5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea grimesiana* subsp. *obatae* (hāhā)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

Lead Region/Field Office:

Region 1/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 2018. The review was based on a review of current, available information since the last 5-year review for *Cyanea grimesiana* subsp. *obatae* (USFWS 2012). The evaluation completed 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 reviews for *Cyanea grimesiana* subsp. *obatae* published in the Federal Register on August 2, 2007 and August 28, 2012 (available at *https://ecos.fws.gov/docs/five_year_review/doc1128.pdf* and *https://ecos.fws.gov/docs/five_year_review/doc4154.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. grimesiana* subsp. *obatae*.

This short-lived perennial shrub in the Campanulaceae (bellflower) family is endangered and endemic to O‘ahu. The current status and trends for *Cyanea grimesiana* subsp. *obatae* are provided in the tables below.

New Status Information:

- Currently, there are four populations totaling between 17 and 20 individuals in the Waiʻanae mountains (ANRP 2018, U.S. Army 2018).
- In 2012, 16 critical habitat units in three ecosystems (lowland mesic, lowland wet, and dry cliff) were designated for *Cyanea grimesiana* subsp. *obatae* in the Waiʻanae mountains of Oʻahu (8,000 ac, 3,240ha) (77 FR 57648, September 18, USFWS 2012).

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 (at the species level) *Cyanea grimesiana* is vulnerable to the impacts of climate change, with a vulnerability score of 0.497 (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 into the future, such as identifying suitable microsites where climate change effects are anticipated to occur more slowly.

New Management Actions:

- Surveys, inventories, and monitoring—The Plant Extinction Prevention Program (PEPP) surveys for and monitors populations (PEPP 2014, 2015, 2016, 2017).
- Invasive species monitoring and control—The Army's Natural Resources Program-Oʻahu (ANRP) undertakes stabilization and management of endangered species to fulfill the requirements of the 2003 and 2008 Biological Opinions for U.S. Army activities in the Mākua and Oʻahu training areas (USFWS 2008). These actions include fencing and ungulate control, and nonnative plant control in management units that benefit the occurrences of *Cyanea grimesiana* subsp. *obatae* in these areas (U.S. Army Garrison 2010; U.S. Army 2018). Currently, all wild and reintroduced plants of *C. grimesiana* subsp. *obatae* occur in fenced management units, including the Kaluaa-Waiʻeli, Palikea, West Makaleha, Pahole, and ʻĒkahanui management units. Rats are also controlled to some degree at all populations, and slugs are controlled to some degree at most populations.
- Captive propagation for genetic storage and reintroduction—
    - Lyon Arboretum Micropropagation Laboratory reports over 600 propagules in storage representing two individuals from the ʻĒkahanui population and five individuals from the Palikea population (Lyon Arboretum 2018). The Lyon Seed Conservation Laboratory reports storage of 360 seeds representing two individuals from one population at Pahole (Lyon Arboretum 2018).
    - Pahole Rare Plant Facility (PRPF) reports propagation of one founder from West Makaleha (PRPF 2018).

    - The ANRP has 371 explants in micropropagation representing seven individuals from ʻĒkahanui and Palikea. There are 72 plants representing 17 founders from ʻĒkahanui, Makaleha, Pahole, and Palikea (ANRP 2018). In addition, there are 192,230 seeds in storage representing 36 founders from ʻĒkahanui, Kaluaa, Makaleha, Mākaha, Pahole, and Palikea (ANRP 2018).
- Reintroduction—
    - The ANRP has reintroduced over 2,000 individuals at 12 sites (representing 41 founders) and currently almost 1,500 survive (U.S. Army 2018).
    - Between 2014 and 2017, PEPP reported reintroduction of 299 individuals of *Cyanea grimesiana* subsp. *obatae* at ʻĒkahanui (33), Kaluaʻa (25), Palikea (3), Pahole (164 at 3 locations), and Kapuna (74, 69 remain) (PEPP 2014, 2015, 2016, 2017).

Synthesis:
Currently there are approximately 20 wild individuals of *Cyanea grimesiana* subsp. *obatae* in four populations in the Waiʻanae mountains. 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. grimesiana* subsp. *obatae* is vulnerable to the effects of climate change. These populations are protection from ungulates and invasive plants by fencing and nonnative plant control. Thousands of seeds are in storage representing almost all known individuals. Additional seed collections are needed from mature individuals at the Palikea wild population. More than 2,500 individuals have been reintroduced since 2012 with more than 50 percent surviving. Seedlings have been observed at some of the wild and reintroduction sites.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Oʻahu Plants (USFWS 1998), 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 grimesiana subsp. *obatae* 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 a nursery or seed bank) collections. In addition, a minimum of three populations should be documented on Oʻahu where they now occur or occurred historically and 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 (Table 1). Although there have been over 2,500 individuals reintroduced, mature outplanted individuals are not included in the population structure, but rather only mature plants at wild populations or mature plants from filial generations at reintroductions. Therefore, no populations have 50 reproducing individuals (Table 2), and, although genetic representation goals are close to being met, all threats are not being sufficiently managed throughout the range of the species. Therefore, *Cyanea grimesiana* subsp. *obatae* 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 additional new threats other than the new data on this taxon's vulnerability to climate change. We are also not aware of other significant new information regarding the species' biological status since the last 5-year reviews in 2007 and 2012. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2019.

- Surveys and monitoring—Continue to survey populations to better determine the current status of the species.
- Ungulate monitoring and control—Continue to construct and maintain fenced exclosures to protect individuals from the negative impacts of habitat degradation and browsing by feral pigs and goats.
- Invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species, and those that compete with *Cyanea grimesiana* subsp. *obatae*.
- Fire destruction and degradation of habitat—Continue to implement fire management plan for Army training areas and develop and implement fire management plans for other areas.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for the recovery of the species.
- Herbivory by rats—Continue to implement control methods for rats in the vicinity of all populations.
- Herbivory by slugs—Continue to implement control methods for slugs that will not affect native snails.
- Invertebrate control research—Conduct studies to determine the effects of the two-spotted leafhopper on populations of *Cyanea grimesiana* subsp. *obatae*. If research determines that control is necessary, develop and implement effective control techniques.
- Captive propagation for genetic storage and reintroduction—
    - Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.

    - Continue to assess genetic variability within the extant populations and implement a plan for conserving the species' genetic diversity in *ex situ* and reintroduced populations.
- Reintroduction and translocation—
    - Continue to augment current natural populations to increase numbers of individuals.
    - Continue reintroduction into known historical range.
    - Continue to protect plants from known threats throughout all translocated populations.
- Alliance and partnership development—Continue to work with the U.S. Army and other land managers to implement ecosystem-level restoration and management to benefit this species.

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1994 (listing)	~18	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
1998 (recovery plan)	13	19	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	16	unknown	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No

2007 (5-year review)	24	401	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2012 (5-year review)	54	67	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2012 (critical habitat)	41	67	All threats managed in all three populations	Partially
			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?**
2019 (5-year review)	15–17	>2,500	All threats managed in all three populations	Partially
			Complete genetic storage	Close to completion
			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	Partial
			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 grimesiana* subsp. *obatae* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate destruction and degradation of habitat	A	Ongoing	Partial, ungulates controlled at management units
Degradation of habitat by established ecosystem-altering invasive plant species	A	Ongoing	Partial, nonnative plants controlled at management units
Fire destruction and degradation of habitat	A	Ongoing	Partial, fire management plan for Army training areas
Climate change degradation or loss of habitat	A	Ongoing	No
Rodent predation or herbivory	C	Ongoing	Partial, rodent control in management units
Slug herbivory	C	Ongoing	Partial, slug control in management units
Invertebrate predation or herbivory–Two-spotted leafhopper	C	Ongoing	None
Competition with invasive nonnative plants	E	Ongoing	Partial, nonnative plants controlled at management units

References:
See previous 5-year reviews for a full list of references (USFWS 2007, 2012). Only references for new information are provided below.

[ANRP] 2018. 2018 status report for the Mākua and O‘ahu implementation plans. 217 pp.

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.

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

Lyon Arboretum. 2018. 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, Hawaii.

[PRPF] Pahole Rare Plant Facility. 2018, 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, Hawaii.

[PEPP] Plant Extinction Prevention Program. 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.

[U.S. Army] U.S. Army, Environmental Division. 2018. Report to the U.S. Fish and Wildlife Service for O‘ahu Army Natural Resource Program, Permit: TES-043638, Reporting period January 1, 2018-December 31, 2018. 16 pp.

U.S. Army Garrison Hawai‘i. 2010. Integrated natural resources management plan 2010-2014, Island of O‘ahu. 375 pp.

[USFWS] U.S. Fish and Wildlife Service. 2003. Biological opinion of the U.S. Fish and Wildlife Service for routine military training and transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Army Installations, Island of Oahu. 356 pp.

[USFWS] 2008. Amendment of the biological opinion of the U.S. Fish and Wildlife Service for military training at Mākua Military Reservation (1-2-2005-F-356). 61 pp.

[USFWS] 2012. *Cyanea grimesiana* subsp. *obatae* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc4154.pdf.*

[USFWS] 2012. Endangered and threatened wildlife and plants; Endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Department of the Interior, Federal Register 77 (181): 57648–57862, September 18, 2012.

[USFWS] 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

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