# 5-YEAR REVIEW

Short Form Summary

**Species Reviewed**: *Clermontia lindseyana* (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:**

Region 1/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 lindseyana* (USFWS 2015). 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 reviews for *Clermontia lindseyana* published in the Federal Register on August 27, 2010 and August 3, 2015 (available at *https://ecos.fws.gov/docs/five_year_review/doc3333.pdf* and *https://ecos.fws.gov/docs/five_year_review/doc4551.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. lindseyana*.

This short-lived perennial shrub or tree in the Campanulaceae (bellflower) family is endangered. The status and trends for *Clermontia lindseyana* are provided in the tables below.

New Status Information:

- Currently, there are two wild populations on the island of Hawai‘i totaling fewer than 50 individuals (Pi‘ihonua South and Kahuku East) and one population on east Maui at Wai‘ōpai totaling approximately 30 individuals (Plant Extinction Protection Program (PEPP) 2017, 2019; Hawai‘i Volcanoes National Park (HVNP) 2019). The current status of the almost 100 wild individuals at ‘Ōlelomoana, Hakalau National Wildlife Refuge (NWR), Pihā, Kilauea Forest, Kūlani, and Ka‘ū has not been recently reported.
- In 2016, one critical habitat unit in the montane mesic ecosystem was designated for *Clermontia lindseyana* on east Maui (4,440 hectares; 10,972 acres) (81 FR 17790, March 30, 2016).

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. This assessment concluded that *Clermontia lindseyana* is minimally vulnerable to the impacts of climate change, with a vulnerability score of 0.0727 (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—The Hawai‘i Volcanoes National Park (HVNP) monitors wild and reintroduced populations within the Park (HVNP 2019). A game camera was installed to monitor the reintroduced population of *Clermontia lindseyana* at Kahuku and at night rats were observed feeding on flower nectar, while during the day the native ‘i‘iwi were observed visiting the flowers; however, a previous report indicated the birds were nectar-robbing and not effectively pollinating the flowers (Pender 2013). The Division of Forestry and Wildlife (DOFAW) monitors reintroductions within exclosures at Nīnole and Kipāhoehoe. The Plant Extinction Prevention Program (PEPP) monitors the population at Pi‘ihonua South on the island of Hawai‘i and the population at Wai‘ōpai on east Maui (PEPP 2017, PEPP 2019).
- Ungulate monitoring and control—PEPP reports assisting with construction of a 4-hectare (10-acre) exclosure at the outplanting unit at Hakalau NWR (PEPP 2016).
- Captive propagation for genetic storage and reintroduction—
    - In 2015, the Volcano Rare Plant Facility (VRPF) reported 11 plants in inventory representing one founder from Ka‘ū and 84 plants representing five founders from Pihā-Hakalau. In 2016, there were nine plants in inventory representing two founders from Ka‘ū and 77 plants representing four founders from Pihā-Hakalau. In 2017, there were 15 plants

representing two founders from Kaʻū and seven plants representing one founder from Pihā-Hakalau. In 2018, there were 16 plants representing two founders from Kaʻū, 127 plants representing four founders from Kūlani, and 20 plants representing two founders from Pihā-Hakalau. In 2019, there was one plant representing one founder from Kaʻū, five plants representing two founders from Kūlani, and one plant in refugia from Pihā-Hakalau (VRPF 2019).
    - The plant propagation facility at Hakalau NWR reports propagation of more than 3,000 plants representing one founder at Hakalau Nui, and propagation of 1,661 plants representing a second founder, intended for reintroduction at Hakalau Nui (Hakalau NWR 2019).
    - The HVNP plant propagation facility reports propagation of 26 plants representing three founders at Kahuku. In addition, one cutting and seven fruits were collected representing two founders at the Kahuku CCC exclosure (HVNP 2019).
- Reintroduction—
    - PEPP reports assisting with reintroductions at the Kahuku CCC exclosure, the Nīnole exclosure, at the Kukuiopaʻe Cabin site, and at the Cabin Kīpuka in Kipāhoehoe NAR (PEPP 2015, 2017, 2019).
    - In 2014, DOFAW reported reintroduction of 250 *Clermontia lindseyana* representing 11 founders at the State's exclosure at Nīnole (PEPP 2019).
    - In 2015, HVNP planted 725 individuals within the CCC exclosure at Kahuku. Survival four years post-planting was nearly 98 percent. In 2017, an additional 180 individuals were planted at this site. In 2018, 29 plants were reintroduced in the montane area of Kahuku and the exclosure near the CCC cabin. In 2019, seven individuals were planted in the Kahuku Mauka Western Plots (HVNP 2019).
    - In 2015, the VRPF reported reintroduction of six plants representing two founders from Pihā-Hakalau to Laupāhoehoe. In 2016, 98 plants representing six founders from Pihā-Hakalau were reintroduced to Hakalau. In 2017, 153 plants representing 10 founders were reintroduced to Hakalau. In 2018, three plants representing one founder from Kīpāhoehoe was reintroduced at the same location. In 2019, 13 plants representing one founder from Kau were reintroduced to the CCC exclosure at Kahuku, six plants from Kīpāhoehoe were reintroduced to the same location, 273 plants representing five founders from Kūlani were reintroduced to the same location, and 19 plants representing two founders from Pihā-Hakalau were reintroduced to Laupāhoehoe (VRPF 2019).
    - In 2019, Hakalau NWR reported reintroduction of 1,661 plants representing two founders at Hakalau Nui back to the same location (Hakalau NWR 2019).

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

| Date | No. wild individuals | No. outplanted | Downlisting Criteria identified in Recovery Plan | Downlisting Criteria Completed? |
|---|---|---|---|---|
| 1994 (listing) | 125–175 (Hawai‘i) 100–150 (Maui) | 0 | All threats managed in all 5–7 populations | No |
| | | | Complete genetic storage | No |
| | | | 5–7 populations with 300 mature individuals each | No |
| 1996 (recovery plan) | 70–100 (Hawai‘i) 330 (Maui) | 0 | All threats managed in all 5–7 populations | No |
| | | | Complete genetic storage | No |
| | | | 5–7 populations with 300 mature individuals each | No |
| 2003 (critical habitat) | >100 (Hawai‘i) 330 (Maui) | 0 | All threats managed in all 5–7 populations | No |
| | | | Complete genetic storage | No |
| | | | 5–7 populations with 300 mature individuals each | No |
| 2010 (5-year review) | 400–500 Hawai‘i and Maui | 1,267 | All threats managed in all 5–7 populations | No |
| | | | Complete genetic storage | Partially |
| | | | 5–7 populations with 300 mature individuals each | No |

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|---|---|---|---|---|
| 2015 (5-year review) | ca 72–124+ (Hawai‘i)<br>ca 30 (Maui) | 74 | All threats managed in all 5–7 populations | Partially |
| | | | Complete genetic storage | Partially |
| | | | 5–7 populations with 300 mature individuals each | No |
| 2016 (critical habitat) | ca 30 (Maui) | 4 | All threats managed in all 5–7 populations | Partially |
| | | | Complete genetic storage | Partially |
| | | | 5–7 populations with 300 mature individuals each | No |
| **Date** | **No. wild individuals** | **No. outplanted** | ***Preventing Extinction Criteria identified by HPPRCC** | ***Preventing Extinction Criteria Completed?** |
| 2020 (5-year review) | <50 (Hawai‘i)<br>ca 30 (Maui) | >2,250 | All threats managed in all 3 populations | Partially, 5 fenced areas |
| | | | Complete genetic storage | Partially |
| | | | Reproduction (*i.e.* viable seeds, seedlings) at all 3 populations | Partially, observed at one location |
| | | | 3 populations with 50 mature individuals each | No (excluding outplants) |

* 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 lindseyana* and ongoing conservation efforts**.

| Threat | Listing factor | Current Status | Conservation/ Management Efforts |
|---|---|---|---|
| Ungulate degradation of habitat | A | Ongoing | Partial, 5 fenced areas |
| Established ecosystem altering invasive plant species degradation of habitat and competition | A, E | Ongoing | Partial, some nonnative plant control efforts |
| Climate change degradation or loss of habitat | A | Ongoing | None |
| Ungulate predation or herbivory | C | Ongoing | Partial, fencing at nearly all wild and reintroduced populations |
| Rodent predation and herbivory | C | Ongoing | None |
| Slug herbivory | C | Ongoing | None |
| Lack of adequate hunting regulations | D | Ongoing | Partial, 5 fenced areas |
| Reduced viability due to loss of mutualists | E | Ongoing | None |

**Synthesis:**
Currently, there are two wild populations of *Clermontia lindseyana* on the island of Hawai‘i (fewer than 50) and one wild population on Maui (30 individuals). Wild populations at Kukuiopa‘e Forest Reserve, Kilauea Forest and Kūlani area, and Ka‘ū Forest Reserve on the island of Hawai‘i, and the population on east Maui, have not been surveyed for status in more than five years. 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 *Clermontia lindseyana* is minimally vulnerable to the effects of climate change. Five wild and reintroduced populations are provided protection from feral ungulates by fencing. Some nonnative plant control is ongoing within exclosures. Collection and storage of cuttings and seeds is ongoing. At least 27 founders are represented in reintroductions at nine locations on the island of Hawai‘i, totaling more than 2,250 individuals. Some recruitment has been observed at one reintroduction, and survivorship of more than 90 percent is documented for those reintroduced individuals.

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 lindseyana* is a short-lived perennial shrub or 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 the islands of Hawai‘i and Maui where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., seeds, seedlings, saplings), with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have been partially met. Although there have been over 2,250 individuals reintroduced, mature outplanted individuals are not included in the population structure, but rather only mature plants at wild populations or mature plants from filial generations at reintroductions. There are no wild populations with at least 50 reproducing inviduals (Table 1). Natural recruitment has been observed at only one population. Genetic representation for the wild populations is partially complete, and not all threats are being managed for wild and reintroduced populations (Table 1, Table 2). Therefore, *Clermontia lindseyana* meets the definition of Endangered as it remains in danger of extinction throughout its range.

**Recommendations for Future Actions:**
There are no new threats or other significant new information regarding the species' biological status since the last 5-year review in 2015. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—Survey geographical and historical range for a current assessment of the species' status.
- Ungulate monitoring and control—Continue to maintain existing fences and fence remaining populations to protect individuals from the negative impacts of feral ungulates.
- Invasive plant monitoring and control—Eradicate invasive introduced plants within ungulate exclosures and maintain exclosures free of invasive plants.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for its recovery.

- Predator and herbivore monitoring and control—Develop and implement effective control methods for slugs at populations where slug herbivory is observed. Implement effective control methods for rats within the vicinity of all known *C. lindseyana* 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 identify suitable reintroduction sites and establish new populations and augment wild populations on Maui and the island of Hawai‘i.
- Population viability monitoring and analysis—Determine population structure, vigor, demography, and phenology to develop recovery strategies for the taxon.
- Alliance and partnership development—Continue to work with the Hawaii Division of Forestry and Wildlife, Hawaii Volcanoes National Park, and other partners and land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

**References:**

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[Hakalau NWR] Hakalau National Wildlife Refuge. 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, Hawai‘i.

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[PEPP] Plant Extinction Prevention Program. 2015. 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.

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[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, Hawai‘i.

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

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