

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Lysimachia lydgatei* (kolokolo kuahiwi)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 76 species in Hawaii, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573, February 12, 2016.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewers:

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 August 2017. The review was based on a review of current, available information since the last 5-year review for *Lysimachia lydgatei* (USFWS 2011). 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 review for *Lysimachia lydgatei* published in the Federal Register on August 2, 2011 (available at https://ecos.fws.gov/docs/five_year_review/doc3793.pdf) for a complete review of the species’ status, threats, and management efforts. 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 *L. lydgatei*.

This short-lived sprawling perennial shrub the Primulaceae (primrose) family is endangered and endemic to west Maui. The current status and trends for *Lysimachia lydgatei* are provided in the tables below.

New Status Information:

- The latest review of the species by IUCN in 2016 reported two subpopulations totaling 52 individuals (Keir *et al.* 2016).
- In 2016, critical habitat was designated in nine units in three ecosystems (lowland dry, montane mesic, wet cliff) on west Maui for *L. lydgatei* (7,442 ac; 3,011 ha) (81 FR 17790, March 30, 2016).

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 Hawai‘i 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 lydgatei* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.765 (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, such as identifying suitable habitat at micro-sites that may be less susceptible to rapid changes in climate.

New Management Actions:

- Surveys and monitoring—The Plant Extinction Prevention Program (PEPP) surveys for and monitors populations of *Lysimachia lydgatei* on west Maui (PEPP 2012, 2013, 2015, 2016, 2017b).
- Captive propagation for genetic storage and reintroduction—
 - In 2017, the PEPP reports for *Lysimachia lydgatei* that five of 45 founders were collected from at Kaua‘ula; three of seven founders from Launiupoko were collected from and two of 10 founders from Ukumehame were collected from (PEPP 2017a).
 - The Lyon Arboretum Micropropagation Laboratory reports 48 containers of propagules from Kaua‘ula in storage. The Lyon Arboretum Seed Conservation Laboratory reports seeds in storage from F₂ seed from plants at Olinda Rare Plant Facility (ORPF) from Kaua‘ula (3,000), from Ukumehame (almost 1,000 representing five individuals), and from Launiupoko (over 1,500 seeds representing five individuals) (Lyon Arboretum 2017).
 - The ORPF reports five potted plants were sent out to Helu in 2013 (ORPF 2013). In 2018, 25 potted plants were propagated from material collected from plants at Launiupoko, 2 potted plants from an unspecified source, and 1 potted plant from material from Makamaka‘ole (ORPF 2018).
 - The Plant Extinction Prevention Program (PEPP) monitors wild individuals and collects fruit (PEPP 2012, 2013, 2015, 2016, 2017b). In 2012, there were 46 individuals at Kaua‘ula and two individuals at Lihau. In 2016 there were six individuals at Launiupoko and four individuals at Helu. In 2017, there were nine individuals at Ukumehame.

- Stochastic events—Build resiliency and redundancy—PEPP reports reintroduction of plants at Kaua‘ula (9), Lihau (5), and Launiupoko (2) (PEPP 2016, 2017b).

Synthesis:

Currently, there are approximately 50 to 67 wild individuals of *Lysimachia lydgatei* on west Maui. A landscape-based assessment of climate change vulnerability for native plants of Hawai‘i using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *L. lydgatei* is highly vulnerable to the effects of climate change, in that there will be a smaller area of suitable habitat available for the species in the near future. Ten founders are represented in collections. Reintroduction is ongoing on west Maui with at least 16 individuals outplanted.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Maui Plant Cluster (USFWS 1997), and have been updated according to the draft revised recovery objective guidelines developed by the Hawai‘i 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.

Lysimachia lydgatei is a short-lived perennial sprawling 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 (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. In addition, a minimum of three populations should be documented on Maui. Each of these populations must be naturally reproducing (viable seeds, seedlings, saplings) and increasing in number, with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met as there are no populations of at least 50 reproducing individuals, only partial genetic representation (Table 1), and all threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Lysimachia lydgatei* 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 2011. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2018.

- Population viability and monitoring—Continue to survey known localities and suitable habitat areas on west Maui determine the current status of all populations of *Lysimachia lydgatei*. Search historical habitat on west Maui for occurrences of this species.
- Ungulate monitoring and control—Construct and maintain exclusion fences, or strategic fencing as appropriate, to protect *L. lydgatei* from the impacts of feral ungulates.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species around all populations.
- Fire destruction or degradation of habitat—Develop and implement fire prevention management plans.
- 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 material into long-term storage due to this species' vulnerability to climate change.
- Reintroduction and translocation—Continue to augment current populations and reintroduce individuals into suitable habitat within historical range that is being managed for known threats to this species.
- Rodent predation or herbivory—Implement effective methods to control rats at known populations.
- Invertebrate predation or herbivory—Determine and implement effective methods to control slugs at known populations.
- Stochastic events—Build resilience and redundancy—Increase numbers of populations and individuals scattered through suitable habitat to reduce impacts from landslides.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for its recovery.
- Alliance and partnership development—Work with the Hawai'i Division of Forestry and Wildlife and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	< 10	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
1997 (recovery plan)	150–250	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	240	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2011 (5-year review)	35	> 4	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2016 (critical habitat)	30	7	All threats managed in all three populations	No
			Complete genetic storage	Partially

			Three populations with 50 mature individuals each	No
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2018 (5-year review)	ca 50	< 20	All threats managed in all three populations	No
			Complete genetic storage	Partially, >10 founders represented
			Reproduction (<i>i.e.</i> 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 lydgatei* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partially, some ungulate management
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	None
Landslides and flooding destruction or degradation of habitat	A	Ongoing	None
Fire destruction or degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	Partially, some ungulate management
Rodent predation or herbivory	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Stochastic events—Reduced viability due to low numbers	E	Ongoing	Partial, seed collection, propagation, and reintroduction ongoing

References:

See the previous 5-year review for a full list of references (USFWS 2011). 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. Hawai‘i Cooperative Studies Unit, University of Hawai‘i at Hilo, Hawai‘i. 134 pp.

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

Keir, M., Portner, T., Weisenberger, L., Caraway, V.L., Kwon, J., Sugii, N. & Sporck-Koehler, M. 2016. *Lysimachia lydgatei*. The IUCN Red List of Threatened Species 2016:e.T80166609A115503028. <http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T80166609A80166625.en>.

Lyon Arboretum. 2017. Micropropagation and seed conservation laboratory databases.

- [ORPF] Olinda Rare Plant Facility. 2014. Controlled propagation report.
- [ORPF] 2015. Controlled propagation report.
- [[PEPP] Plant Extinction Prevention Program. 2012. PEPP annual report fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pp.
- [PEPP] 2013. PEPP annual report fiscal year 2013 (July 1, 2012-June 30, 2013). 207 pp.
- [PEPP] 2015. PEPP annual report fiscal year 2015 (July 1, 2014-June 30, 2015). 179 pp.
- [PEPP] 2016. Plant Extinction Prevention Program FY 2016 annual report (Oct 1, 2015-Sep 30, 2016), US FWS CFDA Program #15.657; Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F14AC00174, December 24, 2016, UH Manoa, PCSU, PEPP. 237 pp.
- [PEPP] 2017a. Statewide species totals *ex situ*, excel table.
- [PEPP] 2017b. PEPP annual report fiscal year 2017 (July 1, 2016-June 30, 2017). 235 pp.
- [USFWS] U.S. Fish and Wildlife Service. 2011. *Lysimachia lydgatei* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/five_year_review/doc3793.pdf.
- [USFWS] 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawai‘i, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573, February 12, 2016.
- [USFWS] 2016. Endangered and threatened wildlife and plants; designation and nondesignation of critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; final rule. Federal Register 81 (61): 17790–18110, March 30, 2016.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Lysimachia lydgatei* (kolokolo kuahiwi)

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

For Field Supervisor, Pacific Islands Fish and Wildlife Office