

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. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 58 species in Washington, Oregon, California, and Hawaii. Federal Register 75(226):71726-71729.

Lead Region/Field Office:

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

Name of Reviewer(s):

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Methodology used to complete this 5-year review:

This review was conducted by staff of the PIFWO of the U.S. Fish and Wildlife Service (USFWS), beginning on January 31, 2012. The review was based on a review of current, available information since the last five-year review for *Isodendrion laurifolium* (USFWS 2009). The National Tropical Botanical Garden provided an initial draft of portions of the five-year review and recommendations for conservation actions needed prior to the next five-year review. The document was reviewed by the Plant Biologists, Island Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

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 review for *Isodendrion laurifolium* published on July 31, 2009 (available at http://ecos.fws.gov/docs/five_year_review/doc2475.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 *I. laurifolium*.

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

New status information:

- In 2010, a population of 10 individuals of *Isodendrion laurifolium* in Makaha Valley was found on Kauai at an elevation of 747 meters (2,451 feet) (National Tropical Botanical Garden [NTBG] 2010). In 2012, four individuals were monitored in the Paaiki enclosure on Kauai (Plant Extinction Prevention Program [PEPP] 2012). The numbers on this island remain around 150 individuals in 13 or fewer populations, similar to what was reported in the last five-year review.
- Currently, the Oahu Plant Extinction Prevention Program (PEPP) and the Oahu Army Natural Resource Program (OANRP) staff are monitoring the three populations of *Isodendrion laurifolium* located on Oahu. At Makaha there are 56 individuals, but the number of mature individuals is unknown. At Waianae Kai there are 11 individuals, and at Palikea Gulch there are two mature individuals. No other populations have been observed recently on Oahu (OANRP 2012a; Oahu PEPP 2012; S. Ching, PEPP, pers. comm. 2012a, 2012b; M. Keir, OANRP, pers. comm. 2012). The numbers represent an increase from 22 to 23 individuals reported on Oahu in the last five-year review, but a decrease in populations from five to three.

Populations of *Isodendrion laurifolium* appear to have fluctuated since the last five-year review, with fewer populations but an increase from 164 to 219 individuals.

New threats:

- Climate change - Climate change may pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative (PICCC) funded climate modeling that will help resolve these spatial limitations. High spatial resolution climate outputs are expected to be available sometime in 2013.

New management actions:

- Captive propagation for genetic storage and reintroduction
 - PEPP coordinators have been monitoring populations and collecting propagules (PEPP 2011). Four seeds were collected from one of the three individuals located at Paaiki on Kauai and sent to Harold L Lyon Arboretum's micropropagation lab (Kishida 2012).
 - In 2012, the Harold L. Lyon Arboretum (2012) had approximately 1,045 seeds in seed storage and 52 individuals in micropropagation for *Isodendrion laurifolium*.
 - Seeds from the Makaha population have been collected for genetic storage (OANRP 2012b; Oahu PEPP 2012; S. Ching, pers. comm. 2012a, 2012b; M. Keir, pers. comm. 2012).
 - One of the two individuals located at Palikea Gulch is represented at the OANRP nursery (OANRP 2012b; Oahu PEPP 2012; S. Ching, pers. comm. 2012a, 2012b; M. Keir, pers. comm. 2012).

- Two individuals are currently growing at NTBG on Kauai (NTBG 2012). In 2012, one fruit was collected at Paaiki on Kauai and sent to the Kauai Division of Forestry and Wildlife facility (PEPP 2012).
- Ungulate exclosures
 - Individuals located at Paaiki on Kauai are protected by a deer-proof fence (Kishida 2012).
 - The Makaha sites on Oahu are fenced but the Palikea Gulch site is not fenced (OANRP 2012b).
- Reintroduction / translocation - A single healthy reintroduced individual remains in Paaiki at 669 meters (2,174 feet) elevation (NTBG 2011; Perlman 2012; Kishida 2012).

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Isodendrion laurifolium* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (e.g., fenced, weeding, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on Oahu and Kauai where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have not been met, as no population containing more than 50 mature individuals (Table 1) and all threats are not being sufficiently managed (Table 2). Therefore, *Isodendrion laurifolium* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Captive propagation for genetic storage and reintroduction
 - Collect cuttings or seed from tagged individuals, recording maternal source.
 - Continue to collect seeds from all existing populations.
- Reintroduction / translocation
 - Determine which sites are least invaded by invasive introduced plant species and which appear to have the highest likelihood of maintaining new reintroductions.
 - Continue to reintroduce the species back into its known historical range.
- Ungulate exclosures
 - Construct ungulate-proof fenced exclosures around each population and monitor the fences for any signs of breaching.
 - Protect all populations against disturbances from feral ungulates.
- Ecosystem-altering invasive plant species control – Control invasive introduced plant species around all populations.
- Predator / herbivore control - Implement effective control methods for rodents.

- Surveys / inventories - Survey geographical and historical range for a thorough current assessment of the species status.
- Threats research
 - Develop and implement effective measures to reduce the impact of landslides and flooding and military activities.
 - Assess the modeled effects of climate change on this species, and use results to determine future landscape needed for the recovery of the species.
- Fire protection - Develop and implement fire management plans for all wild and reintroduced populations.
- Alliance and partnership development - Initiate planning and contribute to implementation of ecosystem-level management and restoration to benefit this species.
- Genetics research - Assess genetic variability within extant populations.
- Population biology research - Study *Isodendrion laurifolium* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (listing)	190-210	0	All threats managed in 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1999 (recovery plan)	190-210	1	All threats managed in 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	164-177	unknown	All threats managed in 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2009 (5-yr review)	164-177	0	All threats managed in 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Unknown
2013 (5-yr review)	Oahu 69, Kauai ~150	1	All threats managed in 3 populations	Partially (see Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Unknown

Table 2. Threats to *Isodendrion laurifolium* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Degradation of habitat, herbivory, and lack of adequate hunting regulations	A, C, D	Ongoing	Partially: Makaha (Oahu) is fenced; Paaiki on Kauai is fenced.
Landslides and flooding	A, E	Ongoing	None
Established ecosystem-altering invasive plant species degradation of habitat	A, E	Ongoing	None
Rodent predation or herbivory – Rats	C	Ongoing	None
Fire	A, E	Ongoing	None
Established invasive plant species competition	A, E	Ongoing	Partially (U.S.Army Garrison 2011)
Military activities	E	Ongoing	None
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2009). Only references for new information are provided below.

Harold L. Lyon Arboretum. 2012. Micropropagation and seed storage databases. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Kishida, Wendy. 2012. Kishida 5 year reviews 2012. Plant Extinction Prevention Program, Kaleheo, Hawaii. 1 page. Unpublished.

National Tropical Botanical Garden. 2010. Provenance report 100005. *Isodendrion laurifolium*. National Tropical Botanical Garden, Kaleheo, Hawaii. 1 page. Unpublished.

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[PEEP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program progress report, July 2011-Dec. 2011. Prepared for U.S. Fish and Wildlife Service and Hawaii Division of Forestry and Wildlife. 169 pages. Unpublished.

U.S. Army Garrison. 2011. Status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 269 pages. Available online at http://manoa.hawaii.edu/hpicesu/DPW/2011_YER/default.htm.

[USFWS] U.S. Fish and Wildlife Service. 1999. Recovery plan for the multi-island plants. U.S. Fish and Wildlife Service, Portland, Oregon. 206 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2009. *Isodendrion laurifolium* (Aupaka) 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 10 pages. Available online at http://ecos.fws.gov/docs/five_year_review/doc2475.pdf.

Personal communications:

Ching, Susan. 2012a. Oahu coordinator, Plant Extinction Prevention Program, Honolulu, Hawaii. E-mail to Margaret Clark, National Tropical Botanical Garden, dated March 2, 2012. Subject: 5 year reviews.

Ching, Susan. 2012b. Oahu coordinator, Plant Extinction Prevention Program, Honolulu, Hawaii. E-mail to Margaret Clark, National Tropical Botanical Garden, dated May 7, 2012. Subject: *Isodendrion laurifolium*.

Keir, Matt. 2012. Rare plant program manager, Oahu Army Natural Resources Program, Schofield Barracks, Hawaii. E-mail to Margaret Clark, National Tropical Botanical Garden, dated May 5, 2012. Subject: *Isodendrion laurifolium*.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Isodendron 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
- No Change in listing status

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