

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea superba* (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 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 *Cyanea superba* (USFWS 2007a). 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 *Cyanea superba* published on August 2, 2007 (available at http://ecos.fws.gov/docs/five_year_review/doc1131.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 no new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *C. superba*.

This short-lived shrub is endangered and occurs only on the island of Oahu (USFWS 1998). *Cyanea superba* is comprised of two subspecies, *C. superba* subsp. *superba* of the

northern Waianae Mountains and *C. superba* subsp. *regina* of the southeastern Koolau Mountains (USFWS 2007a). Both subspecies are contained within the listed taxon, but *Cyanea superba* subsp. *regina* has not been observed since 1960 (USFWS 2007b). The current status and trends for *C. superba* are provided in the tables below.

New taxonomic information:

None reported.

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:
 - As of 2008, the Kahanahaiki and Pahole to Kapuna population units are fenced (U.S. Army Garrison 2008a).
 - In 2007, fencing of subunit I of the Makaha population unit was completed (U.S. Army Garrison 2009).
- Ungulate control:
 - Subunit I of the Makaha population unit has been ungulate-free since June 2007 (U.S. Army Garrison 2009).
 - In 2009, the Makaha population unit was declared ungulate-free (U.S. Army Garrison 2009).
- Ecosystem-altering invasive plant species control:
 - In the Pahole population unit and Upper Kapuna site, staff of Oahu Army Natural Resources controlled weeds around populations of *Cyanea superba* subsp. *superba* to assist in the natural recruitment of seedlings (U.S. Army Garrison 2010).
 - In 2009, weeds were controlled at the Kahanahaiki and Makaha population units around rare taxa and reintroduction sites (U.S. Army Garrison 2009).
- Threats monitoring and control – In 2010, staff of Oahu Army Natural Resources monitored rat (*Rattus* spp.) control efforts initiated to compare predation impacts of rats on fruit production of *Cyanea superba* subsp. *superba*, between a site with rat control (Kahanahaiki) and a site with no rat control (Pahole Natural Area Reserve). The results indicated that rat control significantly decreased rat predation on mature fruits of *C. superba* subsp. *superba* on more than 30 individuals at Kahanahaiki when

compared to Pahole population unit (U.S. Army Garrison 2010). Currently, rats are controlled locally around endangered tree snail areas but benefit individuals of *C. superba* subsp. *superba* during the flowering and fruiting season (U.S. Army Garrison 2010).

- Threats research – In 2009 to 2010, Sluggo[®] (under an Experimental Use Permit from the Hawaii State Department of Agriculture), a slug bait, was applied around naturally recruiting seedlings of *Cyanea superba* subsp. *superba* in the Kahanahaiki population unit to control slugs (U.S. Army Garrison 2009, 2010). In the 2009 to 2010 season, 36 individuals of *C. superba* subsp. *superba* produced fruits in the Kahanahaiki population unit (U.S. Army Garrison 2010). Slug control was stopped at all populations units, as the U.S. Army awaited the review of Sluggo[®] by State and Federal agencies for use in natural areas absent of endemic tree snail species (U.S. Army Garrison 2010).
- Population biology research:
 - With the combined fruiting events and localized slug control, the U.S. Army began a seedling survival study to compare survival rates of *Cyanea superba* subsp. *superba* seedlings based on high (once every two weeks) versus low (once a month) regimes of slug baiting. The results of this study should be available soon.
 - In 2008, a pollination biology study was conducted on *Cyanea superba* subsp. *superba* in the Kahanahaiki population unit by a graduate student at the University of Hawaii at Manoa (U.S. Army Garrison 2008a); this study is still ongoing (U.S. Army Garrison 2010).
- Captive propagation for genetic storage and reintroduction:
 - In 2008, genetic storage of the three original founders of *Cyanea superba* subsp. *superba* in the Kahanahaiki population unit was completed. The only remaining first-generation (F1) individual from the fourth original founder died before seed could be collected (U.S. Army Garrison 2008a).
 - In 2008, there were 140,530 seeds of *Cyanea superba* subsp. *superba* in storage at the U.S. Army Garrison seed laboratory (2008b).
 - In 2010, 66 containers of *Cyanea superba* subsp. *superba* were in micropropagation at the Harold L. Lyon Arboretum (2010).
 - In 2010, the Pahole Rare Plant Facility (2010) had a single individual growing in their nursery.
- Reintroduction / translocation site identification – The U.S. Army Garrison has identified the Central and East Makaleha population unit as a potential reintroduction site for *Cyanea superba* subsp. *superba*. Reintroductions will occur once the management unit fence is complete (U.S. Army Garrison 2010).
- Reintroduction / translocation implementation – In 2010, individuals of *Cyanea superba* subsp. *superba* were reintroduced at the Makaha, Kahanahaiki, and Pahole to

Kapuna population units (U.S. Army Garrison 2010); the exact number of individuals reintroduced was not provided.

- Population viability monitoring:
 - In 2009, more than 300 seedlings were observed around 8 individuals of *Cyanea superba* subsp. *superba* at the Kahanahaiki population unit (U.S. Army Garrison 2009). After the 2009 to 2010 fruiting season, naturally occurring seedlings of *C. superba* subsp. *superba* were observed around 18 of the 36 (50 percent) fruiting individuals at the Kahanahaiki population unit (U.S. Army Garrison 2010).
 - In 2010, four the individuals that produced mature fruit in the 2008 to 2009 fruiting season produced seedlings that are still extant within the Kahanahaiki population unit (86 seedlings) (U.S. Army Garrison 2010).
 - In 2009, more than 300 seedlings were observed under 2 individuals of *Cyanea superba* subsp. *superba* in the Pahole to Kapuna population unit (U.S. Army Garrison 2009). The following year, additional seedlings and immature individuals of *C. superba* subsp. *superba* were observed at the Pahole and Kapuna population units (U.S. Army Garrison 2010).

Synthesis:

As of 2010, there are still no individuals of *Cyanea superba* subsp. *regina* in the wild (USFWS 2010) and the last wild individual of *C. superba* subsp. *superba* was extirpated in 2002 (USFWS 2007a). As of 2010, there are 2 populations containing 169 mature reintroduced individuals of *C. superba* subsp. *superba* (U.S. Army Garrison 2010). At the Kahanahaiki population unit, there are 48 mature, 285 immature, and 67 reintroduced seedlings. At the Makaha population unit, there are 95 immature reintroduced individuals and 121 mature, 183 immature, and 9 reintroduced seedlings at Pahole to Kapuna population unit (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. *Cyanea superba* 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 only a single population of 50 or more mature individuals exists at the Pahole to Kapuna population unit (Table 1) and all threats are only being partially managed throughout all of the populations (Table 2). Therefore, *Cyanea superba* 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 – Continue to 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.
- Genetic research – Conduct research to develop a plan to maintain or increase genetic variability of *Cyanea superba* subsp. *superba*.
- Surveys / inventories:
 - Conduct surveys of appropriate habitat in historical locations to determine if any wild populations of *Cyanea superba* subsp. *regina* still exist.
 - Continue to conduct thorough surveys of all suitable habitats where *Cyanea superba* subsp. *superba* was historically seen.
- Threats research:
 - Continue to conduct research on the use of Sluggo[®] for control of nonnative 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 *Cyanea superba* subsp. *superba*.
- Alliance and partnership development – Work with the U.S. Army and other land managers to continue planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

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

Date	No. wild indivs	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1991 (listing)	<20	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 (recovery plan)	5	40	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	0	140	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2007 (5-year review)	0	109 (mature)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2012 (5-yr review)	0	169 (mature)	All threats managed in all 3 populations	Partially (see Table 2)
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	Partially

Table 2. Threats to *Cyanea superba* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Degradation of habitat	A, D	Ongoing	Partially: Kahanahaiki, Pahole to Kapuna, and Makaha population units are fenced and ungulate-free
Established ecosystem-altering invasive plant species	A	Ongoing	Partially: Weeds controlled at Kahanahaiki, Pahole to Kapuna, and Makaha population units
Rodent predation or herbivory – Rats	C	Ongoing	Partially: Rats controlled with bait stations at the Kahanahaiki population unit; Rat control study at Kahanahaiki and Pahole
Slug herbivory	C	Ongoing	Partially: Slug control research with Sluggo® at Kahanahaiki population unit
Established invasive plant species competition	E	Ongoing	Partially: Weeds controlled at Kahanahaiki, Pahole to Kapuna, and Makaha population units
Low numbers	E	Ongoing	Partially: Captive propagation for genetic storage and reintroduction, population biology research, and reintroduction / translocation implementation
Fire	E	Ongoing	No
Climate change	A, E	Increasing	No

References:

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

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

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Cyanea superba* (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
 X No Change in listing status

Appropriate Listing/Reclassification Priority Number, if applicable:

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