5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Colubrina oppositifolia* (kauila)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2019. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 91 species in Oregon, Washington, Hawaii, and American Samoa. Federal Register 84(112): 27152–27154, June 11, 2019.

Lead Region/Field Office:

Interior Region 12/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 2020. The review was based on a review of current, available information since the last 5-year review for *Colubrina oppositifolia* (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 *Colubrina oppositifolia* in the Federal Register on August 2, 2011 and July 23, 2015 (available at *https://ecos.fws.gov/docs/five_year_review/doc3823.pdf* and *https://ecos.fws.gov/docs/tess/species_nonpublish/2261.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. oppositifolia*.

This long-lived perennial tree in the Rhamnaceae (buckthorn) family is endangered and endemic to O‘ahu, Maui, and Hawai‘i. The status and trends for *Colubrina oppositifolia* are provided in the tables below.

New Status Information:

- In 2012, critical habitat was designated for *Colubrina oppositifolia* on Oʻahu in three units in the lowland mesic ecosystem (2,373 hectares [ha], 5,864 acres [ac]) (77 FR 57648, September 18, 2012). In 2016, critical habitat was designated for *C. oppositifolia* on Maui in six units in the lowland dry and lowland mesic ecosystems (7,472 ha, 18,466 ac) (77 FR 34464, June 11, 2012; 81 FR 17790, March 30, 2016).
- In 2017, the wild plant at Hanakaʻōʻō, Maui, had died (PEPP 2017). Currently, on Maui, there is one individual of *Colubrina oppositifolia* at Honokōwai (PEPP 2020). On Oʻahu, wild individuals were last observed at Palikea Gulch in 2007 (1 individual), Manuwai Gulch in 2020 (16 individuals), Kaomoku Iki gulch in 2003 (3 individuals), and Makaleha in 2012 (13 individuals). On the island of Hawaiʻi, there are between 681 and 739 individuals of *C. oppositifolia* at Puʻuwaʻawaʻa (Department of Land and Natural Resources [DLNR] 2015, pp. 56–57, 101). The current status of plants at Manukā Natural Area Reserve (NAR) is not reported. There are at least 32 outplanted individuals planted on Oʻahu at 3 locations and an additional 12 individuals in *ex situ* or *inter situ* collections at Koko Crater Botanical Garden and Wai'anae Kai (PEPP 2019; 2021, in litt.). On the island of Hawaiʻi, there are more than 100 individuals reintroduced at Puʻuwaʻawaʻa, Kaʻūpūlehu, and Palamanui (PEPP 2019; Kaʻūpūlehu Dryland Forest Reserve 2019; Palamanui Preserve 2019).

New Threats:

- Fortini et al. (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi 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 concluded that *Colubrina oppositifolia* is vulnerable to the impacts of climate change with a vulnerability score of 0.33 (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 Plant Extinction Prevention Program (PEPP) surveys and monitors the wild and reintroduced populations on Oʻahu, Maui, and Hawaiʻi (PEPP 2016, 2017, 2019, 2020).
    - The Nature Conservancy (TNC) provides access to PEPP to survey Kapunakea Preserve for rare plants (TNC 2015, p. 2).
- Ungulate monitoring and control—Fenced areas include Kapuna, Pahole, and Manuwai on Oʻahu and at the Kauila-Hala pepe, Lama Kokiʻo, and Puʻu Loa units of Puʻuwaʻawaʻa on the island of Hawaiʻi (PEPP 2016; DLNR 2015, p. 101).
- Invasive nonnative plant control—

    - PEPP conducts nonnative plant control at both wild and reintroduced Maui occurrences of *C. oppositifolia*; and at the wild and reintroduced populations at Hanakaʻōʻō (Maui) and Keaʻau (Oʻahu) (PEPP 2016, 2017).
    - The State's Native Ecosystems Protection and Management (NEPM) program manages a 1-acre fenced site at Upper Kapuna on Oʻahu (ANRP 2020, p. 75).
- Control of predation and herbivory by nonnative invertebrates—PEPP reported application of pesticide to protect the remaining wild individual at Honokōwai (Maui) from predation by invertebrates (PEPP 2020).
- Collection and propagation—
    - Lyon Arboretum Seed Conservation Laboratory reported storage of 37 seeds representing one founder from Kaʻūpūlehu Mauka (Hawaiʻi) and more than 8,000 seeds representing founders from cultivated collections of Makaleha stock on Oʻahu (Lyon Arboretum 2020).
    - PEPP reports air-layering of one wild plant at Hanakaʻōʻō (Maui) (PEPP 2016).
    - NEPM reported propagation of 36 plants representing 14 founders at Manuwai, Oʻahu (NEPM Nursery 2020).
    - In 2016, Kaʻūpūlehu Dryland Forest Reserve reported propagation of 10 plants representing one founder west of the Hale and 18 plants representing one plant from Malama Trail. In 2017, seven plants were propagated (Kaʻūpūlehu 2019).
    - In 2013, the Olinda Rare Plant Facility (ORPF) reported propagation of one plant representing one founder from Honokōwai, Maui (ORPF 2020).
    - The Volcano Rare Plant Facility (VRPF) reported propagation of 63 plants representing nine founders from Manukā NAR (Hawaiʻi) and collection of more than 3,000 seeds as well as plants representing 16 founders from Puʻuwaʻawaʻa (VRPF 2020).
    - Between 2013 and 2018, Waimea Arboretum reported propagation and storage of 11 plants sourced from one wild founder each from Oʻahu and Hawaiʻi (Waimea Arboretum 2013, 2014, 2015, 2017, 2018).
- Reintroduction—
    - The USDA Forest Service reported outplanting of 101 plants representing six founders, 75 of which survive, and collection of 596 seeds from those plants (Cordell 2019). Spider mites destroyed 65 individuals out of 165 that had germinated. The reintroduction at the State's Uhiuhi (44 individuals) and Hauaina Enclosure (57 individuals) have a 73 percent success rate.
    - In 2016, PEPP reported reintroduction of two plants at Keaʻau (Oʻahu) and 14 plants to a new site at Waiʻanae Kai (Oʻahu) (PEPP 2016). By 2017, two of the three reintroduced plants at Honokōwai had died, and by 2020, all plants had died (PEPP 2017, 2020). In 2019, PEPP reintroduced 12 plants at Kāʻawa Gulch (Oʻahu) and 50 individuals at Puʻuwaʻawaʻa (Hawaiʻi) (PEPP 2019).

- NEPM reported reintroduction of 14 plants at Manuwai in 2019 (NEPM Nursery 2020).
- Ka‘ūpūlehu Dryland Forest Reserve reported outplanting of 25 individuals of *C. oppositifolia* at three locations within the reserve in 2017 (Ka‘ūpūlehu 2019).
- Between 2015 and 2019, 38 individuals of *C. oppositifolia* were outplanted at Palamanui (Palamanui Preserve 2014-2019).
- The VRPF reported 120 plants sent out for reintroduction representing 22 founders from Pu‘uwa‘awa‘a (VRPF 2020).

- Propagation research—PEPP is partnering with Maui Nui Botanical Garden in air-layering trials for *C. oppositifolia* (TNC 2015, p. 2).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 (listing)	94 (O‘ahu) 185–205 (Hawai‘i)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	Unknown
1996 (recovery plan)	Unknown (O‘ahu) 1 (Maui) 185–205 (Hawai‘i) estimated total ca 300	64	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Yes
2003 (critical habitat)	61 (O‘ahu) 1 (Maui) <500 (Hawai‘i)	Unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Unknown

			3 populations with 25 mature individuals each	Unknown
2011 (5-year review)	26–60 (O‘ahu) 2 (Maui) 1,435–1,740 (Hawai‘i)	several dozen	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Partially
2012 (critical habitat, O‘ahu)	ca 50 (O‘ahu)		All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Partially
2015 (5-year review)	54 (O‘ahu) 2 (Maui) 1,190–1,209 (Hawai‘i)	44 (O‘ahu) ca 400 (Hawai‘i)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Partially
2016 (critical habitat, Maui Nui)	2 (Maui)	3 (Maui)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Partially, none on Maui

Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2021 (5-year review)	16 (O‘ahu) 1 (Maui) 681–739 (Hawai‘i)	60 planted, 32 remain (O‘ahu) 3, none remain (Maui) >100 (Hawai‘i)	All threats managed in all 3 populations	Partially, ungulate exclosures on O‘ahu and Hawai‘i, some nonnative plant control
			Complete genetic storage	Partially, 19 founders from 5 sites (O‘ahu), complete (Maui), ~20 founders from 2 sites (Hawai‘i)
			Reproduction (*i.e.* viable seeds, seedlings, saplings) at all 3 populations	No
			3 populations with 25 mature individuals each	Partially, one population >25 (Hawai‘i)

* 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 *Colubrina oppositifolia* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, ungulate exclosures on O‘ahu and Hawai‘i
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant control within exclosures and at reintroductions
Drought destruction and degradation of habitat	A	Ongoing	Partial, attempts to increase redundancy via reintroductions

Fire destruction and degradation of habitat	A	Ongoing	Partial, fire management plan for military training area on O‘ahu
Predation and herbivory by invertebrates	C	Ongoing	Partial, some pesticide treatment
Predation and herbivory by rats	C	Ongoing	None
Climate change degradation or loss of habitat	E	Ongoing	None

Synthesis:
Currently, the largest number of wild individuals is in one location on the island of Hawai‘i; there is 1 wild individual remaining on Maui, and 16 reported on O‘ahu. Ungulate exclosures on O‘ahu and Hawai‘i protect four populations. Nonnative plant control is ongoing within ungulate exclosures and at reintroduction sites. Invertebrate control is conducted at one location. Seeds and propagules are in storage representing more than 40 founders. Air-layering is being tested as an alternate method of propagation.

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.

Colubrina oppositifolia is a long-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 that are well managed. In addition, a minimum of three populations should be documented 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 25 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are no populations on O’ahu or Maui with 25 reproducing trees, and two populations of 681–739 individuals on the island of Hawai‘i. Propagation and reintroduction are ongoing; however, there is no natural recruitment. Genetic storage goals are close or complete for O’ahu and Maui, but not for the large Hawai’i population. In addition, not all threats are

being managed (Table 2). Therefore, *Colubrina oppositifolia* 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 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 2021.

- Surveys and inventories—Continue to survey geographical and historical range for a current assessment of the species' status, especially in areas where the taxon was recently extirpated.
- Ungulate monitoring and control—Continue to monitor and maintain exclosures and construct additional exclosures or strategic fencing where possible to protect all occurrences.
- Invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species at all occurrences.
- Fire monitoring and control—Continue to develop and implement fire prevention management plans for sites with known occurrences.
- Rat control—Continue to implement effective rat control methods at populations when necessary.
- Invertebrate control—Develop and implement effective invertebrate controls, especially for the black twig borer.
- Captive propagation for genetic storage and reintroduction—Continue collection of genetic resources for storage, propagation, and reintroduction.
- Reintroduction and translocation—Continue reintroduction into suitable habitat within historical range with protection from threats.
- Alliance and partnership development—Continue to work with partners and other land managers in planning and implementation of ecosystem-level restoration and management to benefit this taxon.

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[TNC] The Nature Conservancy. 2015. Hawai‘i Operating Unit. 2015 Kapunakea Preserve, west Maui, Hawai‘i final long-range management plan fiscal years 2016-2021. Submitted to the Department of Land & Natural Resources Natural Area Partnership Program. 38 pp.

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Colubrina oppositifolia*
(kauila)

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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