

Clermontia pyrrularia
(Oha wai)

**5-Year Review
Summary and Evaluation**

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

5-YEAR REVIEW

***Clermontia pyrrularia* (Oha wai)**

I. GENERAL INFORMATION

A. Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the Fish and Wildlife Service between July 2005 and June 2006. The Hawaii Biodiversity and Mapping Program was contracted to provide updated information on the current status of *Clermontia pyrrularia*. They also provided recommendations for future actions that may be needed prior to the next 5-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator, whose comments were incorporated into the draft 5-year Review. The draft 5-year Review was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before PIFWO submission to the Regional Office.

B. Reviewers

Lead Region: Region 1

Lead Field Office: Pacific Islands Fish and Wildlife Office

C. Background

1. FR Notice citation announcing initiation of this review:

July 6, 2005. Endangered and Threatened Wildlife and Plants; Initiation of 5-year Reviews (of 33 species in Region 1). 70 FR 38972-38975.

2. Species status:

Declining (FY 2006 Recovery Data Call)

3. Recovery achieved:

1, meaning 0 - 25 percent of the identified recovery objectives for *Clermontia pyrrularia* have been achieved (FY 2006 Recovery Data Call)

4. Listing history

Original Listing

FR notice: U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; determination of endangered or threatened status for 21 plants from the island of Hawaii, state of Hawaii. *Federal Register* 59(43): 10305-10325.

Date listed: March 4, 1994

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

N/A

5. Associated actions:

Critical habitat was designated for *Clermontia pyramidalis* in two units totaling 6,823 acres (2,761 hectares) on the island of Hawaii (U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 46 plant species from the island of Hawaii. *Federal Register* 68(127): 39623-39722).

6. Review History: Just the original listing, designation of critical habitat, and recovery plan development actions.

7. Species' Recovery Priority Number at start of review: 2, meaning a species with a high degree of threat and a high recovery potential.

8. Recovery Plan or Outline

Name of plan: Recovery Plan for the Big Island Plant Cluster. 1996. U.S. Fish and Wildlife Service, Portland, Oregon. 176 pp. plus appendices.

Date issued: September 26, 1996

Dates of previous revisions: N/A

Some of the actions outlined in the Recovery Plan have been initiated but not completed (e.g., construct exclosures to protect populations from feral ungulates; control nonnative plants within fenced exclosures). Some recovery actions will require long-term commitments (e.g., maintenance of exclosure fences; weed control; rat control) or may only be necessary intermittently (e.g., provide protection against human impacts).

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) Policy

This Policy does not apply to plant species.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan?

☒ Yes

☐ No

2. Does the recovery plan contain recovery (i.e., downlisting or delisting) criteria?

☒ Yes

☐ No

3. Adequacy of recovery criteria.
- a. Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and its habitat?
 X Yes
 No
- b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)?
 X Yes
 No
4. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors* are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here

The threats (Factors A, C, and E) affecting this species are discussed in detail in section II.D. Factors B and D are not considered a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the Recovery Plan for the Big Island Plant Cluster (Service 1996), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Clermontia pyralaria* is a long-lived perennial, and to be considered stable, this species must be managed to control threats (e.g. fenced) (Factors A, C, and E) and be represented in an *ex situ* collection. In addition, a minimum of three populations should be documented on the Big Island where the species now occurs or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Clermontia pyralaria* should be documented on the Big Island where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats (Factors A, C, and E), with a minimum of 100 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before downlisting is considered.

This recovery objective has not been met.

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- A) Present or threatened destruction, modification or curtailment of its habitat or range;
B) Overutilization for commercial, recreational, scientific, or educational purposes;
C) Disease or predation;
D) Inadequacy of existing regulatory mechanisms;
E) Other natural or manmade factors affecting its continued existence.

For delisting, a total of 8 to 10 populations of *Clermontia pyrularia* should be documented on the Big Island where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable, or increasing in number, and secure from threats (Factors A, C, and E), with a minimum of 100 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before delisting is considered.

This recovery objective has not been met.

C. Synthesis

Clermontia pyrularia is endemic to the island of Hawaii. It was first collected on the slopes of Mauna Kea in the 1800s (59 FR 10307). *Clermontia pyrularia* has been documented from the western and northeastern side of Mauna Kea, from the western side of Mauna Loa, and from the saddle area between the two mountains (59 FR 10307). In 1994, at the time *C. pyrularia* was listed, there were five known populations located in the Hilo Forest Reserve, near Hakalau Gulch, at Kealahakua, and at Kaawaloa. The exact number of individuals was not known, although it was likely that no more than one individual remained for each population (59 FR 10307). In 1996, when the Recovery Plan was published, this species was known from two populations, one in Laupahoehoe NAR and the other at the Upper Piha Game Management Area (Upper Piha GMA), totaling four individuals (Service 1996). Currently, *C. pyrularia* is known from 1 natural population of 15 individuals in the Upper Piha GMA, and several outplanted populations at Hakalau National Wildlife Refuge (Hakalau NWR). Since 1992, 569 individuals of *C. pyrularia* have been outplanted in the Hakalau NWR, with 136 surviving as of 2003. The outplanted individuals were propagated from seeds collected from the wild plants of *C. pyrularia* as well as from seeds collected from outplanted individuals that had matured and fruited (Jeffrey and Horiuchi 2005). The Upper Piha GMA/Hakalau NWR population currently is composed of approximately 150 individuals.

Clermontia pyrularia is threatened by feral ungulates which damage habitat by rooting and trampling vegetation, and feed on its fruit (Factor A) (Jeffrey and Horiuchi 2005). As early as 1778, European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii, especially to wet and mesic forests, and dry areas at high elevations. Feral pigs are currently present on the island of Hawaii, and inhabit both rain forests and grasslands. While rooting in the ground in search of the invertebrates and plant material they eat, feral pigs disturb and destroy vegetative cover, trample plants and seedlings, and threaten forest regeneration by damaging seeds and seedlings. They disturb soil and cause erosion, especially on slopes. Alien plant seeds are dispersed on their hooves and coats as well as through their digestive tracts, and the disturbed soil is fertilized by their feces, helping these plants to establish. Pigs are a primary vector causing the spread of many introduced plant species (Smith 1985; Scott *et al.* 1986; Tomich 1986; Cuddihy and Stone 1990; Wagner *et al.* 1999). Cattle (*Bos taurus*), the wild progenitor of which was native to Europe, northern Africa, and southwestern Asia, were introduced to the Hawaiian Islands in 1793. Large feral herds developed as a result of restrictions on killing cattle decreed by King

Kamehameha I. While small cattle ranches were developed on Kauai, Oahu, and west Maui, very large ranches of tens of thousands of acres were created on east Maui and Hawaii. Much of the land used in these private enterprises was leased from the State or was privately owned and classified as Forest Reserve and/or Conservation District land. Cattle eat native vegetation, trample roots and seedlings, cause erosion, create disturbed areas into which alien plants invade, and spread seeds of alien plants in their feces and on their bodies. The forest in areas grazed by cattle becomes degraded to grassland pasture, and plant cover is reduced for many years following removal of cattle from an area. Several alien grasses and legumes purposely introduced for cattle forage have become noxious weeds (Tomich 1986; Cuddihy and Stone 1990). Cattle have been eliminated from the Upper Piha GMA, but feral pigs remain a threat to *C. pyrularia* (L. Perry, Division of Forestry and Wildlife, pers. comm. 2006). All domestic cattle grazing was discontinued in the Hakalau Forest NWR between 1989 and 2001, and over 250 feral cattle and 1,000 feral pigs were removed from refuge lands. Eight feral ungulate management units have been completely fenced. The process of removing feral ungulates will continue in all currently fenced management units until eradication has been completed. Fencing and eradication will continue in other areas of the refuge as funding allows (Jeffrey and Horiuchi 2005). In June of 2005, Hakalau NWR received Congressional funding for fencing and feral ungulate removal (Jeffrey and Horiuchi 2005).

Nonnative plant species degrade habitat of and compete with *Clermontia pyrularia* (Factors A and E). At the time of listing the primary nonnative species impacting *C. pyrularia* was *Passiflora mollissima* (banana poka) (59 FR 10307). *Passiflora mollissima*, a vine native to the Andes of South America and first collected in Hawaii in 1926, is a serious pest in mesic forest on the islands of Hawaii, where it overgrows native trees (Wagner *et al.* 1999). It is distributed by feral pigs and other animals that feed on its fruit (Service 1996). Currently, the nonnative plant species *Rubus argutus* (prickly Florida blackberry), *Passiflora mollissima*, *Ehrharta stipoides* (meadow rice grass), and *Pennisetum clandestinum* (kikuyu grass), compete with *C. pyrularia* for space, light, water, and nutrients (Jeffrey and Horiuchi 2005). Weed control is ongoing at fenced areas of Hakalau NWR (Jeffrey and Horiuchi 2005).

Predation on fruits and seeds by black rats (*Rattus rattus*) may limit the successful establishment of new plants (Service 1996) (Factor C). The black rat occurs on all the main Hawaiian Islands around human habitations, in cultivated fields, and in dry to wet forests. Rats are known to eat the fruit and strip the bark of some native plants, particularly fruits of plants in the African violet (Gesneriaceae) family with fleshy stems and fruits (Wagner *et al.* 1985; Tomich 1986; Cuddihy and Stone 1990; Jeffrey and Horiuchi 2005).

In addition to the above threats, species like *Clermontia pyrularia* that are endemic to single islands 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 and disease outbreaks (Factor E). In the past, *C. pyrularia* was pollinated by nectar feeding birds, and its seeds were disseminated by fruit eating birds. Some of these bird species are now extinct, and others have been decimated by mosquito borne diseases, predation by introduced rats, cats and mongooses, competition from introduced birds, and habitat destruction by feral ungulates. As a result, little or no cross pollination takes place and seeds are no longer dispersed. A possible solution to this dilemma is to plant the bird

pollinated and seed dispersed *C. pyrularia* in small areas at relatively high densities intermixed with common native food plants that fruit and flower synchronously with *C. pyrularia* (Jeffrey and Horiuchi 2005). Propagation and seed storage of *C. pyrularia* is conducted at Lyon Arboretum Seed Storage Facility, the Volcano Rare Plant Facility, Hakalau NWR, and at Lyon Arboretum's Micropropagation Facility (Service 2005). Since 1992, 569 individuals of *C. pyrularia* have been outplanted in the Hakalau NWR, with 136 surviving as of 2003. The outplanted individuals were propagated from seeds collected from the wild plants of *C. pyrularia* as well as from seeds collected from outplanted individuals that had matured and fruited (Jeffrey and Horiuchi 2005).

The goals for genetic storage of *C. pyrularia* have been partially met for two populations. The stabilization, downlisting, and recovery goals for this species have not been met and, therefore, *C. pyrularia* meets the definition of endangered as it remains in danger of extinction throughout all of its range.

III. RESULTS

A. Recommended Classification

- ☐ Yes, downlist to Threatened
- ☐ Yes, uplist to Endangered
- ☐ Yes, delist
- ☒ No, no change is needed

B. New Recovery Priority Number N/A

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Search for *Clermontia pyrularia* throughout its historical range, particularly in leeward Mauna Loa, where no wild plants are known to be extant.

- Study *Clermontia 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.
- Formulate a plan to maintain or increase genetic variability of *Clermontia pyrularia*.

V. REFERENCES

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EXPERTS CONSULTED

- Perry, Lyman. 2006. Division of Forestry and Wildlife. Personal communication.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Clermontia pyricularia* (Oha wai)

Current Classification Endangered

Recommendation resulting from the 5-Year Review

Downlist to Threatened

Uplist to Endangered

Delist

X **No change is needed**

Appropriate Listing/Reclassification Priority Number N/A

Review Conducted By

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Date

JUL - 3 2007

Field Supervisor, Fish and Wildlife Service

Approve

Date

Aug 2 2007

Regional Director, Fish and Wildlife Service