5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Lysimachia maxima* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; 5-year status reviews of 46 species in Idaho, Oregon, Washington, Nevada, Montana, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 77(44):13248-13251.

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
Maui nui and Hawaii Island Team Manager, PIFWO
Marie Bruegmann, Plant Recovery Coordinator, PIFWO
Recovery Program Lead, 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 6, 2012. The review was based on a review of current, available information since the last 5-year review for *Lysimachia maxima* (USFWS 2008). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the 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 *Lysimachia maxima* published on January 18, 2008 (available at http://ecos.fws.gov/docs/five_year_review/doc1848.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. maxima*.

This perennial shrub is endangered and endemic to Molokai. The current status and trends for *Lysimachia maxima* are provided in the tables below.

New status information:
In addition to those populations cited in the previous 5-year review, new observations include the following:

- In 2010, there were two populations containing seven wild individuals of *L. maxima* (Plant Extinction Prevention Program [PEPP] 2010).
- In 2011, the reintroduced population contained a single mature individual and two seedlings (PEPP 2011).
- In 2012, an additional 15 individuals of *L. maxima* was reintroduced at Puu Kolekole (PEPP 2012). The total number of reintroduced individuals is 18.
- In 2013, there were a total of 8 wild individuals of *L. maxima* and 18 reintroduced individuals (PEPP 2013).

Overall, the numbers of individuals have decreased from approximately 20 wild individuals reported in the previous 5-year review to approximately 8 wild individuals in 2013 (PEPP 2012, 2013).

New threats:

- Climate change destruction or degradation of habitat – Climate change may also 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 maxima* is highly vulnerable to the impacts of climate change. Furthermore, *L. maxima* 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.
- Flooding and landslides destruction or degradation of habitat – Flooding is a threat to this species (PEPP 2010).
- Slug herbivory – Herbivory by slugs has been reported as a threat to this species (PEPP 2010, 2011, 2012, 2013).

New management actions:

- Captive propagation for genetic storage and reintroduction
  - The National Tropical Botanical Garden (2013) has an unspecified amount of seeds in storage for *L. maxima.*
  - There are approximately 77 seeds in genetic storage at the Harold L. Lyon Arboretum Seed Conservation Laboratory (2013).
  - There are 179 individuals at the Harold L. Lyon Arboretum Micropropagation Laboratory (2013).
  - Fruit was collected by the Plant Extinction Prevention Program from a reintroduced individual of *L. maxima* (PEPP 2012).

- Reintroduction / translocation

- In 2010, the Plant Extinction Prevention Program outplanted three individuals of *L. maxima* at Puu Kolekole (PEPP 2010).
- In 2011, an additional 15 individuals of *L. maxima* was outplanted at Puu Kolekole (PEPP 2012).

- Surveys / inventories – The known wild population at East Kawela was surveyed by the Plant Extinction Prevention Program (2013). Three individuals were relocated and monitored.
- Population viability monitoring and analysis – The Plant Extinction Prevention Program monitored the wild population at East Kawela and the outplanted population at Puu Kolekole (PEPP 2010, 2011, 2012, 2013).
- Listing and critical habitat designation – Six units of unoccupied and occupied areas of critical habitat for *L. maxima* were proposed in the lowland wet and montane wet ecosystems on Molokai (USFWS 2012). The final rule for critical habitat designations has not been published at the time of this review.

Synthesis:
Stabilizing, downlisting, and delisting objectives are provided in the addendum to the recovery plan for the Molokai plant cluster (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Lysimachia maxima* is a short-lived perennial, and to be considered stable, this species 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 Molokai. 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 there are no known populations containing more than 50 individuals (Table 1). In addition, all threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Lysimachia maxima* 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 collecting material for genetic storage and propagation for reintroduction.
  - 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 – Continue augmenting current natural populations to increase numbers of individuals.
- Ungulate monitoring and control – Fence remaining populations to protect them from the impacts of feral ungulates. If fencing is not feasible due to the local terrain (steep slopes), other means should be employed to control ungulate populations.
- Invasive plant monitoring and control – Control invasive introduced plant species within exclosures.

- Surveys / inventories – Continue to survey the geographical and historical range of *L. maxima* for a current assessment of the species' status.
- Predator / herbivore monitoring and control – Control rats (*Rattus* spp.) and slugs (unidentified species) within the vicinity of all known *L. maxima* populations.
- 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 *Lysimachia maxima* from listing through current 5-year review.

Date	No. wild indivs	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (listing)	20-40	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 (recovery plan)	20-40	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	45-50	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2008 (5-year review)	20	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2012 (critical habitat-proposed)	28	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2014 (5-year review)	8	18	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

Table 2. Threats to *Lysimachia maxima* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	None
Invasive introduced plants	A, E	Ongoing	None
Flooding	A	Ongoing	None
Rodent predation or herbivory – rats	C	Ongoing	None
Slugs herbivory	C	Ongoing	None
Landslides and erosion	E	Ongoing	None
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 Micropropagation Laboratory. 2013. Micropropagation database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Harold L. Lyon Arboretum Seed Conservation Laboratory. 2013. Seed storage database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

National Tropical Botanical Garden. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 30 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010). 122 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2011. Plant Extinction Prevention Program annual report, fiscal year 2011 (July 1, 2010-June 30, 2011). 200 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2013. Plant Extinction Prevention Program annual report, fiscal year 2013 (July 1, 2012-June 30, 2013). 207 pages. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 1998. Molokai II: Addendum to the recovery plan for the Molokai plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 52 pages.

[USFWS] U.S. Fish and Wildlife Service. 2008. *Lysimachia maxima* 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 12 pages.

[USFWS] U.S. Fish and Wildlife Service. 2012. 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.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Lysimachia maxima* (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

Appropriate Listing/Reclassification Priority Number, if applicable:_____

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

Maine M Brueggmann Date 2014-03-31