

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Clermontia pyrularia* (‘ōhā wai)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. Federal Register 88(83): 20088–20092, May 7, 2018.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer:

Cheryl Phillipson, Biologist, PIFWO

Lauren Weisenberger, Plant Recovery Coordinator, PIFWO

Megan Laut, 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 (Service) beginning in October 2019. The review was based on a review of current, available information since the last 5-year review for *Clermontia pyrularia* (USFWS 2007). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, 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 *Clermontia pyrularia* published in the Federal Register on August 2, 2007 (available at https://ecos.fws.gov/docs/five_year_review/doc1127.pdf) for a complete review of the species’ status, threats, management efforts, and references cited. 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. pyrularia*.

This short-lived perennial tree in the Campanulaceae (bellflower) family is endangered and endemic to the island of Hawai‘i. The current status and trends for *Clermontia pyrularia* are provided in the tables below.

New Status Information:

- Currently, *Clermontia pyrrularia* is known from three populations, with one wild individual at each location: Kālepa, Pihā, and Kanakaleonui (Plant Extinction Prevention Program (PEPP) 2014, 2015, 2016). Two wild individuals were destroyed by Hurricane Iselle (PEPP 2015).

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 Hawai‘i 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 *Clermontia pyrrularia* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.617 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.

New Management Actions:

- Surveys and inventories—In 2014, an individual of *Clermontia pyrrularia* was discovered at Kanakaleonui (PEPP 2014). After Hurricane Iselle, only one wild plant remained at both Pihā and Kālepa (PEPP 2015).
- Ungulate monitoring and control—Fencing is monitored and maintained at all reintroduction areas (PEPP 2014, 2017).
- Invasive plant monitoring and control—Invasive plant monitoring and control is conducted at fenced reintroduction areas (PEPP 2016, 2017).
- Captive propagation for genetic storage and reintroduction—
 - Lyon Arboretum reports seven explants in storage representing one individual at Pihā (Lyon Arboretum 2019). The Lyon Seed Conservation Laboratory reports more than 13,000 seeds collected, with 1,900 tested and over 11,000 remaining in storage representing one founder from Kālepa and one to two founders at Puakala, Hakalau Forest National Wildlife Refuge (NWR) (Lyon Arboretum 2019).
 - The National Tropical Botanical Garden (NTBG) reports more than 300 seeds collected in 1991 in storage representing the Pihā population (NTBG 2019). The viability of these seeds is unknown.
 - The Volcano Rare Plant Facility (VRPF) reports one plant in storage representing one individual from Pihā, and 315 plants in storage representing two individuals at Humu‘ula (Laupāhoehoe). In addition, two of these plants were reintroduced at Hakalau (VRPF 2019).
 - Hakalau Forest NWR reports propagation and reintroduction of 325 individuals representing 11 founders, all at Hakalau Nui (HFNWR 2018).
 - PEPP reports 11 surviving reintroduced individuals at Pihā, 101 reintroduced plants at Hakalau, and 318 reintroduced individuals at two

sites at Laupāhoehoe (PEPP 2014, 2015, 2017). PEPP is also attempting air-layering of plants as a means of propagation to ensure that clones could be preserved in storage (PEPP 2015).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	>5	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1996 (recovery plan)	4	30	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	unknown, 2 occurrences	unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2007 (5-year review)	15	569, 136 survive	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially, only one reintroduced population

Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2020 (5-year review)	2	>400	All threats managed in all 3 populations	Partially
			Complete genetic storage	Complete for two populations
			Reproduction (<i>i.e.</i> viable seeds, seedlings) at all 3 populations	No
			3 populations with 50 mature individuals each	Partially, two reintroduced populations total more than 50 individuals; not reproducing

* 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 stage after Preventing Extinction).

Table 2. Threats to *Clermontia pyricularia* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, all reintroduced populations are fenced; however constant monitoring for ungulate ingress is required
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant control within the exclosures is ongoing
Climate change degradation or loss of habitat, including hurricanes	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	Partial, all reintroduced populations are fenced; however constant monitoring

			for ungulate ingress is required
Predation or herbivory by rats	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, seed storage, propagation, and reintroduction efforts are ongoing

Synthesis:

Currently there are three wild individuals of *Clermontia pyrularia* on the island of Hawai‘i. A landscape-based assessment of climate change vulnerability for native plants of Hawai‘i using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *C. pyrularia* is highly vulnerable to the effects of climate change. Wild and reintroduced individuals are provided protection from ungulate destruction of habitat and herbivory by fencing; however, the exclosures must be monitored for animal ingress. Some nonnative plant control is ongoing at one reintroduced population. Seed collection, propagation, and reintroduction are ongoing, with several hundred individuals planted. Air-layering is also being tested.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Big Island Plant Cluster (USFWS 1996), and have been updated according to the draft revised recovery objective guidelines developed by the Hawai‘i 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.

Clermontia pyrularia is a short-lived perennial tree. To prevent extinction, which is the first milestone 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 Hawaii Island where they now occur or occurred historically and 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. Genetic storage is complete for only two of the three populations (Table 1). Although more than 500 individuals have been reintroduced, there are no populations totaling 50 reproducing individuals each, and all threats are not being sufficiently managed throughout the range

of the species (Table 2). Therefore, *Clermontia pyrularia* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

We are not aware of any new threats or significant new information regarding the species' biological status since the last 5-year review in 2007. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—Continue to search for *Clermontia pyrularia* throughout its historical range, particularly in leeward Mauna Loa.
- Ungulate monitoring and control—Continue to maintain fenced exclosures to protect individuals from the negative impacts of browsing by ungulates.
- Invasive plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species, and those that compete with *C. pyrularia*.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for the recovery of the species.
- Rodent predation and herbivory—Implement effective control measures for rats at all populations.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species to build resiliency and redundancy to reduce impacts of low numbers and hurricanes.
- Reduced viability—Continue to study *C. pyrularia* with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats. Test reintroduction of *C. pyrularia* into small areas at high densities intermixed with common native food plants for birds, as suggested in the annual permit reports for endangered plant propagation and outplanting activities (Jeffrey and Horiuchi 2005; Kendall and Horiuchi 2013).
- Alliance and partnership development—Continue to work with partners in planning and implementation of ecosystem-level restoration and management to benefit this species.

References:

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- [HFNWR] Hakalau Forest National Wildlife Refuge. 2018. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [HPPRCC] Hawai'i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.
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- Lyon Arboretum. 2019. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [NTBG] National Tropical Botanical Garden. 2019. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. 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. PEPP annual report fiscal year 2014 (July 1, 2013-June 30, 2014). 185 pp.
- [PEPP] 2015. PEPP annual report fiscal year 2015 (July 1, 2014-June 30, 2015). 179 pp.
- [PEPP] 2016. Plant Extinction Prevention Program FY 2016 Annual Report (Oct 1, 2015-Sep 30, 2016), US FWS CFDA Program #15.657; Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F14AC00174, December 24, 2016, UH Manoa, PCSU, PEPP. 237 pp.
- [PEPP] 2017. Plant Extinction Prevention Program FY 2017 annual report (Oct 1, 2016-Sep 30, 2017), US FWS CFDA program #15.657; Endangered species conservation-recovery implementation funds, Cooperative Agreement F14AC00174, December 12, 2017, UH Manoa, PCSU, PEPP. 235 pp.

[USFWS] U.S. Fish and Wildlife Service. 2007. *Clermontia pyrularia* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/five_year_review/doc1127.pdf.

[USFWS] 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. Federal Register 88(83): 20088–20092, May 7, 2018.

[VRPF] Volcano Rare Plant Facility. 2019. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Clermontia pyrularia* ('ōhā 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
- X No Change in listing status

For Field Supervisor, Pacific Islands Fish and Wildlife Office

_____ Date _____