5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Isodendrion laurifolium* (aupaka)

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 *Isodendrion laurifolium* (USFWS 2017). 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 *Isodendrion laurifolium* in the Federal Register on July 21, 2009, August 19, 2013, and September 14, 2017 (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1410.pdf*, *https://ecos.fws.gov/docs/tess/species_nonpublish/2079.pdf*, and *https://ecos.fws.gov/docs/tess/species_nonpublish/2453.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 *I. laurifolium*.

This short-lived perennial shrub in the Violaceae (violet) family is endangered and occurs on Kaua‘i and O‘ahu. The status and trends for *Isodendrion laurifolium* are provided in the tables below.

New Status Information:

- In 2012, critical habitat was designated on Oʻahu for *Isodendrion laurifolium* in 15 units in the lowland mesic and dry cliff ecosystems (6,321 hectares [ha], 15,617 acres [ac]) (77 FR 57648, September 18, 2012).
- In 2017, the Plant Extinction Prevention Program (PEPP) elevated the rank of *Isodendrion laurifolium* on Kauaʻi to "POP," making it a potential PEP species (likely to reach fewer than 50 individuals in the wild) (PEPP 2017).
- Currently, on Oʻahu, there are three recently monitored populations at Mākaha (estimated to be as many as 50 individuals in 2016), Waiʻanae Kai (four to five individuals in 2011), and at Pahole (two wild individuals in 2018). On Kauaʻi, there are five monitored locations, one at Miloliʻi (including Poʻopoʻoiki, Kuʻia, and Paʻaiki) and two at Mākaha, totaling fewer than 20 individuals (PEPP 2017; 2019).

New Threats:

- None reported.

New Management Actions:

- Surveys and monitoring—The Plant Extinction Prevention Program (PEPP) and the Army's Natural Resources Program (ANRP) monitor and survey populations in the Waiʻanae mountains of Oʻahu, and PEPP monitors populations on Kauaʻi (PEPP 2017, 2018, 2019).
- Nonnative plant control—PEPP and the ANRP collaborate with other agencies for nonnative plant control at Pahole and Mākaha (Oʻahu) (PEPP 2018).
- Collection and propagation for genetic storage and reintroduction—
    - In 2020, the Lyon Arboretum Micropropagation Laboratory reported storage of 35 explants representing one founder from Mākaha, Oʻahu (Lyon Arboretum 2020). In 2016, the Lyon Arboretum Seed Conservation Laboratory reported storage of 186 seeds representing 31 founders from two populations at Mākaha on Oʻahu; in 2018, there were five seeds in storage representing one founder from Kaʻawa Gulch (Oʻahu) and 76 seeds in storage from four plants in a living collection at Koko Crater Botanical Garden that represents the Mākaha population (Oʻahu) (Lyon Arboretum 2020).
    - The Pahole Rare Plant Facility (PRPF; Oʻahu) reported between 49 and 73 plants in storage representing five founders from Mākaha, two founders from Waiʻanae Kai, and one founder from an unspecified location (Oʻahu) (Native Ecosystems Protection and Management [NEPM] 2020; PRPF 2019).
- Reintroduction and translocation—On Kauaʻi, one individual was reintroduced in 2018 within an exclosure at Miloliʻi-Upper Mahanaloa (PEPP 2019). On Oʻahu, there is one reintroduced population (in 2014) at Mākaha-Kūmaipō of 43 individuals and two reintroduced populations at Pahole gulch (12 individuals in 2015 and 47 individuals in 2019), and one outplanted population of five individuals at Waiʻeli (Oʻahu) (PRPF 2019; PEPP 2019).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 (listing)	130–140 (Kauaʻi) 60–70 (Oʻahu)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1999 (recovery plan)	130–140 (Kauaʻi) 60–70 (Oʻahu)	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat-Oʻahu)	22–23 (Oʻahu)	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2009 (5-year review)	50+ (Kauaʻi) 22–23 (Oʻahu)	2 (Kauaʻi)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals	Unknown
2012 (critical habitat-Oʻahu)	22–23 (Oʻahu)	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals	No
2013 (5-year review)	ca 150 (Kauaʻi) 69 (Oʻahu)	1 remains (Kauaʻi)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially

			3 populations with 50 mature individuals	Unknown
2017 (5-year review)	130–142 (Kauaʻi) 82 (Oʻahu)	62 (Oʻahu)	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			Natural reproduction at all 3 populations	Unknown
			3 populations with 50 mature individuals	Partially
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2021 (5-year review)	< 20 monitored (Kauaʻi) 50+ monitored (Oʻahu)	1 (Kauaʻi) 47 (Oʻahu)	All threats managed in all 3 populations	Partial, 3 populations on Kauaʻi within exclosures, 2 populations on Oʻahu within exclosures; nonnative plant control at exclosures; fire management
			Complete genetic storage	Partially, >30 founders from Oʻahu represented; 3 founders from Kauaʻi represented
			Natural reproduction at all 3 populations	None reported
			3 populations with 50 mature individuals each	No

* 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 *Isodendrion laurifolium* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, 5 populations within exclosures
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, some nonnative plant control within exclosures
Degradation and destruction by fire	A	Ongoing	Partial, fire management plan for military training areas
Degradation and destruction by landslides	A	Ongoing	None
Predation and herbivory by rats	C	Ongoing	Partial, rat trapping grid at Mākaha
Reduced viability due to low numbers	E	Ongoing	Partial, seed collection, propagation, and reintroduction
Climate change	E	Ongoing	None

Synthesis:
Currently, on Oʻahu, there are three recently monitored wild populations at Mākaha, Waiʻanae Kai, and at Pahole, totaling a little more than 50 individuals, and on Kauaʻi, there are five monitored populations totaling fewer than 20 individuals. Seed collections are ongoing and more than 30 founders total from Oʻahu populations and three founders from Kauaʻi are represented. More than 100 plants have been reintroduced, including almost 50 within the last five years; mostly on Oʻahu. Exclosures protect three wild and/or reintroduced populations on Kauaʻi and two on Oʻahu from feral ungulates and nonnative plant control is conducted within exclosures.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Multi-Island Plants (USFWS 1999) and have been updated according to the draft revised recovery objective guidelines developed by the Hawaiʻi 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.

Isodendrion laurifolium is a short-lived perennial 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 that are well managed. In addition, a minimum of a total of three populations should be documented on O‘ahu and/or Kaua‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings), with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are approximately 100 monitored wild individuals remaining on Kaua‘i and O‘ahu, and numbers are declining. Genetic representation is incomplete (Table 1). Not all threats are being addressed (Table 2). Therefore, *Isodendrion laurifolium* 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 2017. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2021.

- Surveys and inventories—Survey current and historical range for a complete assessment of the species’ status.
- Ungulate monitoring and control—Continue to construct exclosures to protect all occurrences from the impacts of feral ungulates, including browsing.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species at all wild and reintroduced populations.
- Fire monitoring and control—Implement fire management plan for military training areas and develop and implement fire management plans for all wild and reintroduced populations at other locations.
- Predator and herbivore monitoring and control—Implement effective measures to control rodents at all populations.
- Captive propagation for genetic storage and reintroduction—Continue collection of genetic resources for storage, propagation, and reintroduction into managed suitable habitat.
- Reintroduction and translocation—
    - Continue reintroductions and augmentations into suitable habitat within historical range in areas that are managed for known threats.
    - Monitor reintroductions for successful recruitment.
    - Increase numbers of populations and individuals to reduce impacts from landslides and erosion.
- Population biology research—
    - Assess genetic variability within extant populations.
    - Determine viable population size and structure, geographical distribution, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

- Climate change adaptation strategy—Research suitability of habitat for reintroduction of this species in the future due to impacts of climate change.
- 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.

References:

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

Lyon Arboretum. 2020. 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.

[NEPM] Natural Resources Protection and Management. 2020. 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.

[PRPF] Pahole 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.

[PEPP] Plant Extinction Prevention Program. 2017. Plant Extinction Prevention Program FY 2017 Annual Report (Oct 1, 2016-Sep 30, 2017), Coop Agreement: F14A00174, U.S. Fish and Wildlife Service CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, 235 pp.

[PEPP] 2018. Plant Extinction Prevention Program, annual recovery subpermit FWSPIFWO-26 report (January 1st, 2018–December 31st 2018), as designated under the U.S. Endangered Species Act. Unpublished report submitted to U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 49 pp.

[PEPP] 2019. Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), US FWS CFDA Program #15.657; Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Manoa, PCSU, PEPP. 192 pp. + appendices.

[USFWS] U.S. Fish and Wildlife Service. 1999. Recovery plan for the Multi-Island Plants. USFWS Region 1, Portland, OR. 206 pp. + appendices.

[USFWS] 2009. *Isodendrion laurifolium* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/1410.pdf.*

[USFWS] 2012. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species. 77 FR 57648, September 18, 2012.

[USFWS] 2013. *Isodendrion laurifolium* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/2079.pdf.*

[USFWS] 2017. *Isodendrion laurifolium* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/2453.pdf.*

[USFWS] 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.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Isodendrion laurifolium*
(aupaka)

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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