5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Isodendrion pyrifolium* (wahine noho kula)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews of 44 species in Oregon, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 78(24):8185-8187.

Lead Region/Field Office:

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

Name of Reviewer(s):

Chelsie Javar-Salas, Plant Biologist, PIFWO
Marie Bruegmann, Plant Recovery Coordinator, PIFWO
Kristi Young, Programmatic Deputy Field Supervisor, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on March 4, 2013. The review was based on a review of current, available information since the last 5-year review for *Isodendrion pyrifolium* (USFWS 2008). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Plant Recovery Coordinator. 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 pyrifolium* published on January 18, 2008 (available at http://ecos.fws.gov/docs/five_year_review/doc1841.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. pyrifolium*.

This short-lived perennial shrub in the violet family (Violaceae) is endangered and historically known from the islands of Niihau, Oahu, Molokai, Lanai, Maui, and Hawaii (USFWS 1996). Currently, it is only found on Hawaii Island (USFWS 2008). The status and trends for *Isodendrion pyrifolium* are provided in the tables below.

New status information:

- Currently, there are five wild individuals of *Isodendrion pyrifolium* known in North Kona (J. Wagner, pers. comm. 2015). There are four outplanted populations containing 90 individuals (J. Wagner, *in litt*. 2015).
- Overall, the number of wild individuals has increased from the three wild individuals reported in the previous 5-year review to five wild individuals (none mature) in 2015.

New threats:

- Climate change destruction 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. The assessment by Fortini *et al.* (2013) concluded that *Isodendrion pyrifolium* is highly vulnerable to the impacts of climate change. Furthermore, *I. pyrifolium* was identified as a species that will have no overlapping area between current and future climate envelope (areas that contain the full range of climate conditions under which the species is known to occur) by 2100. Therefore, additional management actions are needed to conserve this taxon into the future.
- Invertebrate predation or herbivory – The giant African land snail (*Achatina fulica*) is reported to girdle outplantings which eventually kills the plants (J. Wagner, *in litt*. 2015). In addition, red spider mites (*Tetranychus urticae*) are a threat to this species and may lead to the death of young plants if not controlled.

New management actions:

- Ungulate monitoring and control – The ungulate fence around the wild population is inspected bi-annually (Wagner 2014b).
- Invasive plant monitoring and control – Annual weed control is ongoing at both the wild and reintroduced populations (Wagner 2014b; Wagner 2014c).
- Population viability monitoring and analysis
    - In 2011, the wild population was monitored and contained two individuals (Plant Extinction Prevention Program 2012).
    - The wild and reintroduced individuals are monitored regularly (Wagner 2015).
    - Ten reintroduced individuals were observed flowering in 2014 (Wagner 2014c), but there was no subsequent report of seedlings.
- Captive propagation for genetic storage and reintroduction
    - The Volcano Rare Plant Facility (2012) has 300 individuals in their nursery and 460 seeds in storage.
    - The Volcano Rare Plant Facility (2013) has 258 individuals in their nursery and 464 seeds are in storage. Twenty-five individuals were reintroduced in 2013.
    - There are 219 individuals of *I. pyrifolium* growing at the Volcano Rare Plant Facility (2014). Twenty-three individuals were reintroduced and 460 seeds are in storage.
    - The Lyon Arboretum's Seed Conservation Lab (2013) has 420 seeds in storage.
    - The National Tropical Botanical Garden (2013) has an unspecified amount of seeds in storage.

- Reintroduction / translocation
    - In 2012, 16 individuals were reintroduced on private property in North Kona (Wagner 2014d). An additional 22 individuals were reintroduced in 2014 and 4 individuals in 2015 (Wagner 2014d). As 2014, 35 individuals remain (J. Wagner, pers. comm. 2015).
    - On private property in North Kona, 29 individuals of *I. pyrifolium* were reintroduced (J. Wagner, pers. comm. 2015).
- Stochastic events – Build resilience and redundancy – Irrigation water lines have been installed at wild and reintroduced *I. pyrifolium* populations, because they occur in extremely drought-stressed areas (Wagner 2013, 2014a).
- Listing and critical habitat designation
    - One unit of critical habitat was proposed in the lowland mesic ecosystem on Molokai (USFWS 2012a). An additional 14 units of critical habitat was proposed on Maui in the lowland wet, dry cliff, and wet cliff ecosystems. The final rule for critical habitat designations has not been published at the time of this review.
    - On Hawaii Island, seven units of critical habitat were proposed in the lowland dry ecosystem for *I. pyrifolium* (USFWS 2012b). The final rule for critical habitat designations has not been published at the time of this review.
- Fire monitoring and control – The firebreak around the wild population is maintained bi-annually (Wagner 2014b).

Synthesis:
Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Big Island plant cluster (USFWS 1996), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Isodendrion pyrifolium* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (*e.g*., fenced) and be represented in an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on the island of Hawaii and if possible, at least one other island where the species now occurs 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 only five wild individuals are known with no mature individuals and the maturity of the reintroduced individuals is unknown (Table 1). In addition, all threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Isodendrion pyrifolium* 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
    - Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.

    - Evaluate genetic resources currently in storage to determine the need to place additional genetic resources in long-term storage due to this species' vulnerability to climate change.
- Reintroduction / translocation – Augment current natural populations to increase numbers of individuals.
- Ungulate monitoring and control – Maintain existing exclosures and monitor for potential incursions.
- Invasive plant monitoring and control – Continue control and maintenance of invasive plants within fenced exclosures.
- Predator / herbivore monitoring and control – Control rodents within the vicinity of al known *Isodendrion pyrifolium* populations.
- Fire monitoring and control – Develop and implement a fire management plan at the existing exclosure. Continue maintaining firebreaks around the wild and outplanted populations.
- Population viability monitoring and analysis – Continue monitoring wild and outplanted individuals for a thorough current assessment of the species' status.
- Climate change adaptation strategy – Research the suitability of habitat for reintroducing this species in the future due to the impacts of climate change. Develop a strategy for preventing the extinction of this species if no suitable habitat is predicted in the future.
- Alliance and partnership development – Initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

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

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	50-60	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1996 (recovery plan)	50-60	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	9	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2008 (5-yr review)	3	25	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2012 (critical habitat - proposed)	0 (Maui, Molokai, Lanai only)	0	All threats managed in all 3 populations	N/A
			Complete genetic storage	N/A
			3 populations with 50 mature individuals each	N/A
2015 (5-yr review)	5 (none mature)	90	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, the population is fenced
Invasive introduced plants	A, E	Ongoing	Partially, weed control occurs at fenced locations
Development	A	Ongoing	None
Rodent predation or herbivory - rats	C	Ongoing	None
Invertebrate herbivory – red spider mite, beetles, giant African land snail	C	Ongoing	Partially, hand removal and use of insecticides
Drought	E	Ongoing	Partially, irrigated
Fire	E	Ongoing	Partially, firebreak maintained around fences
Low numbers	E	Ongoing	Partially, captive propagation for genetic storage and reintroduction
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2008). 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. 141 pages.

Harold L. Lyon Arboretum Seed Conservation Laboratory. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Seed storage database. University of Hawaii at Manoa, Honolulu, Hawaii.

National Tropical Botanical Garden. 2013. Report on controlled propagation of listed and candidate 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, Hawaii.

Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[USFWS] U.S. Fish and Wildlife Service. 1996. Big Island plant cluster recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 202 + pages.

[USFWS] U.S. Fish and Wildlife Service. 2008. *Isodendrion pyrifolium* 5-year review summary and evaluation. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 14 pages.

[USFWS] U.S. Fish and Wildlife Service. 2012a. Endangered and threatened wildlife and plants; listing 38 species on Molokai, Lanai, and Maui as endangered and designating critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; proposed rule. Federal Register 77(112):34464-34775.

[USFWS] U.S. Fish and Wildlife Service. 2012b. Endangered and threatened wildlife and plants; listing 15 species on Hawaii Island as endangered and designating critical habitat for 3 species; proposed rule. Federal Register 77(201):63928-64018.

Volcano Rare Plant Facility. 2012. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Volcano Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Volcano Rare Plant Facility. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished

Wagner, J. 2013. Laiopua dry forest preserve six month progress report, December 2013. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

Wagner, J. 2014a. Dry forest preserve six month progress report, June 2014. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

Wagner, J. 2014b. Laiopua dry forest preserve six month progress report, December 2014. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

Wagner, J. 2014c. Dry forest preserve six month progress report, December 2014. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

Wagner, J. 2014d. Dry forest preserve six month progress report, December 2014 database. Unpublished data submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Isodendrion pyrifolium* (wahine noho kula)

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

Appropriate Listing/Reclassification Priority Number, if applicable:_____

for **Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office**

Maine M Bluegmann Date 2015-08-03