

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea hamatiflora* ssp. *carlsonii* (haha)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews of 44 species in Oregon, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 78(24):8185-8187.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Chelsie Javar-Salas, Plant Biologist, PIFWO

Marie Bruegmann, Plant Recovery Coordinator, PIFWO

Kristi Young, Programmatic Deputy Field Supervisor, 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 March 4, 2013. The review was based on a review of current, available information since the last 5-year review for *Cyanea hamatiflora* ssp. *carlsonii* (USFWS 2009). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Plant Recovery Coordinator. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

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 at: http://ecos.fws.gov/tess_public.

Review Analysis:

Please refer to the previous 5-year review for *Cyanea hamatiflora* ssp. *carlsonii* published on July 21, 2009 (available at: http://ecos.fws.gov/docs/five_year_review/doc2460.pdf) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of *C. hamatiflora* ssp. *carlsonii*.

This short-lived perennial is a member of the bellflower family (Campanulaceae) and is an endangered taxon endemic to Hawaii Island (USFWS 1996). Historically, *Cyanea hamatiflora* ssp. *carlsonii* was known the west side of Hawaii Island (USFWS 1996). At the time of the previous 5-year review, *C. hamatiflora* ssp. *carlsonii* was known to occur at two sites on the western slope of Hualalai and the southwestern slope of Mauna Loa (USFWS 2009). These two populations are still extant and are located on privately and

State-owned land at Keokea (Olelomoana) and Honuaua Forest Reserve. The status and trends for *C. hamatiflora* ssp. *carlsonii* are provided in the tables below.

New status information:

- *Cyanea hamatiflora* ssp. *carlsonii* is categorized as PEPP species containing less than 50 individuals in the wild and is managed by the Plant Extinction Prevention Program (2009, 2010, 2011, 2013a, 2014).
- At the time of the previous 5-year review, the Honuaua Forest Reserve (FR) population had two mature individuals and the Olelomoana FR population contained 12 mature individuals and 3 immature individuals (USFWS 2009). In 2010, there were three populations containing 14 wild individuals of *Cyanea hamatiflora* ssp. *carlsonii* (Plant Extinction Prevention Program [PEPP] 2009).
- In 2009 and 2010, more than 2,400 individuals were reintroduced to Kipahoehoe Natural Area Reserve in South Kona (Volcano Rare Plant Facility 2010, 2011). The current status of these individuals is unknown.
- In 2009 to 2013, approximately 165 individuals were reintroduced to Puu Waawaa FR Volcano Rare Plant Facility (2010, 2011, 2013); the current status of these individuals are unknown.
- In 2014, the wild population at Olelomoana FR contained three mature and one immature individuals of *Cyanea hamatiflora* ssp. *carlsonii* (PEPP 2014). There are 41 individuals in the reintroduced population at Olelomoana FR (PEPP 2014). The status of two wild mature individuals at Honuaua FR is unknown.
- Overall, the numbers of individuals have decreased from the 17 wild individuals reported in the previous 5-year review, to approximately four to six wild individuals in two populations in 2014. There are three reintroduced populations containing approximately 41 to 2,606 individuals. A range is presented because only the Olelomoana FR population has been recently monitored, while the remaining two populations have not been monitored and therefore the status of those individuals is unknown.

New threats:

- Climate change destruction or degradation of habitat – Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaii 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 *C. hamatiflora* is minimally vulnerable to the impacts of climate change.

New management actions:

- Ungulate monitoring and control
 - In 2008, the fence enclosure at Honuaua FR was monitored and damages to the fence were repaired (PEPP 2009).
 - In 2011, a 10-acre fence (Kukuiopae FR enclosure) was constructed within the South Kona FR with partners from the State of Hawaii Division of Forestry and Wildlife and Natural Area Reserve System (PEPP 2011). The primary purpose of

- this enclosure is to protect the remaining 22 individuals of *C. hamatiflora* ssp. *carlsonii* and the endangered *Cyanea stictophylla* from the damaging effects of feral pigs.
- Two fenced exclosures (exclosure I is 0.25 acres and II is 0.2 acres in size) for *C. hamatiflora* ssp. *carlsonii* at Honuaula FR are monitored bi-annually (State of Hawaii Department of Land and Natural Resources [DLNR] 2013, 2014a).
 - In March 2014, on Hawaii Island, two mouflon sheep (*Ovis musimon*) had gotten into the outplanting exclosure and remained there for an unknown length of time; it is thought the sheep may have been intentionally released into the exclosure (PEPP 2014). The two sheep were subsequently dispatched and removed.
 - In 2014, PEPP staff and partners constructed a fence utilizing “deer fence” materials (deer mesh) around three of four remaining wild plants of *C. hamatiflora* ssp. *carlsonii* at Olelomoana FR (PEPP 2014; DLNR 2014b).
 - Captive propagation for genetic storage and reintroduction – In 2010, the Volcano Rare Plant Facility (2010) had 34 individuals representing three populations growing in their nursery. The Facility propagated 1,080 individuals for reintroductions at Puu Waawaa and Kipahoehoe FR in 2010. In 2011, the Volcano Rare Plant Facility (2011) had 27 individuals representing the Honuaula and Olelomoana FR populations growing in their nursery. The Facility propagated 1,577 individuals for reintroductions at Puu Waawaa and Kipahoehoe FR in 2011 and a single individual for reintroduction to occur next year. In 2012, the Volcano Rare Plant Facility (2012) had no plants growing in their nursery. In 2013, the Volcano Rare Plant Facility (2013) had a single individual representing a founder from Puu Waawaa growing in their nursery. The Facility propagated a single individual for reintroduction at Puu Waawaa in 2013. In 2014, the Facility had two plants growing in their nursery representing founders from Olelomoana FR (Volcano Rare Plant Facility 2014). The Facility propagated 21 individuals for reintroduction next year.
 - Reintroduction / translocation
 - In 2009, 1,079 individuals of *C. hamatiflora* ssp. *carlsonii* were reintroduced at the Kipahoehoe Natural Area Reserve (PEPP 2010; Volcano Rare Plant Facility 2010). In 2010, an additional 1,414 individuals were reintroduced at Kipahoehoe Natural Area Reserve (Volcano Rare Plant Facility 2011). The survivorship rates of these reintroduced individuals are unknown.
 - In 2011, 230 plants were reintroduced into the newly constructed Kukuiopae FR exclosure (PEPP 2011).
 - In 2009, a single individual was reintroduced to Puu Waawaa FR (Volcano Rare Plant Facility 2010). In 2010, an additional 163 individuals were reintroduced to Puu Waawaa FR (Volcano Rare Plant Facility 2011). A single individual was reintroduced at Puu Waawaa FR (Volcano Rare Plant Facility 2013). The survivorship rates of these reintroduced individuals are unknown.
 - Population viability monitoring and analysis
 - In 2008, the wild populations at Olelomoana South Kona FR and Honuaula Forest Reserve were monitored and nets to aid in the collection of fruits was installed (PEPP 2009). Fruits were collected in September 2008 at Olelomoana and in October 2008 from Honuaula (PEPP 2009). Fruits were delivered to the Volcano

- Rare Plant Facility for propagation. Fruits were collected from eight of the ten plants visited at Olelomoana FR in November 2008 (PEPP 2008).
- In 2012, the population at Olelomoana FR was monitored and fruits were collected (PEPP 2013a).
 - In 2013, *C. hamatiflora* ssp. *carlsonii* was identified as one of 33 PEPP species for which no secure collection exist in genetic storage facilities (PEPP 2013b).
 - In 2013, five individuals at the Kukuioapae FR were monitored and fruits were collected from the ground beneath two individuals (PEPP 2014).
 - In March 2014, a large proportion of the reintroduced plants of *C. hamatiflora* ssp. *carlsonii* at Olelomoana FR were discovered eaten by two mouflon sheep (*Ovis musimon*) that had gotten into the outplanting enclosure and remained there for an unknown length of time (PEPP 2014). The assessment of the remaining plants revealed that the *C. hamatiflora* ssp. *carlsonii* plants were the preferred food item in the enclosure because as many as 193 plants may have been eaten by the sheep. The 234 plants that were in the enclosure were reduced to 41 plants.
 - In 2014, propagules were collected from *C. hamatiflora* ssp. *carlsonii* at South Kona FR; the number of fruits collected was not reported (DLNR 2014b).

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Big Island plant cluster (USFWS 1996), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Cyanea hamatiflora* ssp. *carlsonii* 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 Hawaii. 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 not been met as only four to six wild individuals are known, the maturity of the reintroduced individuals is unknown, and the species continues to decline (Table 1). Likewise, all of the threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Cyanea hamatiflora* ssp. *carlsonii* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Surveys / inventories – Survey geographical and historical range for a current assessment of the species' status.
- Captive propagation for genetic storage and reintroduction – Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.
- Ungulate monitoring and control – Maintain existing fences and fence remaining populations to protect them from the impacts of feral ungulates.
- Invasive plant monitoring and control – Eradicate invasive introduced plants within ungulate enclosures and maintain enclosures free of invasive plants.

- Population viability monitoring and analysis – Continue monitoring wild and reintroduced individuals.
- Alliance and partnership development – Initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

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

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	19	Unknown	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1996 (recovery plan)	14	51	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	14	Unknown	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2009 (5-yr review)	17	54	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2015 (5-yr review)	4-6	41-2,606	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

Table 2. Threats to *Cyanea hamatiflora* ssp. *carlsonii* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, Honuaula and Olelomoana is fenced
Invasive introduced plants	A, E	Ongoing	None
Rodent predation or herbivory – rats	C	Ongoing	None
Slug herbivory	C	Ongoing	None
Low numbers	E	Ongoing	Partially, captive propagation for reintroduction
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2009). 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. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 141 pages.

[PEPP] Plant Extinction Prevention Program. 2009. Plant Extinction Prevention Program annual report, fiscal year 2009 (July 1, 2008-June 30, 2009). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[PEPP] Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

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[PEPP] Plant Extinction Prevention Program. 2013a. Plant Extinction Prevention Program annual report, fiscal year 2013 (July 1, 2012-June 30, 2013). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

- [PEPP] Plant Extinction Prevention Program. 2013b. Plant Extinction Prevention Program progress report, fiscal year 2013, qtr 1-2 (July 1, 2012-December 31, 2012). 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. Plant Extinction Prevention Program annual report, fiscal year 2014 (July 1, 2013-June 30, 2014). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [DLNR] State of Hawaii Department of Land and Natural Resources. 2013. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 annual performance report for plant restoration and enhancement, threatened, endangered, candidate, and species of concern outplanting, Hawaii (endangered plant restoration and enhancement); final report. July 1, 2012 – June 30, 2013. Unpublished.
- [DLNR] State of Hawaii Department of Land and Natural Resources. 2014a. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 annual performance report for plant restoration and enhancement, threatened, endangered, candidate, and species of concern outplanting, Hawaii (endangered plant restoration and enhancement); final report. July 1, 2013 – June 30, 2014. Unpublished.
- [DLNR] State of Hawaii Department of Land and Natural Resources. 2014b. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 annual performance report for plant restoration and enhancement, threatened, endangered, candidate, and species of concern outplanting, Hawaii (endangered plant restoration and enhancement); interim report. July 1, 2013 – June 30, 2014. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 1996. Big Island plant cluster recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 202 + pages.
- [USFWS] U.S. Fish and Wildlife Service. 2009. 5-year review short form summary for *Cyanea hamatiflora* ssp. *carlsonii* (haha). Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 7 pages.
- Volcano Rare Plant Facility. 2010. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.
- Volcano Rare Plant Facility. 2011. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Volcano Rare Plant Facility. 2012. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Volcano Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Volcano Rare Plant Facility. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Cyanea hamatiflora* ssp. *carlsonii*
(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
- No Change in listing status

Appropriate Listing/Reclassification Priority Number, if applicable: _____

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for Maie M. Buegmann

Date 2015-08-03