

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Clermontia oblongifolia* subsp. *mauiensis* (oha wai)

Current Classification: Endangered

Federal Register Notice 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.

Lead Region/Field Office:

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

Name of Reviewer(s):

Marie Bruegmann, Plant Recovery Coordinator, PIFWO

Jess Newton, Recovery Program Lead, PIFWO

Assistant Field Supervisor for Endangered Species, 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 16, 2009. The review was based on final critical habitat designations for *Clermontia oblongifolia* subsp. *mauiensis* and other species from the islands of Lanai and Maui (USFWS 2003a, b) 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.

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 designations for *Clermontia oblongifolia* subsp. *mauiensis* published in the Federal Register on January 9, and May 14, 2003 (USFWS 2003a, b) 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. oblongifolia* subsp. *mauiensis*.

At the time of listing in 1992, there were an unknown number of individuals in one population on the island of Maui (USFWS 1992). Currently, there are 4 known individuals on the island of Maui (Perlman 2009).

Two individuals of *Clermontia oblongifolia* subsp. *mauiensis* were known from the Puu Kukui Trail on West Maui, at 950 to 991 meters (3,117 to 3,250 feet) elevation, both of which have died (Hawaii Biodiversity and Mapping Program 2009; Perlman 2009). Joel Lau saw a couple of individuals some years ago on The Nature Conservancy of Hawaii's Kapunakea Preserve in West Maui (Perlman 2009).

In 2009, 4 individuals of *Clermontia oblongifolia* subsp. *mauiensis* were observed along the pipeline of the Lower Waikamoi Ditch Trail and at Haipuena Gulch in East Maui (Perlman 2009). These are the same 4 individual plants that plant material was collected from in 2007. It had been observed in that vicinity along the Olinda Pipeline Trail by Otto Degener in 1927 (Hawaii Biodiversity and Mapping Program 2009). Joseph Rock observed it on East Maui in 1911 at Honomanu at 792 to 914 meters (2,600-3,000 feet) elevation (Hawaii Biodiversity and Mapping Program 2009).

In 1998, Ken Wood and Robert Hobdy observed *Clermontia oblongifolia* subsp. *mauiensis* between Palea and Kamiki on the island of Lanai at 930 meters (3,050 feet) elevation (Wood 2009). Prior to that it was last recorded on Lanai at Kaiholena Ridge at 800 meters (2,625 feet) elevation, and at Mahana Valley by Degener, citing observations made by Joseph Rock in 1910 (Hawaii Biodiversity and Mapping Program 2009). Hobdy believed the plant may often be undetected because it is difficult to spot except when it is in flower (Hawaii Biodiversity and Mapping Program 2009).

Clermontia flowers are protandrous (male parts maturing first), which indicates that they are primarily outcrossing between plants, although they may occasionally self-pollinate. *Clermontia* species are believed to have been pollinated by passerine birds (honeycreepers and honeyeaters). Their seed is believed to be spread by birds also. They are observed to have an ecological role as a pioneer on edges, openings, and windfalls in the forest (Lammers 1992).

In a genus with a high degree of endemism, *Clermontia oblongifolia* is the most widely distributed species in the genus, present on four different islands. The genus *Clermontia* is believed to have speciated in relatively recent times from a single ancestor. The greatest number of *Clermontia* species occurs on the youngest of the main Hawaiian Islands, Hawaii Island, and only a single species is found on the oldest island, Kauai. Where more than one species is found on the same island, they are from different clades (subgroups of the genus). The genus has remained, however, within a fairly specific habitat niche, not diversifying much across elevations (Lammers 1995).

In 1996 through 1997, a visiting researcher, Victor Albert, discovered *Clermontia* plants in the Waikamoi region of East Maui which appeared to be a hybrid between *Clermontia arborescens* and *C. kakeana*. Both species are found sympatrically at that location. Later analysis showed the plants fit Rock's description of *Clermontia oblongifolia* subsp.

mauiensis, reported from the windward slopes of Haleakala. From his phylogenetic analysis Albert felt that what Rock had described as *Clermontia oblongifolia* subsp. *mauiensis* was actually a primary hybrid, with some individuals showing close relatedness to the presumed *C. arborescens* parents, and others more similar to *C. kakeana* and other double-petalled *Clermontia* species (V. Albert, pers comm. 2001). Albert did not have access to material from the West Maui or Lanai populations of *Clermontia oblongifolia* subsp. *mauiensis* for analysis, nor did he compare his specimens with the type collections in the Bishop Museum Herbarium (Oppenheimer 2009).

Hank Oppenheimer of the Maui Nui Plant Extinction Prevention Program collected flowering material from the four Waikamoi plants in May 2007, which the Bernice P. Bishop Museum Herbarium sent to Dr. Thomas Lammers, a taxonomic authority on the Campanulaceae, who identified them as hybrids of *C. arborescens* subsp. *waihia* and *C. kakeana*, both of which are common in the area. All four of these individuals are morphologically slightly different, which supports the theory of a hybrid origin. Oppenheimer examined Rock's and Degener's type specimens at Bernice P. Bishop Museum Herbarium which were collected from this area. Oppenheimer collected specimens in several areas of both East and West Maui that are putative hybrids. Usually their morphology seems closer to *C. arborescens* with blunter flower bud apices. The description of *C. oblongifolia* subsp. *mauiensis* states the buds are pointed, more like *C. kakeana*. The plant which he found in 2009 corresponded most closely to the type description from Haleakala National Park, along Palikea Stream near Fern Camp. This specimen has not been compared with the type specimen yet. Oppenheimer believes that *Clermontia oblongifolia* subsp. *mauiensis* is not a valid taxon but a hybrid. Other *Clermontia* hybrids are known to occur. However, one of the parents, *C. kakeana*, has never been documented from Lanai, although *Clermontia arborescens* subsp. *waikoluensis* does occur there. Oppenheimer has not yet examined any Lanai material. There could be both hybrids and a valid, extremely rare taxon (Oppenheimer 2009).

In his 1995 treatment of *Clermontia* biogeography, Thomas Lammers recognized three subspecies of *Clermontia oblongifolia*: subsp. *oblongifolia* from Oahu, subsp. *brevipes* from Molokai, and subsp. *mauiensis* from Lanai and Maui (Lammers 1995). As discussed in the previous section, additional analysis may be needed to resolve the status of *C. oblongifolia* subsp. *mauiensis* as an independent taxon rather than a hybrid.

The habitat where *Clermontia oblongifolia* subsp. *mauiensis* occurs on East Maui is *Metrosideros polymorpha* (ohia) montane wet forest with *Broussaisia arguta* (kanawao), *Cheirodendron trigynum* (olapa), *Cibotium* spp. (hapuu), *Clermontia arborescens* (oha wai nui), *C. kakeana* (oha wai), *Coprosma pubens* (pilo), *Cyanea mceldowneyi* (haha), *Cyrtandra grayana* (keokeo haiwale), *Diplazium sandwichianum* (pohole), *Ilex anomala* (kawau), *Labordia hedyosmifolia* (kamakahala), *Myrsine lessertiana* (kolea lau nui), *Nothocestrum longifolium* (aiea), *Perrottetia sandwichensis* (olomea), *Psychotria* sp. (kopiko), *Touchardia latifolia* (olona), and *Vaccinium* sp. (ohelo) (Perlman 2009).

On Lanai, *Clermontia oblongifolia* subsp. *mauiensis* grows in *Metrosideros polymorpha* mixed mesic forest on ridges with *Dicranopteris linearis* (uluhe), and *Metrosideros*

polymorpha shrubland with *Alphitonia ponderosa* (kauwila), *Broussaisia arguta*, *Diplopterygium pinnatum* (uluhe lau nui), *Machaerina* spp. (uki), *Myrsine lessertiana*, *Sadleria pallida* (amau), *Sphenomeris chinensis* (palaa), and *Wikstroemia oahuensis* (akia) (Wood 2009).

Threats to *Clermontia oblongifolia* subsp. *mauiensis* are deer (*Axis axis*) and pigs (*Sus scrofa*), which degrade habitat (Listing Factor A and D). Invasive introduced plant species that compete with the taxon and degrade habitat include *Ageratina adenophora* (sticky snakeroot), *Clidemia hirta* (Koster's curse), *Hedychium gardnerianum* (Kahili ginger), *Leptospermum scoparium* (New Zealand tea tree), *Morella faya* (fire tree), *Psidium cattleianum* (strawberry guava), *P. guajava* (common guava), *Rubus rosifolius* (thimbleberry), and *Tibouchina herbacea* (glorybush) (Listing Factor A and E) (Oppenheimer 2009; Perlman 2009; Wood 2009).

Threats to *Clermontia oblongifolia* subsp. *mauiensis* also include predation by rats (*Rattus* spp.), deer, and slugs (various species) (Listing Factor C) (Perlman 2009; Wood 2009). Slugs show a particular affinity for feeding on plants in the Campanulaceae family (Listing Factor C) (Joe 2006). Climate change may also pose a threat to this species (Listing Factors A and E). 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 (PICCC) has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

In addition to all of the other threats, species like *Clermontia oblongifolia* subsp. *mauiensis* that have few populations and low numbers of individuals 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 (Listing 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 (Listing Factor E) (USFWS 1997).

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Maui plant cluster (USFWS 1997), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Clermontia oblongifolia* subsp. *mauiensis* 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. There are only two known populations with a total of 6 individuals (Table 1), and all threats are not being

managed (Table 2). Therefore, *Clermontia oblongifolia* subsp. *mauiensis* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Pollen staining tests should be conducted, as pollen is often aborted and consequently staining is often (but not always) reduced in hybrids.
- Conduct genetic analysis to determine if the taxon is valid or a hybrid.
- 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.

References:

- Hawaii Biodiversity and Mapping Program. 2009. Program Database Hawaii Biodiversity and Mapping Program. Honolulu, Hawaii.
- Joe, S. 2006. Impact of alien slugs on native plant seedlings in a diverse mesic forest, Oahu, Hawaii, and a study of slug food plant preferences. MS degree, Department of Botany (Ecology, Evolution, and Conservation Biology), University of Hawaii at Manoa, Honolulu, Hawaii. 87 pages.
- Lammers, T.G. 1992. Two new combinations in the endemic Hawaiian genus *Cyanea* (Campanulaceae: Lobelioideae). *Novon* 2:129-131.
- Lammers, T.G. 1995. Patterns of speciation and biogeography in *Clermontia* (Campanulaceae, Lobelioideae), in W.L. Wagner, and V. A. Funk (editors). *Hawaiian biogeography: Evolution on a hot spot archipelago*. Smithsonian Institution Press, Washington, D.C. 338-362 pages.
- Oppenheimer, H.L. 2009. *Clermontia oblongifolia* subsp. *mauiensis* - 5 year review edits and comments. Plant Extinction Prevention Program, Lahaina, Hawaii. 7 pages. Unpublished.
- Perlman, S. 2009. *Clermontia oblongifolia* subsp. *Mauiensis*. National Tropical Botanical Garden, Kalaheo, Hawaii. 1 page. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; determination of endangered or threatened status for 15 plants from the island of Maui, Hawaii; final rule. *Federal Register* 57(95):20772-20782.

[USFWS] U.S. Fish and Wildlife Service, 1997. Recovery plan for the Maui plant cluster (Hawaii). U.S. Fish and Wildlife Service, Portland, Oregon. 130 pages. + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2003a. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, Hawaii; final rule. Federal Register 68(6):1220-1274

[USFWS] U.S. Fish and Wildlife Service. 2003b. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the Islands of Maui and Kahoolawe, Hawaii; final rule. Federal Register 68(93):25934-26165.

Wood, K.R. 2009. Notes on *Clermontia oblongifolia mauiensis*. National Tropical Botanical Garden, Kalaheo, Hawaii. 1 page. Unpublished.

Personal Communications:

Albert, V.A. Biodiversity and Systematics, University of Alabama. Untitled letter to USFWS. 2001. 2 pages.

Table 1. Status of *Clermontia oblongifolia* subsp. *mauiensis* from listing through 5-year review.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	unknown	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1997 (recovery plan)	1	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	2 +	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)	6	0	All threats managed in all 3 populations	No (Table 2)
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No: only 6 individuals are known

Table 2. Threats to *Clermontia oblongifolia* subsp. *mauiensis*.

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

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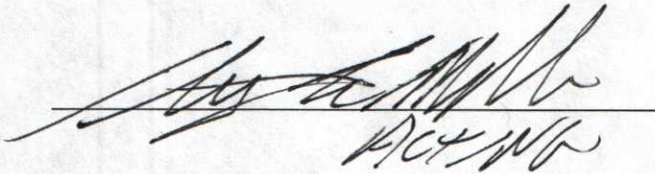
SIGNATURE PAGE for 5-YEAR REVIEW of *Clermontia oblongifolia* subsp. *mauiensis*
(oha wai)

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



Date 8/2/11