5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea glabra* (hāhā)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawaii, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewers:

Cheryl Phillipson, Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Gregory Koob, Conservation & Restoration Team Manager, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) beginning in August 2017. The review was based on a review of current, available information since the last 5-year review for *Cyanea glabra* (USFWS 2011). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Gregory Koob, Conservation and Restoration Team Manager.

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 glabra* published in the Federal Register on August 2, 2011 (available at *https://ecos.fws.gov/docs/five_year_review/doc3826.pdf*) for a complete review of the species' status, threats, and management efforts. We are not aware of any significant new information regarding the species' biological status since listing to warrant a change in the Federal listing status of *C. glabra*.

This short-lived perennial shrub in the Campanulaceae (bellflower) family is endangered and endemic to Maui. The current status and trends for *Cyanea glabra* are provided in the tables below.

New Status Information:

- In the 2011 5-year review, there were no known populations of *Cyanea glabra* on Maui because of uncertain taxonomic identity of some individuals. Since that time, plants from west Maui previously identified as *C. glabra* were studied closely and were found to represent a new species, which was then described as *C. kauaulaensis* (Oppenheimer and Lorence 2012). Plants on east Maui at Kīpahulu and Kaʻāpahu are now recognized as *C. maritae* (Lammers 2004). In 2007, a new population of *C. glabra* was found on east Maui along West Wailua Iki stream, consisting of "100s" of individuals (Oppenheimer 2018, in litt.). Currently, this population is estimated to total about 300 individuals (Oppenheimer 2018, in litt.).
- In 2016, 16 critical habitat units were designated in four ecosystems on both east and west Maui for *Cyanea glabra*; however, since that time it has been determined that those plants on west Maui are actually *C. kauaulaensis*, and those plants on east Maui at Kaʻāpahu and Kīpahulu are *C. maritae*. We will reevaluate critical habitat for *C. glabra* in a future rule. In summary, there are five units in one ecosystem (montane wet) on east Maui for *C. glabra* (21,142 ac, 8,556 ha) (81 FR 17790, March 30, 2016).

New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this species. Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi using high resolution climate change projections. Climate change vulnerability is defined as the relative inability of a species to display the possible responses necessary for persistence under climate change. The assessment by Fortini *et al.* (2013) concluded that *Cyanea glabra* is vulnerable to the impacts of climate change, with a vulnerability score of 0.504 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions are needed to conserve this taxon into the future.

New Management Actions:

- Ungulate monitoring and control—In 1996, the East Maui Watershed Partnership proposed a fencing strategy to protect forest on the east Maui slope between Hanawī NAR and the Koʻolau Gap to TNC's Waikamoi Preserve (TNC 2014). Funding was provided, and the fence was completed in 2006. Currently, the only known individuals of *Cyanea glabra* are within this fenced area; however, it has been reported that habitat destruction and predation by feral pigs are still threats to this species until all feral animals are removed (Oppenheimer 2018, in litt.).
- Captive propagation for genetic storage and reintroduction—
    - The Plant Extinction Prevention Program (PEPP) has collected from 10 of the 300 founders (just over three percent) at the only known population of *Cyanea glabra* (PEPP 2017).
    - The Olinda Rare Plant Facility (ORPF) reported a total of 15 plants in storage since 2015 (ORPF 2015, 2018).

- Stochastic events—Build resiliency and redundancy—One individual of *Cyanea glabra* was reintroduced at West Wailua Iki (PEPP 2017). Just over three percent of the 300 founders are represented in collections.

Synthesis:
Surveys and research conducted since completion of the last 5-year review for this species confirm a new population of *Cyanea glabra* at West Wailua Iki stream, and that all other populations that were previously questioned as *C. glabra* are indeed other species. A landscape-based assessment of climate change vulnerability for native plants of Hawai‘i using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *Cyanea glabra* is vulnerable to the effects of climate change, in that there will be a smaller area of suitable habitat available for the species in the near future. Only three percent of the known plants are represented in collections. Seed collections, propagation, and outplanting efforts are ongoing.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Addendum to the Recovery Plan for the Multi-island Plants (USFWS 2002), and have been updated according to the draft revised recovery objective guidelines developed by the Hawai‘i and Pacific Plants Recovery Coordinating Committee (HPPRCC 2011). The HPPRCC identifies an additional initial objective, the Preventing Extinction Stage, in addition to the Interim Stabilization, Delisting, and Downlisting objectives. Furthermore, life history traits such as breeding system, population size fluctuation or decline, and reproduction type (sexual or vegetative), have been included in the calculation of goals for the number of populations and reproducing individuals for each stage. The goals for each stage remain grouped by life span defined as annual, short-lived perennial (fewer than 10 years), or long-lived perennial.

Cyanea glabra is a short-lived perennial shrub. To prevent extinction, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and have 50 individuals (or the total number of individuals if fewer than 50 exist) from each of three populations represented in *ex situ* (secured off-site, such as in a nursery or seed bank) collections. In addition, a minimum of three populations should be documented on Maui where it now occurs or occurred historically. Each of these populations must be naturally reproducing (*i.e.*, viable seeds, seedlings, saplings) and increasing in number, with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met as there is only one population of 300 individuals and it is unknown how many are mature and reproducing, genetic representation is incomplete (Table 1), and all threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Cyanea glabra* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
We are not aware of any new threats or significant new information regarding the species' biological status since the last 5-year review in 2011. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2018.

- Surveys and inventories—Survey for additional populations of *Cyanea glabra* in areas of potentially suitable habitat.
- Ungulate monitoring and control—Continue to construct and maintain fenced exclosures to protect individuals from the negative impacts of feral ungulates. Protect all occurrences against browsing and habitat disturbances from feral ungulates to prevent imminent extinction.
- Invasive plant monitoring and control—
    - Control established ecosystem-altering nonnative invasive plant species around all populations.
    - Control invasive nonnative species that compete with the species around all populations.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species.
- Predator and herbivore monitoring and control—
    - Implement effective control methods for rodents at the last known location.
    - Develop and implement effective control methods for slugs.
    - Develop and implement effective control methods for the two-spotted leaf hopper.
- Stochastic events—Build resiliency and redundancy—Increase numbers of populations and individuals scattered through historic range to reduce impacts from landslides and flooding.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for recovery of the species.
- Alliance and partnership development—Continue to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1999 (listing)	235	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
2002 (recovery plan)	12	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	12	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
2011 (5-year review)	0	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
2016 (critical habitat)	200+	0	All threats managed in all three populations	No
			Complete genetic storage	No

			Three populations with 50 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2018 (5-year review)	ca 300	1	All threats managed in all three populations	No
			Complete genetic storage	Partially, 3 percent
			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	No
			Three populations with 50 mature individuals each	No, only one population

* The Preventing Extinction Stage was established in 2011. Prior to 2011, the Interim Stabilization Stage was the first stage towards recovery (now it is the second after Preventing Extinction).

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, exclosure fence constructed
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	None
Landslides and flooding destruction or degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	Partial, exclosure fence constructed
Rodent predation or herbivory	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Stochastic events—Reduced viability due to low numbers	E	Ongoing	Partial, seed storage, propagation, and reintroduction efforts are ongoing

References:

See the previous 5-year review for a full list of references (USFWS 2011). Only references for new information are provided below.

Fortini, L., J. Price, J. Jacobi, A. Vorsino, J. Burgett, K. Brinck, F. Amidon, S. Miller, S. Gon II, G. Koob, and E. Paxton. 2013. A landscape-based assessment of climate change vulnerability for all native Hawaiian plants. Technical report HCSU-044. Hawai‘i Cooperative Studies Unit, University of Hawai‘i at Hilo, Hawai‘i. 134 pp.

[HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.

Lammers, T.G. 2004. Five new species of the endemic Hawaiian genus *Cyanea* (Campanulaceae: Lobelioideae). Novon 14: 84–101.

[ORPF] Olinda Rare Plant Facility. 2015. Controlled propagation report.

[ORPF] 2018. Controlled propagation report.

Oppenheimer, H. and D.H. Lorence. 2012. A new species of *Cyanea* (Campanulaceae, Lobelioideae) from Maui, Hawaiian Islands. PhytoKeys 13: 15–23.

Oppenheimer, H. 2018, in litt., GIS data and population information for *Cyanea glabra*.

[PEPP] Plant Extinction Prevention Program. 2017. Statewide species totals *ex situ*, Excel table.

[TNC] The Nature Conservancy. 2014. Waikamoi Preserve East Maui Irrigation (EMI) addition, east Maui, Hawai‘i, long-range management plan, fiscal years 2015-2020. The Nature Conservancy, Maui Program. 29 pp.

[USFWS] U.S. Fish and Wildlife Service. 2011. *Cyanea glabra* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc3826.pdf.*

[USFWS] 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawaii, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573, February 12, 2016.

[USFWS] 2016. Endangered and threatened wildlife and plants; designation and nondesignation of critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; final rule. Federal Register 81 (61): 17790–18110, March 30, 2016.

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

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

For **Field Supervisor, Pacific Islands Fish and Wildlife Office**

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