5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Lysimachia filifolia* (No common name)

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 *Lysimachia filifolia* (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 *Lysimachia filifolia* published in the Federal Register on July 21, 2009 (USFWS 2009, available at *https://ecos.fws.gov/docs/five_year_review/doc4225.pdf*) and on August 5, 2013 (USFWS 2013, available at *https://ecos.fws.gov/docs/five_year_review/doc2451.pdf*) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *L. filifolia*.

This short-lived, perennial, small shrub in the Primulaceae family is endangered and found on Kauai and Oahu. The current status and trends for *Lysimachia filifolia* provided in the tables below.

New Status Information:

- *Lysimachia filifolia* has been found in one new location on Kauai since the time of the last 5-year review in 2013, an occurrence of one individual at the upper north fork of the Wainiha River; however, botanists were unable to relocate it (NTBG 2013a; PEPP 2014; Kishida 2017, in litt.). The second population totaling approximately 30 individuals was destroyed by a landslide (Kishida 2017, in litt.). There are no known remaining individuals on Kauai.
- Populations on Oahu remain at the same three locations, with one of those locations monitored recently (Uwao, 50 individuals) (PEPP 2015); additional estimates remain as unknown for Waianu and at approximately 50 individuals at Waiahole, as no observations have been made since the last five year review.
- Genetic studies were initiated to determine if the Kauai and Oahu populations were distinct; however, the small amount of material limited the certainty of the analysis, and currently, there is no material from any Kauai populations in the wild, in a living collection, or in storage (Kishida 2017, in litt.).

New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this species. 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 *Lysimachia filifolia* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.443 (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.
- Rodent predation or herbivory—Rats are noted to be a threat to the occurrence of *Lysimachia filifolia* at Wainiha (Kauai) (NTBG 2013a).
- Invertebrate predation or herbivory—Slugs are noted to be a threat to the occurrence of *L. filifolia* at Wainiha (Kauai) (NTBG 2013a).

New Management Actions:

- Population viability monitoring and analysis—PEPP is surveying for new populations and monitoring known populations on Oahu and Kauai (PEP 2013, 2014, 2015).
- Captive propagation for genetic storage and reintroduction—Lyon Arboretum maintained over 500 explants between 1994 and 2016, and currently has 168 containers in micropropagation from two collections from Waiahole (Oahu). Pahole Rare Plant Facility has seven collections totaling 19 plants (Lyon Arboretum 2017).

Synthesis:

Surveys conducted since completion of the last 5-year review for this species revealed a new occurrence of *Lysimachia filifolia* at Wainiha on Kauai; however, that individual died. 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 *L. filifolia* is highly vulnerable to the effects of climate change. Seeds and plants are in storage and in propagation.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Kauai Plant Cluster (USFWS 1995), 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.

Lysimachia filifolia is a short-lived, perennial, small shrub. To reach interim objectives, 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 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 and Oahu 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 interim goals for this species have been partially met (Table 1). There may be two populations totaling 50 individuals, but it is uncertain how many of those are mature. Genetic representation is not complete (Table 1), and not all threats are being sufficiently managed throughout the range of the species (Table 2). Therefore, *Lysimachia filifolia* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
Predation and herbivory by rats and slugs has been identified as a new threat to *Lysimachia filifolia*. No other significant new information regarding the species biological status has come to light since the last 5-year review in 2013. Thus, the following recommendations for future actions are added or reiterated for the 5-year review for 2017.

- Surveys and inventories—Continue to survey for populations of *Lysimachia filifolia* in areas of potentially suitable habitat.
- 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.
- Predator and herbivore monitoring and control—
    - Implement effective control methods for rodents.
    - Determine and implement effective control methods for slugs.
- Captive propagation for genetic storage and reintroduction—Continue collection efforts for maintenance of genetic stock.
- Reintroduction and translocation—Reintroduce individuals into protected suitable habitat within historic range.

- Population biology research—Study *Lysimachia filifolia* populations to determine viable population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Stochastic events—Build resilience and redundancy—Increase numbers of populations and individuals scattered through historic range to reduce impacts from landslides and rock falls.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	226–276	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	Unknown
1995 (recovery plan)	170–275	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	20–75 (Kauai) 50 (Oahu)	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
2009 (5-year review)	30 (Kauai) 125 (Oahu)	0	All threats managed in all three populations	No

			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2012 (critical habitat)	50–160 (Oahu)	0	All threats managed in all three populations each	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2013 (5-yr review)	30 (Kauai) 85 (Oahu)	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2016 (5-year review)	0 (Kauai) ~100 (Oahu)	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	No
			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).

Table 2. Threats to *Lysimachia filifolia* ongoing 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
Hurricane destruction and degradation of habitat	A	Ongoing	None
Climate change loss or degradation of habitat	A	Ongoing	None
Rodent predation or herbivory	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None

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.

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

Kishida, W. 2017, in litt. Email regarding question about current status of genetic testing of *Lysimachia filifolia*, 16 JUN 2017.

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

[NTBG] National Tropical Botanical Garden. 2013a. NTBG database herbarium specimen detail for *Lysimachia filifolia.* 067226, 10 OCT 2013.

[NTBG] 2013b. NTBG controlled propagation database report.

[PRPF] Pahole Rare Plant Facility. 2013. Report on controlled propagation of listed, proposed, and candidate species, as designated under the U.S. Endangered Species Act. 16 pp.

[PEPP] Plant Extinction Prevention Program. 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, 2015). 179 pp.

U.S. Army. 2013. Species GIS database.

[USFWS] U. S. Fish and Wildlife Service. 2013. *Lysimachia filifolia* 5-year review summary and evaluation. *https://ecos.fws.gov/docs/five_year_review/doc2451.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.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Lysimachia filifolia* (No common name)

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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