented on Oahu. 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.

One interim stabilization goal for this species has been met, as there are three populations that contain 50 or more mature individuals; however, downlisting goals have not been

met, as none of the populations have 300 or more mature individuals (Table 1). In addition, all threats are not being sufficiently managed throughout the populations (Table 2). Therefore, *Cyanea acuminata* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Surveys / inventories - Survey geographical and historical range and other potentially suitable habitat for a thorough current assessment of the species.
- Captive propagation for genetic storage and reintroduction – Continue collection of fruit and plant material for genetic storage.
- Population viability monitoring – Continue to monitor fruit development to determine stage of maturity for collection or whether fruits are aborting prematurely.
- Ungulate exclosures
 - Continue to protect plant populations from disturbance and herbivory from feral ungulates by controlling ungulate populations and maintaining strategic fences.
 - Continue to construct and maintain fenced exclosures to protect individuals from the adverse impacts of feral ungulates by excluding them from plant populations.
- Ecosystem-altering invasive plant species control – Control invasive introduced plant species within ungulate exclosures and maintain the exclosures free of introduced invasive plants.
- Predator / herbivore control
 - Continue to investigate and implement adequate rat control methods.
 - Continue to investigate and implement adequate slug control methods that will not impact native snails.
- Reintroduction / translocation– Augment current natural populations with appropriate genetic individuals.
- Genetic research – Assess genetic variability within extant populations.
- Population biology research – Study *Cyanea acuminata* 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 - Initiate planning and contribute to implementation of ecosystem-level management and restoration to benefit this species.

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

Date	No. wild individuals	No. outplanted	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria Completed?
1996 (listing)	<100	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Unknown
			5-7 populations with 300 mature individuals each	No
1998 (recovery plan)	<100	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2003 (critical habitat)	<200	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2008 (5-yr review)	215-245	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2013 (5-yr review)	458	0	All threats managed in all 5-7 populations	Partially (Table 2)
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No

Table 2. Status of threats to *Cyanea acuminata* (haha) and going conservation efforts

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – habitat modification and herbivory	A, C, D, E	Ongoing	Partially: Kaala management unit is fenced but not ungulate-free
Rats – herbivory	C	Ongoing	Partially: U.S. Army controlling rats
Slugs – herbivory	C	Ongoing	Unknown
Fire	A, E	Ongoing	No
Invasive introduced plants	A, E	Ongoing	Partially: weed control ongoing but not within the entire population range
Climate change	A, E	Increasing	No
Trampling and foot traffic from military activity	E	Ongoing	Partially

References:

See previous 5-year review for a full list of references (USFWS 2009). Only references for new information are provided below.

Joe, S.M., and C.C. Daehler. 2008. Invasive slugs as under-appreciated obstacles to rare plant restoration: evidence from the Hawaiian Islands. *Biological Invasions* 10(2):245-255.

Joe, S.M. 2011. Registration of Sluggo for rare plant restoration: an effective new tool for slug control. 2011 Hawaii Conservation Conference; island ecosystems: the year of the forest; abstract book. Available online at http://hawaiiconservation.org/files/content/activities/hawaii_conservation_conference/abstract_book_final_edited.pdf. Accessed 30 December 2011.

Mosher, Stephen M., J.L. Rohrer, V. Costello, M.D. Burt, M. Keir, J. Beachy, H.K. Kawelo and M. Mansker. 2010. Rat control for the protection of endangered birds, plants, and tree snails on the island of Oahu, Hawaii. Pages 14-17 in R.M. Timm and K.A. Fagerstone, (editors). *Proceedings of the 24th vertebrate pest conference*. University of California, Davis, California.

Perlman, S. 2011. *Cyanea acuminata*. National Tropical Botanical Garden, Kalaheo, Hawaii. 1 page. Unpublished.

Oahu Army Natural Resource Program. 2011. Population structure summary for *Cyanea acuminata*. 2 pages. Unpublished.

U.S. Army Garrison. 2010. Status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit.

Schofield Barracks, Hawaii. 588 pages. Available online at
<http://manoa.hawaii.edu/hpicesu/dpw_mit.htm>.

U.S. Army Garrison. 2011. Status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 269 pages. Available online at
<http://manoa.hawaii.edu/hpicesu/dpw_mit.htm>.

[USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. U.S. Fish and Wildlife Service, Portland, Oregon. 270 pages, plus appendices.

[USFWS] U.S. Fish and Wildlife Service. 2009. *Cyanea acuminata* (Haha) 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 10 pages. Available online at
<http://ecos.fws.gov/docs/five_year_review/doc2457.pdf>.

Personal communications:

Keir, Matt. 2012. Rare plant program manager, Oahu Army Natural Resource Program. E-mail to Margaret Clark, National Tropical Botanical Garden, dated January 5 and 28, 2012. Subject: *Cyanea acuminata* information.

Perlman, Steve. 2012. Research biologist, National Tropical Botanical Garden. E-mail to Margaret Clark, National Tropical Botanical Garden, dated January 4, 2012. Subject: *Cyanea acuminata*.

Weisenberger, Lauren. 2012. Seed bank manager, Oahu Army Natural Resource Program. E-mail to Margaret Clark, National Tropical Botanical Garden, dated January 3, 2012. Subject: Re: help?!*Cyanea acuminata* information.

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

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Date *2013-08-20*