5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyanea mannii* (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 mannii* (USFWS 2011). 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 review for *Cyanea mannii* published in the Federal Register on August 2, 2011 (available at *https://ecos.fws.gov/docs/five_year_review/doc3820.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. mannii*.

This short-lived perennial shrub in the Campanulaceae (bellflower) family is endangered and endemic to Moloka‘i. The current status and trends for *Cyanea mannii* are provided in the tables below.

New Status Information:

- In the 2011 5-year review, there were eight populations of *Cyanea mannii* totaling fewer than 200 individuals. Between 2007 and 2008, there were four individuals observed at Kapuna Spring, two individuals observed at Waihānau Stream, and five individuals observed at the headwaters of east Kawela (Oppenheimer 2010, in litt.). The current status of these populations is unknown, no new information was available. One of the eight populations, at Mokomoko, totals between 50 and 100 individuals (Bakutis 2018, in litt.). There may possibly be three other locations with greater than 40 individuals each, but these observations are from the early 1990s. Other locations from old observations had only a few individuals each.
- In 2016, five critical habitat units were designated in three ecosystems (lowland mesic, lowland wet, and montane mesic) on Molokaʻi for *Cyanea mannii* (14,696 ac, 5,947 ha) (81 FR 17790, March 30, 2016).

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 *Cyanea mannii* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.844 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions are needed to conserve this taxon into the future.
- Fire destruction or degradation of habitat—Fire is reported to be a threat to *Cyanea mannii* on Molokaʻi (Keir *et al.* 2016). Fire can destroy dormant seeds as well as individual plants. Successive fires burn farther and farther into native habitat and alter microclimate conditions to further alter habitat conditions to favor nonnative plants. Nonnative plants convert native plant communities to nonnative dominated plant communities (D'Antonio and Vitousek 1992; Tunison *et al*. 2002). Increasing episodes of drought, expansion of invasive grass cover, and temperature increases, have led to an increase in the number of wildfires on Molokaʻi (Trauernicht *et al.* 2015).
- Drought degradation of habitat—Drought is observed to be a threat to *Cyanea mannii* on Molokaʻi (Keir *et al.* 2016). Over the past 100 years, the Hawaiian Islands have experienced an annual decline in precipitation from just over 9 percent, increasing to as much as 15 percent within the last 20 years (US-NSTC 2008; Chu and Chen 2005; Diaz 2005). Drought affects plants directly by desiccation. The increase in drought frequency and intensity leads to a self-perpetuating cycle of increase in cover of nonnative plants, increase in the number of fires, and an increase of erosion (US-GCRP 2009; Warren 2011). Recent episodes of drought have also driven axis deer farther into urban and forested areas in search of food, increasing their negative impacts to native vegetation from herbivory and trampling (Waring 1996, in litt; Nishibayashi 2001, in litt.).

- Landslides and flooding destruction or degradation of habitat—Landslides are reported to be a threat to *Cyanea mannii* (Keir *et al.* 2016). Populations of this species occur in steep, rocky areas along streams or at headwaters of streams. Landslides, including tree falls and erosion associated with them, can have a significant effect on small populations by destabilizing substrate, altering hydrological patterns, and by damaging and destroying individual plants (Stearns 1985).
- Lack of adequate hunting regulations—Four populations of *Cyanea mannii* on Molokaʻi occur in a State hunting area. Nonnative feral ungulates pose a major ongoing threat to native species through destruction and modification of habitat, and through direct herbivory or predation. Only one population is fenced and habitat destruction and modification, and predation, by pigs, goats, and axis deer have been noted as threats to the species. In addition, public hunting areas are not fenced and game mammals have unrestricted access to most areas across the landscape, regardless of underlying land use designation; therefore, any unfenced populations are at risk (DLNR 2010).

New Management Actions:

- Invasive plant monitoring and control—The Nature Conservancy of Hawaiʻi (TNCH) conducts manual and chemical control of nonnative plants in Kamakou Preserve (TNCH 2011).
- Ungulate monitoring and control—A population of *Cyanea mannii* that occurs in Kamakou Preserve will be provided some protection from feral ungulates because of fencing and feral ungulate removal (TNCH 2011).

Synthesis:

Currently, there are three populations of *Cyanea mannii* at Mokomoko on Molokaʻi (50 to 100 individuals total), and possibly three to five more populations at Waihānau Stream and east Kawela, with the most recent observations occurring in 2008. 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. mannii* is highly 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. The population in Kamakou Preserve may be provided protection by fencing and ongoing ungulate control. There are no known recent collection or propagation efforts for this species.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Molokai Plant Cluster (USFWS 1996), 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 mannii 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 Moloka‘i. 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 as there are no populations of at least 50 reproducing individuals, there are no *ex situ* collections (Table 1), and all threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Cyanea mannii* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
Drought, landslides, fire, and lack of hunting regulations have been added as new threats; however, we are not aware of significant new information regarding the species' biological status since the last 5-year review in 2011. Thus, the following recommendations for future actions are added or reiterated for the 5-year review for 2018.

- Surveys and inventories—Continue to survey for additional populations of *Cyanea mannii* in areas of potentially suitable habitat. Regularly monitor known populations.
- Ungulate monitoring and control—Continue to construct and maintain fenced exclosures to protect individuals from the negative impacts of feral ungulates and to prevent imminent extinction in the wild.
- Invasive plant monitoring and control—
    - Continue to control established ecosystem-altering nonnative invasive plant species around all populations.
    - Continue to control invasive nonnative species that compete with the species around all populations.
- Captive propagation for genetic storage and reintroduction—Begin collection and propagation efforts for maintenance of genetic stock.
- Reintroduction and translocation—Begin reintroduction of individuals into suitable habitat within historic range that is being managed for known threats to this species.
- Fire monitoring and control—Develop and implement fire prevention management plans.
- Predator and herbivore monitoring and control—
    - Implement effective control methods for rodents at wild and reintroduced populations.
    - Develop and implement effective control methods for slugs.

- Stochastic events—Build resiliency and redundancy—Increase numbers of populations and individuals scattered through historic range to reduce impacts from erosion and drought.
- Climate change adaptation strategy—Research the suitability of habitat for reintroducing this species in the future due to impacts from climate change.
- Alliance and partnership development—Continue to initiate, plan, and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	40	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
1996 (recovery plan)	< 1,000	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	ca 200	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
2011 (5-year review)	< 200	4	All threats managed in all three populations	No
			Complete genetic storage	No

			Three populations with 50 mature individuals each	No
2016 (critical habitat)	< 200	0	All threats managed in all three populations	No
			Complete genetic storage	No
			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)	64–114	0	All threats managed in all three populations	No
			Complete genetic storage	No
			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 mannii* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, one population fenced
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, one population monitored for nonnative plants
Landslides and flooding loss or modification and destruction of habitat	A	Ongoing	None
Drought destruction or degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Fire destruction or degradation of habitat	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	None
Rodent predation or herbivory	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Lack of adequate hunting regulations	D	Ongoing	Partial, one population fenced
Invasive species—Established invasive plant species competition	E	Ongoing	Partial, one population may benefit from indirect monitoring
Stochastic events—Reduced viability due to small number of populations	E	Ongoing	None

References:

See the previous 5-year review for a full list of references (USFWS 2011). Only references for new information are provided below.

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