Cyanea mannii
(haha)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW
Species reviewed: *Cyanea mannii* / haha

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5-YEAR REVIEW
***Cyanea mannii* (haha)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Endangered Species Program, Division of Recovery, Jesse D`Elia, (503) 231-2071

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808) 792-9400

Cooperating Field Office(s):
N/A

Cooperating Regional Office(s):
N/A

1.2 Methodology used to complete the 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 16, 2009. The review was based on final critical habitat designations for *Cyanea mannii* and other species from the islands of Molokai (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 Recovery Program Lead and the Assistant Field Supervisor for Endangered Species before submission to the Field Supervisor for approval.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2009. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 103 species in Hawaii. Federal Register 74(49):11130-11133.

1.3.2 Listing history

Original Listing
FR notice: USFWS. 1992. Endangered and threatened wildlife and plants; determination of endangered or threatened status for 16 plants from the island of Molokai, Hawaii; final rule. Federal Register 57(196):46325-46340.
Date listed: October 8, 1992
Entity listed: Species
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.3.3 Associated rulemakings:

USFWS. 2003. Endangered and threatened wildlife and plants; final designations and nondesignations of critical habitat for 42 plant species from the island of Molokai, Hawaii; final rule. Federal Register 68(52):12982-13141.

Critical habitat was designated for *Cyanea mannii* in five units totaling 598 hectares (1471 acres) on the island of Molokai. This designation includes habitat on State and private lands (USFWS 2003).

1.3.4 Review History:

Species status review [FY 2010 Recovery Data Call (September 2010)]: Stable

Recovery achieved:
1 (0-25%) (FY 2007 Recovery Data Call – most recent year reported)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

2

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: Recovery plan for the Molokai plant cluster.
Date issued: September 26, 1996.
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?
____ ***Yes***
__X_ ***No***

2.1.2 Is the species under review listed as a DPS?
____ ***Yes***
__X_ ***No***

2.1.3 Was the DPS listed prior to 1996?
____ ***Yes***
____ ***No***

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?
____ ***Yes***
____ ***No***

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?
____ ***Yes***
____ ***No***

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?
____ ***Yes***
__X_ ***No***

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?
__X_ ***Yes***
____ ***No***

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

__X_ ***Yes***
____ ***No***

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

__X_ ***Yes***
____ ***No***

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Listing Factors A, C, D, and E) affecting this species is presented in section 2.3.2 and Table 2. Listing Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the Molokai plant cluster recovery plan (USFWS 1996), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Cyanea mannii* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced, weeding, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on Molokai, and if possible, at least one other island where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met. There is no confirmed population of more than 50 individuals and all threats have not been managed.

For downlisting, a total of five to seven populations of *Cyanea mannii* should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population

should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Cyanea mannii* should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

No new information.

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Historically, *Cyanea mannii* was known only from Kalae on East Molokai. In 1984, a single plant was discovered west of Puu Kolekole on East Molokai. Since then, additional populations were found in the east and west forks of Kawela Gulch within Kamakou Preserve on East Molokai (USFWS 1992). In 1996, there were believed to be nine known populations, with a total of fewer than 1,000 individuals (USFWS 1996). In 2003, eight populations containing approximately 200 individuals were estimated (USFWS 2003).

Cyanea mannii is endemic to East Molokai. Staff of the National Tropical Botanical Garden observed four individuals of *Cyanea mannii* in 1991 at Kamakou Preserve, below East Kawela intake on the east aspect at 1,067 meters (3,500 feet)

elevation (Wood 2009). Three mature individuals were seen in Kawela Gulch in 1997 (Hawaii Biodiversity and Mapping Program 2009). In 2001, scattered plants were observed in the gulch between 1,036 and 1,067 meters (3,400 and 3,500 feet) elevation (Perlman 2009).

In 1991, at least 40 individuals were seen at Kua Gulch at 792 to 914 meters (2,600 to 3,000 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). In 2002, Perlman observed scattered individuals of *Cyanea mannii* in Kua Gulch at 808 to 884 meters (2,650 to 2,900 feet) elevation (National Tropical Botanical Garden 2009; Perlman 2009).

In 1992, at least 20 individuals of *Cyanea mannii* were observed at Kalamaula, a gulch between Waianui and Mokomoko Gulch, at 640 to 732 meters (2,100 to 2,400 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). At least 50 additional individuals were seen in 1994 at Kalamaula, Mokomoko Gulch at 594 to 732 meters (1,950 to 2,400 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). At Mokomoko Gulch, near Kupuna Springs, Steve Perlman of the National Tropical Botanical Garden also saw *Cyanea mannii* in 2002 (National Tropical Botanical Garden 2009).

At least 50 individuals were reported in 1993 from Waihanau Stream, at 808 to 838 meters (2,650 to 2,750 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). Several individuals of *Cyanea mannii* were seen in Kupaia Gulch in 1992 (Hawaii Biodiversity and Mapping Program 2009). Seven individuals with 50 branching heads were seen in 1998 in Kapulei, Molokai at 997 meters (3,270 feet) elevation by Ken Wood from the National Tropical Botanical Garden (Wood 2009). In 2002, Perlman observed scattered individuals of *C. mannii* in Wawaia inside a newly fenced area, in Kumueli Gulch (National Tropical Botanical Garden 2009).

Since the exact numbers of individuals were often not recorded by field botanists, currently there are approximately less than 200 individuals of *Cyanea mannii* on Molokai in an unknown number of populations.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No new information.

2.3.1.4 Taxonomic classification or changes in nomenclature:

No new information.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g., corrections to the historical range, change in distribution of the species within its historic range, etc.):

See section 2.3.1.2 above.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

In East Kawela, the habitat where *Cyanea mannii* occurs is *Metrosideros polymorpha* (ohia) – *Cheirodendron trigynum* (olapa) montane wet forest with associated native species including *Astelia menziesiana* (kaluaha), *Broussaisia arguta* (kanawao), *Cibotium* sp. (hapuu), *Pouteria sandwicensis* (alaa), and *Stenogyne bifida* (no common name [NCN]) (Wood, 2009). In the Wawaia-Kumueli region below the summit of Kamakou, which is the highest point on Molokai located at 1,512 meters (4,961 feet) elevation, the associated native species includes *Boehmeria grandis* (akolea), *Broussaisia arguta*, *Cheirodendron trigynum* (olapa), *Cibotium glaucum*, *Clermontia grandiflora* subsp. *munroi* (oha wai), *C. kakeana* (haha), *Coprosma* sp. (pilo), *Cyrtandra grayi* (keokeo haiwale), *C. macrocalyx* (keokeo haiwale), *Deschampsia nubigena* (hairgrass), *Dicranopteris linearis* (uluhe), *Diplazium sandwichianum* (hoio), *Diplopterygium pinnatum* (uluhe lau nui), *Dodonaea viscosa* (aalii), *Dubautia plantaginea* (naenae), *Elaphoglossum crassifolium* (hoe a Maui), *Eragrostis grandis* (lovegrass), *Ilex anomala* (kawau), *Kadua acuminata* (au), *Korthalsella remyana* (kaumahana), *Labordia triflora* (kamakahala), *Leptecophylla tameiameiae* (pukiawe), *Lobelia dunbariae* (NCN), *Lobelia hypoleuca* (kuhiaikamo owahie), *Lycopodiella cernua* (wawaeiole), *Lysimachia remyi* (NCN), *Machaerina angustifolia* (uki), *Metrosideros polymorpha* var. *glaberrima* (ohia), *M. polymorpha* var. *incana* (ohia), *M. waialealae* var. *fauriei* (NCN), *Myrsine lessertiana* (kolea lau nui), *Peperomia*

cookiana (ala ala wai nui), *Peperomia latifolia* (ala ala wai nui), *Perrottetia sandwicensis* (olomea), *Pipturus argutus* (mamake), *Pleomele* sp. (hala pepe), *Polypodium pellucidum* (ae), *Psychotria mariniana* (kopiko), *Sadleria cyatheoides* (amau), *S. pallida* (amau ii), *Scaevola chamissoniana* (naupaka kuahiwi), *Smilax melastomifolia* (hoi kuahiwi), *Stenogyne kamehamehae* (NCN), *Tectaria gaudichaudii* (iwa iwa lau nui), *Tetraplasandra hawaiiensis* (ohe), *Urera glabra* (opuhe), *Vaccinium dentatum* (ohelo), *V. reticulatum* (ohelo), *Viola* sp. (nani), and *Wikstroemia forbesiana* (akia) (Perlman 2009; Wood and Perlman 2002).

In Kua Gulch, the habitat where *Cyanea mannii* occurs is *Metrosideros polymorpha – Dicranopteris linearis* wet forest with *Alyxia stellata*, *Bobea* sp. (akahea), *Boehmeria grandis*, *Dodonaea viscosa*, *Doodia* sp. (okupukupu), *Freycinetia arborea* (ie ie), *Labordia triflora*, *Leptecophylla tameiameiae*, *Metrosideros* spp., *Myrsine lessertiana*, *Nestegis sandwicensis (olopua)*, *Perrottetia sandwicensis*, *Pipturus albidus* (ala ala wai nui), *Pisonia sandwicensis* (papala kepau), *Psychotria mariniana*, *Sadleria cyatheoides*, *Tetraplasandra hawaiiensis*, *Wikstroemia oahuensis*, and *Xylosma hawaiiense* (ae) (National Tropical Botanical Garden 2009; Perlman 2009).

Mokomoko Gulch habitat includes associated native species including *Clermontia kakeana*, *Freycinetia arborea*, *Metrosideros* sp., *Perrottetia sandwicensis*, *Pipturus* sp., *Psychotria* sp., and *Urera glabra* (National Tropical Botanical Garden 2009).

At Kapulei, the habitat is transitional *Metrosideros polymorpha – Dicranopteris linearis* montane mesic to wet forest with steep forested slopes, in riparian headwater drainages thick with ferns growing along saturated basalt walls associated with several small waterfalls above 1,006 meters (3,300 feet) elevation. Associated native species occurring with *Cyanea mannii* includes *Clermontia arborescens* subsp. *waikoluensis* (oha wai nui), *C. pallida* (haha), *Cyrtandra biserrata* (keokeo haiwale), *C. grayi* (keokeo haiwale), *Cyrtandra hematos* (keokeo haiwale), *Sadleria pallida*, *Metrosideros polymorpha* var. *glaberrima*, *M. polymorpha* var. *incana*, *Peperomia rockii* (ala ala wai nui), *Perrottetia sandwicensis*, and *Phyllostegia ambigua* (NCN) (Wood 2009).

In Wawaia Gulch where *Cyanea mannii* occurs the habitat is *Metrosideros polymorpha – Dicranopteris linearis* wet forest with associated native species including *Bobea* sp., *Boehmeria* sp., *Cibotium* sp., *Clermontia kakeana*, *Cyrtandra* sp., *Dodonaea viscosa*, *Leptecophylla tameiameiae*, *Myrsine* sp., *Pipturus* sp., *Urera glabra*, *Sadleria* sp., *Tetraplasandra hawaiiensis*, and *Wikstroemia* sp. (National Tropical Botanical Garden 2009).

2.3.1.7 Other:

No new information.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Threats that modify habitat include feral pigs (*Sus scrofa*), goats (*Capra hircus*), Axis deer (*Axis axis)*, and invasive introduced plant species such as *Ageratum conyzoides* (goatweed), *Ageratina riparia* (spreading mist flower), *Axonopus fissifolius* (narrow leaved carpetgrass), *Buddleia asiatica* (dog tail), *Christella dentata* (downy wood fern), *Drymaria cordata* (tropical chickweed), *Erigeron karvinskianus* (daisy fleabane), *Hedychium* sp. (ginger), *Hypochoeris radicata* (hairy cat's ear), *Lantana camara* (lantana), *Melinis minutiflora* (molasses grass), *Pluchea carolinensis* (sourbush), *Psidium guajava* (common guava), *Nephrolepis* sp. (NCN), *Ricinus communis* (castor bean), *Rubus rosifolius* (thimbleberry), *Sacciolepis indica* (Glenwood grass), *Schinus terebinthifolius* (Christmas berry), and *Setaria parvula* (yellow foxtail) (National Tropical Botanical Garden 2009; Perlman 2009; Wood 2009; Wood and Perlman 2002).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Not a threat.

2.3.2.3 Disease or predation:

Rats (*Rattus* spp.) and slugs (unidentified species) are predators of *Cyanea* species (Perlman 2009).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

No new information.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

The introduced invasive plant species discussed in section 2.3.2.1 above are also a threat to *Cyanea mannii* because they compete with the species for water, light, and nutrients.

In addition to all of the other threats, species like *Cyanea mannii* 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. 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 (USFWS 1996).

Climate change may also pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

In 2009, one million dollars in funding from the federal Department of Interior's Cooperative Endangered Species Conservation Fund was obtained to help acquire a perpetual conservation easement over 248 hectares (614 acres) of strategic watershed on the eastern end of Molokai. The property has several federally listed threatened or endangered species as well as critical habitat in and around the proposed easement area. Among federally listed species benefiting from this protection are *Cyanea mannii* (haha), *Canavalia molokaiensis* (awikiwiki), *Hibiscus arnottianus* ssp. *immaculatus* (kokio keokeo), *Brighamia rockii* (puaala), *Cyanea dunbariae* (haha), *Gardenia brighamii* (nanu), *Pritchardia munroi* (loulu), and *Phyllostegia hispida* (USFWS 2009; C. Rowland, USFWS, pers. comm.

2010).

2.4 Synthesis

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Molokai plant cluster (USFWS 1996), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Cyanea mannii* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on islands where they now occur or occurred historically. For the species to be considered stable, 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 there is no confirmed population containing more than 50 individuals (Table 1) and all threats are not being managed (Table 2). Therefore, *Cyanea mannii* meets the definition of endangered as it remains in danger of extinction throughout its range.

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

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	40	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1996 (recovery plan)	<1000	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	200	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2010 (5-year review)	<200	0	All threats managed in all 3 populations	No (Table 2)
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No: there are no populations with 50 mature individuals

Table 2. Threats to *Cyanea mannii* .

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – habitat modification and herbivory	A, D	Ongoing	No
Invasive introduced plants	A, E	Ongoing	No
Rats – herbivory	C	Ongoing	No
Slugs – herbivory	C	Ongoing	No
Small population size	E	Ongoing	No
Climate change	A, E	Increasing	No

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X_ No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Survey to determine the current status of all wild and reintroduced populations
- Monitor known populations.
- Collect seeds from each population for genetic storage and potentially, for reintroduction.
- Fence all populations to provide protection from the negative impacts of feral ungulates.
- Control invasive introduced plant species around all populations.
- Develop and implement methods to control slugs.
- Control rats in the vicinity of these populations
- Propagate to augment existing populations.
- Establish additional populations within protected suitable habitat.
- Work with Hawaii Division of Forestry and Wildlife and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

5.0 REFERENCES

References:

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National Tropical Botanical Garden. 2009. Herbarium database. National Tropical Botanical Garden, Kalaheo, Hawaii. Unpublished.

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the island of Molokai, Hawaii; final rule. Federal Register 57(196):46325-46340.

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[USFWS] U.S. Fish and Wildlife Service. 2009. Press release: Fish and Wildlife Service provides $1 million in land acquisition funds to Hawaii. Honolulu, Hawaii. April 17, 2009.

Wood, K.R. and S. Perlman. 2002. Personal observations of the Kumueli-Wawaia Region Molokai, Hawaii; including a checklist of vascular plants. Special report prepared for The Nature Conservancy of Hawaii. National Tropical Botanical Garden, Kalaheo, Hawaii. 17 pages. Unpublished.

Wood, K.R. 2009. Notes on *Cyanea mannii*. National Tropical Botanical Garden, Kalaheo, Hawaii. 19 pages. Unpublished.

Personal Communications:

Rowland, Craig. 2010. Conservation Partnerships Program Coordinator, U.S. Fish and Wildlife Service. E-mail to Marie Bruegmann, U.S Fish and Wildlife Service, dated April 16, 2010. Subject: Additional information on status of Molokai easement.

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U.S. FISH AND WILDLIFE SERVICE
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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

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
Chelsie Javar, Fish and Wildlife Biologist
Marie Bruegmann, Plant Recovery Coordinator
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Field Supervisor, Pacific Islands Fish and Wildlife Office

_____ Date 8/2/11