5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea hamatiflora* subsp. *hamatiflora* (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 hamatiflora* subsp. *hamatiflora* (USFWS 2014). 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 reviews for *Cyanea hamatiflora* subsp. *hamatiflora* published in the Federal Register on July 21, 2009 and March 14, 2014 (available at *http://ecos.fws.gov/docs/five_year_review/doc2461.pdf* and *https://ecos.fws.gov/docs/five_year_review/doc4388.pdf*) for a complete review of the subspecies' status, threats, and management efforts. We are not aware of any significant new information regarding the subspecies' biological status since listing to warrant a change in the Federal listing status of *C. hamatiflora* subsp. *hamatiflora*.

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

New Status Information:

- In the last 5-year review for *Cyanea hamatiflora* subsp. *hamatiflora* in 2014, there were between 458 and 558 individuals at three general locations (Kīpahulu, Koʻolau Forest Reserve (FR), and lower Hanawī on east Maui. Currently, populations remain on private lands near and inside the Koʻolau Forest Reserve (west of upper Waiokamilo stream, West Wailua Nui stream, West Wailua Iki stream) as well as in Hanawī Natural Area Reserve (NAR), and in Haleakalā National Park (NP). There are an estimated 300 individuals in the Park (Robertson 2016, in litt.). New populations have been discovered in and near the Koʻolau FR at Waikamoi stream (1 individual), Honomanū stream (3 individuals), upper and lower Haipuaʻena stream (4 to 10 individuals), the cliff area of upper Keʻanae (2 individuals); and at three locations in Kīpahulu Valley in Haleakalā NP (39 to 42 individuals) (Oppenheimer 2018, in litt.). In summary, these populations total fewer than 400 individuals on windward east Maui.
- In 2016, seven critical habitat units were designated for *Cyanea hamatiflora* subsp. *hamatiflora* in three ecosystems (lowland wet, montane wet, and montane mesic) on east Maui (48,193 ac, 23,923 ha) (81 FR 17790, March 30, 2016).

New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this subspecies. 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 hamatiflora* is vulnerable to the impacts of climate change, with a vulnerability score of 0.378 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Additional management actions may be needed to conserve this taxon into the future.
- Invasive species—Established invasive plant species competition—When a Hawaiian koa moth (*Scotorythra paludicola*) infested Haleakalā NP lands, it caused vast defoliations of the native tree and major forest component, *Acacia koa*, its host plant. In turn, a nonnative invasive plant, *Clidemia hirta* (Koster's curse), already present in the Park, quickly occupied newly opened areas when the koa canopy was removed. This nonnative plant formed a dense understory where more than half of the known *Cyanea hamatiflora* subsp. *hamatiflora* occur. Because of this invasion, access to monitor these populations is difficult, and it is unknown what effect the rapid increase in *Clidemia* is having on the native flora, including *C. hamatiflora* subsp. *hamatiflora* (Robertson 2016, in litt.).

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, approximately 50 individuals of *Cyanea hamatiflora* subsp. *hamatiflora* are

within this fenced area; however, habitat destruction and predation by feral pigs are still threats to this subspecies until all feral ungulates are removed (Oppenheimer 2018, in litt.).

- Captive propagation for genetic storage and reintroduction—
    - Two of 13 founders from a population at ʻŌpana-Halehaku are represented in collections. An outplanting at West Wailua Iki of 38 individuals represents one founder (PEPP 2017).
    - Lyon Arboretum maintains seed collections from the West Wailua Iki and ʻOheʻo populations (Lyon Arboretum 2017).
    - The National Tropical Botanical Garden (NTBG) stores about 40 seeds collected from the Haipuaʻena Gulch population (NTBG 2017).
    - The Olinda Rare Plant Facility (ORPF) maintains potted plants grown from seeds collected at the West Wailua Iki population, and one plant currently remains at the nursery (ORPF 2014, 2018).
- Stochastic events—Build resiliency and redundancy—
    - Haleakalā NP reported outplanting 17 individuals (Robertson 2016, in litt.).
    - One plant was outplanted at West Wailua Iki (PEPP 2017).

Synthesis:
Surveys conducted since completion of the last 5-year review for this subspecies located new populations of *Cyanea hamatiflora* subsp. *hamatiflora* at five locations on east Maui. A landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *C. hamatiflora* 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. Seed collections are ongoing; however, very few founders are represented. Outplanting efforts are ongoing, with 18 individuals recently reintroduced.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Addendum to the Recovery Plan for Multi-island Plants (USFWS 2002), and have been updated according to the draft revised recovery objective guidelines developed by the Hawaiʻi 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 hamatiflora subsp. *hamatiflora* is a short-lived perennial palm-like tree. 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 a nursery or seed bank) collections. In addition, a minimum of three populations should be documented on Maui. 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 subspecies have not been met as, although there is one location where there are approximately 300 individuals (Haleakalā NP), it is uncertain how many are 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 hamatiflora* subsp. *hamatiflora* 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 2014. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2018.

- Surveys and inventories—Continue to survey for additional populations of *Cyanea hamatiflora* subsp. *hamatiflora* 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.
- 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.
- Predator and herbivore monitoring and control—
    - Implement effective control methods for rodents at all known populations.
    - Research and implement effective control methods for slugs.
    - Determine which invertebrate(s) are damaging fruits and research effective control methods.
- Captive propagation for genetic storage and reintroduction—Continue propagation efforts for maintenance of genetic stock and reintroduction.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this subspecies.
- Climate change adaptation strategy—Research the suitability of habitat for reintroducing this subspecies in the future due to the impacts of climate change.
- 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 hamatiflora* subsp. *hamatiflora* from listing through current 5-year review.

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1999 (listing)	70–125	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	Partially
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	12	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2009 (5-year review)	382–482	15	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2014 (5-year review)	458–558	0	All threats managed in all three populations	No
			Complete genetic storage	Partially

			Three populations with 50 mature individuals each	No
2016 (critical habitat)	458–558	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			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)	< 400	50	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	No
			Three populations with 50 mature individuals each	No

* 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 hamatiflora* subsp. *hamatiflora* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, fencing constructed
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant control at Haleakala NP
Landslides and erosion 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, fencing constructed
Rodent predation or herbivory	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Stochastic events—Loss of mutualists	E	Ongoing	None

References:

See the previous 5-year reviews for a full list of references (USFWS 2009, 2014). 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.

Lyon Arboretum. 2017. Micropropagation and seed conservation laboratory databases.

[NTBG] National Tropical Botanical Garden. 2017. Controlled propagation report.

[ORPF] Olinda Rare Plant Facility. 2014. Controlled propagation report.

[ORPF] 2018. Controlled propagation report.

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

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

Robertson, S. 2016, in litt., Information from Haleakalā NP for 2016 five-year review for *Cyanea hamatiflora* ssp. *hamatiflora* (haha).

[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. 2014. *Cyanea hamatiflora* subsp. *hamatiflora* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc4388.pdf*.

[USFWS] 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawai‘i, 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 hamatiflora* subsp. *hamatiflora* (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**

GREGORY KOOB Digitally signed by GREGORY KOOB
Date: 2018.10.22 14:30:57 -10'00'