5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea stictophylla* (hāhā)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. Federal Register 88(83): 20088–20092, May 7, 2018.

Lead Region/Field Office:

Interior Region 12/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer:

Cheryl Phillipson, Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Megan Laut, 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 (Service) beginning in October 2019. The review was based on a review of current, available information since the last 5-year review for *Cyanea stictophylla* (USFWS 2012). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, 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 stictophylla* published in the Federal Register on August 28, 2012 (available at *https://ecos.fws.gov/docs/five_year_review/doc4086.pdf*) for a complete review of the species' status, threats, management efforts, and references cited. 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. stictophylla*.

This short-lived perennial shrub or tree in the Campanulaceae (bellflower) family is endangered. The status and trends for *Cyanea stictophylla* are provided in the tables below.

New Status Information:

- Currently, there are 29 mature and six immature wild individuals at five locations on the island of Hawai‘i (PEPP 2019).

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 Hawai‘i 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. This assessment concluded that *Cyanea stictophylla* is vulnerable to the impacts of climate change, with a vulnerability score of 0.0543 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon, such as identifying key microsites for outplanting efforts.

New Management Actions:

- Surveys and inventories—The Plant Extinction Prevention Program (PEPP) surveys for known and new populations of *Cyanea stictophylla* (PEPP 2013, 2014, 2015, 2016, 2017).
- Ungulate monitoring and control—PEPP constructs fencing and retrofits fencing to prevent habitat destruction by feral ungulates such as cattle, deer, sheep, and feral pigs. Newly fenced individuals and populations of *C. stictophylla* include those at Kukuiopa‘e, Ka‘ohe, and ‘Ōlelomoana (PEPP 2014, 2015, 2016, 2017, 2018).
- Captive propagation for genetic storage and reintroduction—
    - The Lyon Arboretum Micropropagation Laboratory reports propagation of 30 explants representing one individual from Kūlani, and 109 explants representing two individuals at Pu‘uwa‘awa‘a Forest Bird Sanctuary (Lyon Arboretum 2019). The Lyon Arboretum Seed Laboratory reports collection and storage of 54,557 seeds representing 13 individuals from three populations (Pu‘uwa‘awa‘a, ‘Ōlelomoana, and Ka‘ohe) (Lyon Arboretum 2019).
    - Hawaii Volcanoes National Park (HAVO) reports propagation of eight plants in refugia and storage of 41,500 seeds (representing one plant from Pali o Ka‘eo) (HAVO 2019).
    - The National Tropical Botanical Garden (NTBG) reports storage of 215 seeds representing two individuals from Kukuiopa‘e (NTBG 2019).
    - The Volcano Rare Plant Facility (VRPF) reports 16 plants in their living collection representing one individual from Kahuku pit crater, one individual from Ka‘ohe, three individuals from South Kona, four individuals from Kukuiopa‘e-Kīpāhoehoe, one individual from Kūlani, and two individuals from ‘Ōlelomoana (VRPF 2019).
- Reintroduction and translocation—
    - The VRPF reports propagation of 63 plants representing three individuals at Ka‘ohe (31 sent out for planting at Kīpāhoehoe, Kahuku, and

Kukuiopa‘e); 31 plants representing seven individuals from Kukuiopa‘e-Kīpāhoehoe (115 propagated and sent out for planting at Kīpāhoehoe and Kahuku); nine plants representing one individual at Kūlani (sent out for planting at Kūlani); and 34 plants representing three individuals at Pu‘uwa‘awa‘a (326 propagated and sent out for planting at Pu‘uwa‘awa‘a) (VRPF 2019). Since 2013, over 2,400 individuals propagated at VRPF have been reintroduced to Kīpāhoehoe, Kahuku, Kūlani, Pu‘uwa‘awa‘a and Kukuiopa‘e.

- HAVO reports reintroduction (to Kahuku East) of 48 plants representing 1 individuals at Kipāhoehoe, eight plants representing 1 individuals from Ka‘ohe, one plant representing one individual from Kukuiopa‘e, and six plants representing one individual from South Kona (HAVO 2019).
- PEPP reports planting of 10 individuals at ‘Ōlelomoana (currently eight to 13 individuals survive); planting of more than 500 individuals at Kukuiopa‘e (362 individuals survive); planting of 65 individuals at Kīpāhoehoe; planting of 20 individuals at Ka‘ohe, planting of 130 individuals at Kahuku East; planting of 111 individuals at Pu‘uwa‘awa‘a; planting of 151 individuals at five sites in Papa (PEPP 2015, 2016, 2017, 2019). The plantings at Keauhou Lower (ca 100) were last observed in 2016. Some of these plantings may be duplicative with those propagated and reported for planting by VRPF.

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1994 (listing)	15	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1996 (recovery plan)	<20	46	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

2003 (critical habitat)	10	106	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2012 (5-year review)	45	>1,000	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2020 (5-year review)	29 mature 6 immature	Unknown (>2,400 planted; at least 100s survive)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			Reproduction (i.e. viable seeds, seedlings) at all 3 populations	No
			3 populations with 50 mature individuals each	No, mostly immature, no recruitment

* 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 stage after Preventing Extinction).

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts

Ungulate degradation of habitat	A	Ongoing	Partial, 3 wild and 8 reintroduced populations fenced
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, nonnative plant control at fenced populations
Destruction by treefall	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	Partial, 3 wild and 8 reintroduced populations fenced
Rodent predation or herbivory	C	Ongoing	None
Lack of adequate hunting regulations	D	Ongoing	Partial, 3 wild populations and 8 reintroduced populations fenced
Reduced viability due to low numbers	E	Ongoing	Partial, seed and cuttings collection, propagation, and reintroduction

Synthesis:
Currently there are 29 mature and six immature wild individuals of *Cyanea stictophylla* on the island of Hawai‘i. 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 *C. stictophylla* is vulnerable to the effects of climate change. Three wild and eight planted populations of *C. stictophylla* are provided protection from feral ungulates by fencing. Seed collection, propagation, and reintroduction are ongoing. Over 2,000 individuals have been planted at nine locations since the last 5-year review; however, most of these plants are immature, survivorship is largely unknown at several sites, and there is no natural recruitment observed.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Big Island Plant Cluster (USFWS 1996), 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 stictophylla is a short-lived perennial shrub or tree. To prevent extinction, which is the first milestone 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 a nursery or seed bank) collections. In addition, a minimum of three populations should be documented on the island of Hawai‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings, saplings), with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are no wild population (or regeneration from reintroductions) with 50 mature individuals (Table 1). Genetic storage is complete (Table 1), but all threats are not being managed (Table 1, Table 2). Therefore, *Cyanea stictophylla* 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 other significant new information regarding the species' biological status since the last 5-year review in 2012. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—Continue to survey suitable habitat and historical range for a thorough assessment of the species' status.
- Ungulate monitoring and control—Continue to maintain existing fences and fence remaining populations to protect individuals from the negative impacts of feral ungulates.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species and those that compete with *C. stictophylla* at all populations.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species to determine future landscape needed for its recovery.
- Predator and herbivore monitoring and control—Implement effective control methods for rodents.
- Captive propagation for genetic storage and reintroduction—
    - Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
    - Maximize the number of individuals from which seed and cuttings are collected to maintain and improve genetic variation of collections.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to build resiliency and redundancy.
- Population biology research—Carry our field studies to determine pollinators and seed dispersal mechanisms of *C. stictophylla*.
- Genetic research—Use genetic analysis techniques to determine overall levels of diversity of stored and propagated material.

- Treefall—Develop and implement effective measures to prevent damage to *C. stictophylla* from treefall at Hakalau Forest NWR-Kona Forest Unit.
- Alliance and partnership development—Continue to work with the Hawai‘i Division of Forestry and Wildlife and other partners and land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

References:

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. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 134 pp.

[HAVO] Hawai‘i Volcanoes National Park. 2019. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

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

Lyon Arboretum. 2019. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

[NTBG] National Tropical Botanical Garden. 2019. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

[PEPP] Plant Extinction Prevention Program. 2013. PEPP annual report fiscal year 2013 (July 1, 2012-June 30, 2013). 207 pp.

[PEPP] 2014. PEPP annual report fiscal year 2014 (July 1, 2013-June 30, 2014). 185 pp.

[PEPP] 2015. PEPP annual report fiscal year 2015 (July 1, 2014-June 30, 2015). 179 pp.

[PEPP] 2016. Plant Extinction Prevention Program FY 2016 Annual Report (Oct 1, 2015-Sep 30, 2016), US FWS CFDA Program #15.657; Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F14AC00174, December 24, 2016, UH Manoa, PCSU, PEPP. 237 pp.

[PEPP] 2017. Plant Extinction Prevention Program FY 2017 annual report (Oct 1, 2016-Sep 30, 2017), US FWS CFDA program #15.657; Endangered species

conservation-recovery implementation funds, Cooperative Agreement F14AC00174, December 12, 2017, UH Manoa, PCSU, PEPP. 235 pp.

[PEPP] 2018. Plant Extinction Prevention Program, fiscal year 2018 interim performance report, (October 1, 2017 - September 30, 2018), Cooperative Agreement: F18AC00502, 49 pp.

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[USFWS] U.S. Fish and Wildlife Service. 2012. *Cyanea stictophylla* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc4086.pdf.*

[USFWS] 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. 88 FR 20088, May 7, 2018.

[VRPF] 2019. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

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