

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea remyi* (haha)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2008. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 70 species in Idaho, Montana, Oregon, Washington, and the Pacific Islands. Federal Register 73(83):23264-23266.

Lead Region/Field Office:

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

Name of Reviewer(s):

Marie Bruegmann, Pacific Islands Fish and Wildlife Office, Plant Recovery Coordinator
Marilet A. Zablan, Pacific Islands Fish and Wildlife Office, Assistant Field Supervisor for Endangered Species
Jeff Newman, Pacific Islands Fish and Wildlife Office, Acting Deputy Field Supervisor

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 April 29, 2008. The review was based on the final critical habitat designation for *Cyanea remyi* and other species from the island of Kauai (USFWS 2003), as well as a review of current, available information. The National Tropical Botanical Garden provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Samuel Aruch, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Assistant Field Supervisor for Endangered Species and Acting Deputy Field Supervisor before submission to the Field Supervisor for approval.

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).

Application of the 1996 Distinct Population Segment (DPS) Policy:

This Policy does not apply to plants.

Review Analysis:

Please refer to the final critical habitat designation for *Cyanea remyi* published in the Federal Register on February 27, 2003 (USFWS 2003) for a complete review of the species' status (including biology and habitat), threats, and management efforts. No new threats and no significant new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *C. remyi*.

In 1987, *Cyanea remyi* was seen for the first time since 1916 at the headwaters of the Wailua River at 713 meters (2,340 feet) elevation on saturated, rocky ground in the Blue Hole. It was then estimated to contain from 30 to 50 individuals. Subsequently it was seen again in November of that year at 658 meters (2,160 feet) elevation. When visited in 1993 after Hurricane Iniki, very few individuals were seen. In 2000, three individuals were seen at 442 meter (1,450 foot) elevation, and five flowering individuals at 671 meters (2,200 feet) (Perlman 2008). In July 2006, one feeble individual was observed (Tangalin 2006).

Between 1988 and 1995, six or seven populations of *Cyanea remyi*, numbering 110 individuals were seen at elevations of 674 to 817 meters (2,210 to 2,680 feet) in the Wahiawa Mountains (Lorence and Flynn 1991; Perlman 2008). In May 2000, about 15 individuals were seen at this locality. In December 2001, about six individuals were seen streamside near Hulua, below Kapalaoa between 689 and 725 meters (2,260 and 2,380 feet) elevation. In January 2002, between 20 and 30 individuals were seen below Mt. Kahili. In August 2004, two mature individuals, one with flowers, were seen next to Wahiawa Stream. In February 2005, three individuals were observed near Hulua, and in December 2006, two individuals were observed on the side of Wahiawa Stream. However, these individuals were later destroyed in flashfloods (National Tropical Botanical Garden 2008b; Perlman 2008; Tangalin 2006).

In 1999, on Mt. Kahili above the ridge trail from Kahili Mountain Park, on an east facing slope, two clumps of *Cyanea remyi* were observed at 646 meters (2,120 feet) elevation by Steve Perlman of the National Tropical Botanical Garden. In March 2004, he and Natalia Tangalin observed two mature individuals, two immature individuals, and three seedlings of *Cyanea remyi* off the main ridge trail at 561 meters (1,840 feet) elevation. This group of plants was also later wiped out in a flashflood (Perlman 2008; Tangalin 2006).

Other locations have not had recorded observations for at least fifteen years. These include discoveries by Tim Flynn of National Tropical Botanical Garden at Wainiha in the Halelea Forest Reserve, along the road from the powerhouse to the dam and in the Hoary Head Range, east of Omoe. In the back of Waioli Valley below Namolokama in the headwaters of Waioli Stream, two sterile individuals were discovered in January of 1993 at 370 meters (1,143 feet) elevation and three individuals at 823 meters (2,700 feet) elevation (National Tropical Botanical Garden 2008a; Perlman 2008). In the Iliiliula Valley in 1994, Steve Perlman and Ken Wood found about 50 to 100 scattered individuals below the south waterfall at 597 meters (1,960 feet) elevation. In the Makaleha Mountains in July of 1993, one individual was seen at 817 meters (2,680 feet) elevation and one individual at Makaleha Peak's northwest face at 932 meters (3,060 feet) (National Tropical Botanical Garden 2008a). In the upper Hanalei Valley below Pohakupele, two to five individuals were seen in March 1993 (National Tropical Botanical Garden 2008a). In Upper Limahuli Valley's east drainage between Pali Eleele and Hono O Na Pali, *Cyanea remyi* was seen in 1996 by Ken Wood (National Tropical Botanical Garden 2008a). At the time of listing, several hundred individuals were known from four populations (USFWS 1996). In 2006, Perlman estimated a total of 50 individuals for the species (Perlman 2008) at this locality. Currently, since floods

destroyed populations along Wahiawa Stream and on Mt. Kahili, there may be as few as 24 individuals remaining in three populations, at Blue Hole, below Mt. Kahili and at Hulua.

The three original discoveries of *Cyanea remyi* are within a relatively small area of Kauai's Wahiawa Mountains. The location at Blue Hole is about nine to ten kilometers (5.6 to 6.2 miles) north of the location in the Wahiawa Mountains, and about eleven kilometers (6.8 miles) south of the population in Waioli (Lammers and Lorence 1993).

The natural plant community located around Blue Hole, at the base of Mt. Waialeale, on the north fork of the Wailua River is a low, stunted *Metrosideros polymorpha* (ohia) lowland wet forest with an understory of ferns. Associated species include *Antidesma platyphyllum* (hame), *Athyrium macraei* (no common name [NCN]), *Bidens* spp. (kookoolau), *Bobea brevipes* (ahakea), *Boehmeria grandis* (akolea), *Broussaisia arguta* (kanawao), *Chamaesyce remyi* var. *remyi* (NCN), *C. remyi* var. *kauaiensis* (NCN), *Cheirodendron platyphyllum* (olapa), *Cibotium glaucum* (hapuu), *Cyanea asarifolia* (haha), *C. spathulata* (haha), *C. sylvestris* (haha), *Cyclosorus sandwicensis* (NCN), *Cyrtandra confertiflora* (haiwale), *C. kealeae* (haiwale), *C. paludosa* (moa), *Diplazium sandwichianum* (hoio), *Dubautia knudsenii* (naenae), *Dubautia plantaginea* ssp. *magnifolia* (naenae), *Freycinetia arborea* (ieie), *Gunnera kauaiensis* (ape ape), *Huperzia phyllantha* (wawae iole), *Ilex anomala* (kawau), *Isachne pallens* (NCN), *Kadua affinis* (manono), *K. centranthoides* (NCN), *K. elatior* (awiwi), *K. foggiana* (NCN), *Machaerina angustifolia* (uki), *Myrsine lessertiana* (kolea lau nui), *Nephrolepis cordifolia* (NCN), *Peperomia* spp. (alaala wai nui), *Perrottetia sandwicensis* (olomea), *Pilea peploides* (NCN), *Pipturus kauaiensis* (mamake), *Pipturus ruber* (mamake), *Pneumatopteris sandwicensis* (NCN), *Pritchardia flynnii* (loulu), *Psychotria mariniana* (kopiko), *Sadleria pallida* (amau), *Selaginella arbuscula* (lepelepe a moa), *Sphenomeris chinensis* (palaa), *Tetraplasandra oahuensis* (ohe mauka), *Thelypteris globulifera* (NCN), *Touchardia latifolia* (olona), and *Wikstroemia oahuensis* (akia) (D. Lorence, National Tropical Botanical Garden, pers. comm. 2009; Perlman 2008; Tangalin 2006).

In upper Wahiawa Valley, below Kapalaoa and Mt. Kahili, the Wahiawa Mountains form a bowl shaped area of rugged mountainous terrain dissected by numerous stream systems and covered by lowland rainforest and boggy shrubland (Lorence 1991). In this *Metrosideros polymorpha* - *Dicranopteris linearis* (uluhe) wet forest, *Cyanea remyi* occurs with *Bobea brevipes* (ahakea), *Broussaisia arguta*, *Cyanea fissa* (haha), *C. kealiae*, *C. kolekoleensis*, *C. spathulata*, *C. sylvestris*, *C. undulata* (haha), *Cyrtandra confertiflora*, *C. longifolia* (haiwale), *C. oenobarba* (haiwale), *C. paludosa* (moa), *C. pickeringii* (haiwale), *Dubautia imbricate* (naenae), *D. syndetica*, *D. pauciflora* (naenae), *Freycinetia arborea*, *Hesperomannia lydgatei* (NCN), *Ilex anomala* (kawau), *Kadua cordata*, *K. foggiana*, *K. affinis* (manono), *K. tryblium* (NCN), *Labordia lydgatei* (kamakahala), *L. tinifolia* var. *wahiawaensis* (kamakahala), *Perrottetia sandwicensis*, *Platydesma rostrata* (pilo kea lau lii), *P. spathulata* (pilo kea), *Pritchardia flynnii* (loulu), *Psychotria* spp. (kopiko), *Scaevola mollis* (naupaka kuahiwi), *Scaevola* spp. (naupaka), *Syzygium sandwicense* (ohia ha), *Viola helenae* (aupaka), *Wikstroemia oahuensis*, and

Xylosma hawaiiense (ae) (National Tropical Botanical Garden 2008b; Perlman 2008; D. Lorence, pers. comm. 2009).

On Mt. Kahili, *Cyanea remyi* occurs in *Tetraplasandra* sp. (ohe mauka) – *Cheirodendron* sp. (olapa) – *Dicranopteris linearis* low wet forest with associated species including *Cheirodendron platyphyllum*, *Cyanea spathulata*, *Cyrtandra confertiflora*, *Cyrtandra kealiae* subsp. *urceolata* (haiwale), *Gardenia remyi* (nanu), *Isodendrion longifolium* (aupaka), *Melicope clusiifolia* (kukaemoa), *Platydesma spathulata* (pilo kea), *Pteralyxia kauaiensis* (kaulu), *Tetraplasandra oahuensis*, and *Xylosma hawaiiense* (Tangalin 2006) .

Pigs (*Sus scrofa*) are damaging habitat in areas where *Cyanea remyi* grows (Factor A). They dig up the ground and open it to invasive introduced plant species, including *Clidemia hirta* (Koster's curse), *Melastoma septemnerium* (NCN), *Phaius tankarvilleae* (Chinese ground orchid), *Psidium cattleianum* (strawberry guava), *Trema orientalis* (gunpowder tree), and *Rubus rosifolius* (thimbleberry) which crowd out native vegetation (Factor E). Additionally, the species grows in areas subject to floods and landslides, and has been damaged in the past by hurricanes (Factor E) (Perlman 2008; Tangalin 2006). Rats (*Rattus rattus*) and introduced species of slugs have been observed eating this species (Factor C) (Perlman 2008).

Climate change may also pose a threat to *Cyanea remyi* (Factors A and E). However, current climate change models do not allow us to predict specifically what those effects, and their extent, would be for this species.

In addition to all of the other threats, species like *Cyanea remyi* that are endemic to small portions of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes, landslides, flooding and disease outbreaks (Factor E). The extent of these natural processes on this single island endemic are exacerbated by anthropogenic threats, such as habitat loss for human development or predation by introduced species (Factor E) (USFWS 1998).

This species has not been grown much in cultivation. There are 1,700 seeds stored at the Center for Conservation, Research and Training Seed Storage Facility (2008) for the National Tropical Botanical Garden and 2,500 seeds are stored at the National Tropical Botanical Garden (2009). The Nature Conservancy of Hawaii has recently constructed a fence around the Wahiawa (Kanaele) Bog (Wood 2008) and plans to reintroduce a number of endangered species to the area (M. Clark, USFWS, pers. comm 2008).

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan titled "Kauai II: Addendum to the recovery plan for the Kauai plant cluster" for plants from the island of Kauai (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Cyanea remyi* 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 Kauai. 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 (see Table 1), as no population has more than 50 mature individuals and all threats are not being managed. Therefore, *Cyanea remyi* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Fence areas where this species grows to protect against pig damage.
- Conduct rat and slug control around known plants.
- Continue to store seeds.
- Propagate plants for outplanting.
- Work with Hawaii Division of Forestry and Wildlife, The Nature Conservancy of Hawaii, and Hawaii State Parks to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

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Personal communications:

- Clark, Michelle. 2008. Fish and Wildlife Biologist, USFWS, Lihue, Kauai. Email to David Burney, National Tropical Botanical Garden, dated November 6, 2008.
- Lorence, David. 2009. Reserch Botanist, National Tropical Botanical Garden. Email to Margaret Clark, National Tropical Botanical Garden, dated January 11, 2009.

Table 1. Status of *Cyanea remyi* from listing through 5-year review.

Date	No. wild indivs.	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 (listing)	>700	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 (recovery plan)	500	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	394-484	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2009 (5-year review)	24	0	All threats managed	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

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

Field Supervisor, Pacific Islands Fish and Wildlife Office

FSW



Date AUG 27 2010