

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Isodendron laurifolium* (Aupaka)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2015. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 133 species in Hawaii, Oregon, Idaho, and Washington. Federal Register 80(30): 8100–8103.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Cheryl Phillipson, Biologist, PIFWO

Lauren Weisenberger, Plant Recovery Coordinator, PIFWO

Gregory Koob, 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 (USFWS) beginning in January 2016. The review was based on a review of current, available information since the last 5-year review for *Isodendron laurifolium* (USFWS 2013). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Gregory Koob, 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 *Isodendron laurifolium* published in the Federal Register on July 21, 2009 (USFWS 2009, available at http://ecos.fws.gov/docs/five_year_review/doc2475.pdf) and on August 19, 2013 (USFWS 2013, available at https://ecos.fws.gov/docs/five_year_review/doc4219.pdf) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species biological status has come to light since listing to warrant a change in the Federal listing status of *Isodendron laurifolium*.

This short-lived perennial shrub in the Violaceae family is endangered and occurs on Kauai and Oahu. The current status and trends for *Isodendron laurifolium* are provided in the tables below.

New Status Information:

- *Isodendrion laurifolium* has been found on Kauai at Makaha (ca 70 individuals), Paaiki (one individual), Poopooiki (one individual), Kawaiula (nine individuals), Kalalau (one individual), Kuia drainage (nine individuals), Nualolo (one individual), and on Waialae Trail (ca 50 individuals) (NTBG 2013a, 2014a-f, 2015a-e, 2016a-d). In 2015, Wood *et al.* reported 9 “subpopulations” (considered “populations” by USFWS) on Kauai totaling 130 individuals (Wood *et al.* 2015). This is a decline from the last five year review. On Oahu, *I. laurifolium* is reported from the Waianae Mountains at Makaha (58 individuals), Waianae Kai (12 individuals), and Pahole (12 individuals) (PEPP 2017).

New Threats:

- Climate change loss or degradation of habitat—Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaii 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 *Isodendrion laurifolium* is extremely vulnerable to the impacts of climate change with a vulnerability score of 0.843 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions are needed to conserve this taxon into the future.

New Management Actions:

- Captive propagation for genetic storage and reintroduction—Seed collection and plant propagation for Oahu populations is ongoing and almost complete with over 2,000 seeds in storage from 51 founders. PEPP also has 19 plants from nine different collections growing at the Pahole Rare Plant Facility (Lyon Arboretum 2017). There are three seed collections that have been made over the last few years from plants on Kauai (NTBG 2017).
- Reintroduction and translocation—There is an outplanting on Oahu of approximately 40 individuals (PEPP 2017). On Kauai, there are about 25 individuals in three separate exclosures (HBMP 2010; PEPP 2012, 2013, 2014).
- Fire monitoring and control—On Oahu, the Waianae Mountains Watershed Partnership is controlling nonnative plant species and growing a native plant fuel break in Waianae Kai to reduce the risk of wildfires.
- Predator and herbivore monitoring and control—On Oahu, the Oahu Army Natural Resources Program (OANRP) is controlling ungulates and rats within fenced exclosures at Makaha (U.S. Army 2016).

Synthesis:

Currently, there are nine populations on Kauai, and three on Oahu. These populations total about 212 individuals, with the majority of individuals on Kauai. A landscape-based assessment of climate change vulnerability for native plants of Hawaii using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *Isodendrion laurifolium* is extremely vulnerable to the effects of climate change. Seed storage and propagation efforts are ongoing, with individuals outplanted in managed areas.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Addendum to 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 Hawaii 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 determination 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.

Isodendron laurifolium is a short-lived perennial shrub. To prevent extinction, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and have 50 individuals from each of three populations represented in an *ex situ* (at other than the plant's natural location, such as a nursery or seed bank) collection. In addition, a minimum of three populations should be documented on Kauai 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 individuals per population.

The preventing extinction goals for this species have not been met, genetic representation is incomplete (Table 1), and all threats are not being sufficiently managed throughout the range of the species (Table 2). While there may be three populations with 50 or more individuals (50, 58, 70), it is unclear how many of those plants are mature. Therefore, *Isodendron laurifolium* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

The following recommendations for future actions are reiterated for the 5-year review in 2017.

- Surveys and inventories—Survey geographical and historic range for a thorough current assessment of the species.
- Ungulate monitoring and control—Continue to construct enclosure fences to protect individuals from the adverse impacts of feral ungulates. Continue to protect all occurrences against habitat disturbances from feral ungulates.
- Invasive plant monitoring and control—
 - Control established ecosystem-altering nonnative invasive plant species around all populations.
 - Control invasive nonnative species that compete with the species around all populations.
- Captive propagation for genetic storage and reintroduction—Continue collection of material to increase the *ex situ* stocks of the species.
- Reintroduction and translocation—Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species. Augment current natural populations to increase numbers of individuals.
- Predator and herbivore monitoring and control—Implement effective measures to control rodents around all populations.

- Fire monitoring and control—Develop and implement fire management plans for all wild and reintroduced populations, including populations impacted by fire from military training. Continue to control fire-stimulating nonnative plant species within fenced exclosures
- Genetic research—Assess genetic variability within extant populations.
- Stochastic events—Build resilience and redundancy—Increase numbers of populations and individuals scattered through historic range to reduce impacts from landslides and erosion.
- Population biology research—Study *Isodendrion laurifolium* populations to determine viable population size and structure, geographical distribution, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

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)	190–210	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
1999 (recovery plan)	190–210	0	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	164–177	0	All threats managed in all three populations	Partially
			Complete genetic storage	Partially

			Three populations with 50 mature individuals each	No
2009 (5-year review)	164–177		All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	Unknown
2013 (5-year review)	219	64	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	Unknown
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2016 (5-year review)	130 (Kauai) 82 (Oahu)	65	All threats managed in all three populations each	No
			Complete genetic storage	Partially**
			Reproduction (<i>i.e.</i> viable seeds, seedlings) at all three populations	Unknown
			Three 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 after Preventing Extinction).

**The Oahu plants have 51 founders represented, but only three Kauai plants are represented.

Table 2. Threats to *Isodendron laurifolium* and conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	None
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	None
Landslides and flooding loss or degradation of habitat	A	Ongoing	None
Climate change loss or degradation of habitat	A	Ongoing	None
Predation or herbivory by rats	C	Ongoing	None
Human disturbance—Fire mortality or reduced viability	E	Ongoing	Partial, fire management plan in place for Oahu
Stochastic events—Reduced viability due to low numbers	E	Ongoing	Partial, seed collection and propagation efforts

References:

See previous 5-year reviews in 2009 and 2013 for a full list of references. Only references for new information are provided below.

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.

[HBMP] Hawaii Biodiversity and Mapping Program. 2010. Element occurrence records for *Isodendron laurifolium*. 56 pp.

[HPPRCC] Hawaii and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 12 pp.

Lyon Arboretum. 2017. Micropropagation and Seed Conservation Laboratories and Pahole Rare Plant Facility controlled propagation database.

[NTBG] National Tropical Botanical Garden. 2013a. NTBG database herbarium specimen detail for *Isodendron laurifolium*. No number, 4 DEC 2013.

[NTBG] 2013b. NTBG database herbarium specimen detail for *Isodendron laurifolium*. 069558, 29 JAN 2014.

[NTBG] 2014a. NTBG database herbarium specimen detail for *Isodendron laurifolium*. 069558, 29 JAN 2014.

- [NTBG] 2014b. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. No number, 28 FEB 2014.
- [NTBG] 2014c. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. No number, 28 FEB 2014.
- [NTBG] 2014d. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. No number, 4 MAR 2014.
- [NTBG] 2014e. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. No number, 4 MAR 2014.
- [NTBG] 2014f. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. No number, 10 JUN 2014.
- [NTBG] 2015a. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 30 MAY 2015.
- [NTBG] 2015b. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 6 SEP 2015.
- [NTBG] 2015c. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 18 SEP 2015.
- [NTBG] 2015d. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 18 SEP 2015.
- [NTBG] 2015e. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 6 NOV 2015.
- [NTBG]. 2016a. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 28 JUL 2016.
- [NTBG]. 2016b. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 26 SEP 2016.
- [NTBG]. 2016c. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 13 OCT 2016.
- [NTBG]. 2016d. NTBG database herbarium specimen detail for *Isodendrion laurifolium*. no number, 27 OCT 2016.
- [NTBG]. 2017. NTBG controlled propagation report.
- [PEPP] Plant Extinction Prevention Program. 2012. Annual report fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pp.

- [PEPP] 2013. Annual report fiscal year 2013 (July 1, 2012-June 30, 2013). 207 pp.
- [PEPP] 2014. Annual report fiscal year 2014 (July 1, 2013-June 30, 2014). 185 pp.
- [PEPP] 2015. Annual report fiscal year 2015 (July 1, 2014-June 30, 2016). 179 pp.
- [PEPP] 2016. Hawaii Department of Land & Natural Resources, DOFAW rare plant program, section 6 interim performance report, F15AF00595, Plant Extinction Prevention Program annual report Fiscal Year 2016 (July 1, 2015-June 30, 2016). 53 pp.
- [PEPP]. 2017. Species status updates report. February 2017.
- [US Army] U.S. Army. 2016. Status report for the Makua and Oahu implementation plans. October 2016. http://manoa.hawaii.edu/hpicesu/DPW/2016_YER/default.htm.
- [USFWS] U.S. Fish and Wildlife Service. 2009. *Isodendron laurifolium* 5-year review summary and evaluation. http://ecos.fws.gov/docs/five_year_review/doc2475.pdf.
- [USFWS] 2012. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. 77 FR 57648, September 18, 2012.
- [USFWS] 2013. *Isodendron laurifolium* 5-year review summary and evaluation. https://ecos.fws.gov/docs/five_year_review/doc4219.pdf.
- [USFWS] 2015. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 133 species in Hawaii, Oregon, Idaho, and Washington. 80 FR 8100, February 13, 2015.
- Wood, K., W. Kishida, and M.J. Keir. 2015. *Isodendron laurifolium*. The IUCN Red List of Threatened Species 2015: e.T80091402A80091437, <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T80091402A80091437.en>.

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
