5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Clermontia drepanomorpha* (ʻōhā 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:

Interior Region 12/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaiʻi

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 drepanomorpha* (USFWS 2012). 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 drepanomorpha* published in the Federal Register on August 28, 2012 (available at *https://ecos.fws.gov/docs/five_year_review/doc4089.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. drepanomorpha*.

This short-lived perennial shrub (sometimes epiphytic) in the Campanulaceae (bellflower) family is endangered. The status and trends for *C. drepanomorpha* are provided in the tables below.

New Status Information:

- There are no reported surveys for this species since the last 5-year review in 2012. IN 2008, there were as many as 300 individuals within Pu‘u o ‘Umi Natural Area Reserve (NAR) in the Kohala mountains. In 2011, the number of populations and individuals were unknown but in decline (USFWS 2012).

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 drepanomorpha* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.551 (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:

- Captive propagation for genetic storage and reintroduction—The Volcano Rare Plant Facility (VRPF) is propagating plants for reintroduction at Kohala: in 2014, VRPF reported nine plants in inventory representing one founder from Kohala. In 2015, VRPF reported propagation and reintroduction of eight plants (representing the same founder) to Kohala. In 2017, VRPF reported propagation of 63 plants representing two different founders from Kohala, with 32 plants from one of those founders reintroduced back to Kohala. In 2019, there were nine plants in inventory and 121 plants prepared for reintroduction representing a fourth founder from Kohala (VRPF 2014, 2015, 2017, 2019).

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (listing)	200	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No

1998 (recovery plan)	237–292	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
2012 (5-year review)	~300	unknown	All threats managed in all 3 populations	Partially
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2020 (5-year review)	<300 (no updates since 2012)	161 planted; current estimate unknown	All threats managed in all 3 populations	Partially, reintroduced populations fenced
			Complete genetic storage	Partially, 4 founders represented in propagation
			Reproduction (*i.e.* viable seeds, seedlings) at all 3 populations	Unknown

			3 populations with 50 mature individuals each	Status unknown

* 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 drepanomorpha* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, reintroduced populations fenced
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	None
Drought destruction and degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Collecting	B	Ongoing	None
Rodent predation or herbivory	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, propagation and reintroduction

Synthesis:
Currently there are fewer than 300 wild individuals of *Clermontia drepanomorpha* in the Kohala mountains 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. drepanomorpha* is highly vulnerable to the effects of climate change. Propagation is ongoing with 161 plants reintroduced to the Kohala area. Reintroductions are provided protection from feral ungulates by fencing.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Big Island II: Addendum to the Recovery Plan for the Big Island Plant Cluster (USFWS 1998), 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 drepanomorpha is a short-lived perennial, sometimes epiphytic, shrub. 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 the island of Hawai‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings, saplings), with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. Estimates for this species are over 12 years old, and it is unknown whether there are any populations totaling at least 50 reproducing individuals. Genetic storage goals have not been met, and all threats are not being managed (Table 1, Table 2). Therefore, *Clermontia drepanomorpha* 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 other significant new information regarding the species' biological status since the last 5-year review in 2012. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—
    - The historical range of *Clermontia drepanomorpha* should be surveyed intensively, preferably in July, which coincides with the greatest number of historical records of the flowering time.
    - Determine if historical populations are extirpated.
    - Determine sites that have the highest likelihood of maintaining reintroductions.
- Ungulate monitoring and control—Fence all known populations and continue to monitor and maintain fenced exclosures to protect individuals from the negative impacts of ungulates.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species, and those that compete with *C. drepanomorpha*.
- Site and habitat protection—Develop and implement effective control measures to reduce the impact of collecting and drought.

- Climate change adaptation strategy—Assess the modeled effects of climate change on these species and use to determine future landscape needed for their recovery.
- Predator and herbivore monitoring and control—
    - Implement effective control methods for rodents and slugs.
    - Monitor populations for evidence of insect predation and disease and determine if control methods are necessary and are available.
- Captive propagation for genetic storage and reintroduction—
    - Continue collection and propagation efforts keeping track of the maternal source used.
    - Collect and store seeds at three separate facilities.
- Reintroduction and translocation—
    - Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats.
    - Maximize genetic variation among individuals at reintroduction sites.
- Population biology research—
    - Determine which species may act as pollinators and which may assist with fruit dispersal.
    - Carry out genetic studies to determine the genetic variation within the population and devise an effective breeding program.
- Alliance and partnership development—Work with the Hawaii Division of Forestry and Wildlife and other land managers in planning and implementation of ecosystem-level restoration and management to benefit this taxon.

References:

Fortini, L., J. Price, J. Jacobi, A. Vorsino, J. Burgett, K. Brinck, F. Amidon, S. Miller, S. Gon II, G. Koob, and E. Paxton. 2013. A landscape-based assessment of climate change vulnerability for all native Hawaiian plants. Technical report HCSU-044. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 134 pp.

[HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.

[USFWS] U.S. Fish and Wildlife Service. 1998. Big Island II: Addendum to the Recovery Plan for the Big Island Plant Cluster. 80 pp. + appendices.

[USFWS] 2012. *Clermontia drepanomorpha* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc4089.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. 2014. 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.

[VRPF] 2015. 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.

[VRPF] 2017. 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.

[VRPF] 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.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Clermontia drepanomorpha* (ʻōhā 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**

MEGAN LAUT Digitally signed by MEGAN LAUT
Date: 2020.09.25 14:51:24 -10'00'

_____ Date_____