

Lysimachia lydgatei
(kolokolo kuahiwi)

**5-Year Review
Summary and Evaluation**

**U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii**

5-YEAR REVIEW

Species reviewed: *Lysimachia lydgatei*/ kolokolo kuahiwi

TABLE OF CONTENTS

1.0 GENERAL INFORMATION 3

1.1 Reviewers 3

1.2 Methodology used to complete the review: 3

1.3 Background: 3

2.0 REVIEW ANALYSIS..... 5

2.1 Application of the 1996 Distinct Population Segment (DPS) policy 5

2.2 Recovery Criteria..... 5

2.3 Updated Information and Current Species Status 7

2.4 Synthesis..... 11

3.0 RESULTS 13

3.1 Recommended Classification: 13

3.2 New Recovery Priority Number: 13

3.3 Listing and Reclassification Priority Number: 13

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS..... 13

5.0 REFERENCES..... 14

Signature Page..... 16

5-YEAR REVIEW
***Lysimachia lydgatei* (kolokolo kuahiwi)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia, (503) 231-2071

Lead Field Office:

Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808) 792-9400

Cooperating Field Office(s):

N/A

Cooperating Regional Office(s):

N/A

1.2 Methodology used to complete the 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 16, 2009. The review was based on final critical habitat designations for *Lysimachia lydgatei* and other species from the island of Maui (USFWS 2003) as well as a review of current, available information. The National Tropical Botanical Garden provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Samuel Aruch, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and Assistant Field Supervisor for Endangered Species before submittal to the Field Supervisor for approval.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2009. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 103 species in Hawaii. Federal Register 74(49):11130-11133.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1992. Endangered and threatened wildlife and plants; determination of threatened or endangered status for 15 plants from the island of Maui, Hawaii; final rule. Federal Register 57(95):20772-20788.

Date listed: October 8, 1992

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

FR notice: N/A

Date listed: N/A

Entity listed: N/A

Classification: N/A

1.3.3 Associated rulemakings:

USFWS. 2003. Endangered and threatened wildlife and plants; final designations and nondesignations of critical habitat for 60 plant species from the island of Maui, Hawaii; final rule. Federal Register 68(93):25934-26165.

Critical habitat was designated for *Lysimachia lydgatei* in 5 units totaling 411 hectares (1,014 acres) on the island of Maui. This designation includes habitat on State and private lands (USFWS 2003).

1.3.4 Review History:

Species status review [FY 2010 Recovery Data Call (September 2010)]:
Stable

Recovery achieved:

1 (1-25%) (FY 2007 Recovery Data Call – most recent year reported)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:
5

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: USFWS. 1997. Recovery plan for the Maui plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 130 pages + appendices.

Date issued: July 19, 1997.

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

Yes

No

2.1.2 Is the species under review listed as a DPS?

Yes

No

2.1.3 Was the DPS listed prior to 1996?

Yes

No

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

Yes

No

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

Yes

No

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

Yes

No

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

Yes

No

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

Yes

No

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

Yes

No

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Listing Factors A, C, D, and E) affecting this species is presented in section 2.3.2 and Table 2. Listing Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the Maui plant cluster recovery plan (USFWS 1997), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Lysimachia lydgatei* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, 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 Maui, and if possible, at least one other island 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.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Lysimachia lydgatei* should be documented on islands where they now occur or

occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Lysimachia lydgatei* should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

No new information.

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Lysimachia lydgatei was originally listed as endangered in 1992 (USFWS 1992). In 1997, four individuals were known from three populations, all on leeward West Maui (USFWS 1997). Ken Wood and Hank Oppenheimer observed a population of *Lysimachia lydgatei* on West Maui, at Puehuhunui, east of Lahaina, below and west of Helu Mountain, southeast of Kauaula Valley, in forest and shrubland on private land at 1,128 to 1,140 meters (3,700 to 3,740 feet) elevation in December 2006 (Hawaii Biodiversity and Mapping Program 2009; Perlman 2010; Wood 2010). These plants were confirmed to be *L. lydgatei* when a further survey in 2008 found about 30 individuals (H. Oppenheimer, Plant Extinction Prevention

Program, pers. comm. 2010). Another small population nearby on State owned land was also confirmed to be *L. lydgatei* (H. Oppenheimer, pers. comm. 2010). Two populations with 20 individuals were reported from above Hale Pohaku in 1989 at 1,356 to 1,433 meters (4,450 to 4,700 feet) elevation, but this elevation may actually be lower (Hawaii Biodiversity and Mapping Program 2009; Wood 2010). Also in the Lahaina District, at Hale Pohaku, about 20 individuals were seen in 1992, at 914 meters (3,000 feet) elevation and 50 to 100 individuals at 1,109 meters (3,640 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; Perlman 2010; Wood 2010).

Lysimachia lydgatei was recorded from Ula Ula, somewhat south of these other locations in the West Maui Mountains, in 1991, at 853 to 945 meters (2,800 to 3,100 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). However, Oppenheimer did not find any individuals of *L. lydgatei* during visits to Hale Pohaku, or Ula Ula (H. Oppenheimer, pers. comm. 2010). Scattered plants had been seen in 1991 on the rim in the Lihau Natural Area Reserve at 1,250 meters (4,100 feet) elevation (Perlman 2010).

Currently, there are approximately 35 total individuals known in 2 populations.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No new information.

2.3.1.4 Taxonomic classification or changes in nomenclature:

A recent revision of the Hawaiian *Lysimachia* by Ken Marr merged this species with the common, widespread variable *L. remyi* (Marr and Bohm 1997). Many people do not follow this treatment and uphold this species as distinct (Hawaii Department of Land and Natural Resources 2007).

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g., corrections to the historical range, change in distribution of the species within its historic range, etc.):

No new information

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

The habitat in the West Maui Mountains where this species has been observed is *Metrosideros polymorpha* (ohia) – *Cheirodendron trigynum* (olapa) montane forest and *Metrosideros polymorpha* – *Dicranopteris linearis* (uluhe) montane wet shrubland with associated species including *Alyxia stellata* (maile), *Astelia* sp., *Bidens mauiensis* (kookoolau), *Carex* sp. (no common name [NCN]), *Broussaisia arguta* (kanawao), *Cheirodendron* sp. (olapa), *Clermontia arborescens* (oha wai nui), *Cocculus orbiculatus* (huehue), *Coprosma foliosa* (pilo), *C. ochracea* (pilo), *Cyrtomium caryotideum* (kaapeape), *Dianella sandwicensis* (uki uki), *Dodonaea viscosa* (aalii), *Dubautia plantaginea* (naenae), *D. scabra* (naenae), *Eragrostis variabilis* (kawelu), *Eurya sandwicensis* (anini), *Kadua* sp., *Leptecophylla tameiameia* (pukiawe), *Lobelia grayana* (NCN), *Machaerina angustifolia* (uki), *Melicope peduncularis* (alani), *Morelotia gahniiformis* (NCN), *Myrsine lessertiana* (kolea lau nui), *M. sandwicensis* (kole lau lii), *Nestegis sandwicensis* (olopua), *Peperomia* sp. (ala ala wai nui), *Pipturus albidus* (mamake), *Plantago pachyphylla* (laukahi kuahiwi), *Pouteria sandwicensis* (alaa), *Scaevola chamissoniana* (naupaka kuahiwi), *Smilax melastomifolia* (hoi kuahiwi), *Stenogyne sessilis* (NCN), *Urera glabra* (opuhe), *Vaccinium dentatum* (ohelo), and *Wikstroemia oahuensis* (akia). Ferns including *Coniogramme pilosa* (NCN), *Deparia* sp. (NCN), *Diplazium* sp. (hoio), *Doodia kunthiana* (okupukupu), *Dryopteris fusco-atra* (ii), *Lycopodiella cernua* (wawaeiole), *Lycopodium venustulum* (NCN), *Microlepia strigosa* (palapalai), *Polypodium pellucidum* (ae lau nui), *Pteris* sp. (brake), *Sadleria pallida* (amau), *S. cyatheoides* (amau), and *Selaginella deflexa* (NCN) are common in the forest understory (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2009; H. Oppenheimer, pers. comm. 2010; Perlman 2010; USFWS 1997; Wood 2010).

2.3.1.7 Other:

No new information.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Fire is a major potential threat to *Lysimachia lydgatei* (USFWS 1997). Landslides are another potential threat to rare plants in this area (National Tropical Botanical Garden 2009). *Adiantum hispidulum* (rough maidenhair fern), *Ageratina adenophora* (sticky snakeroot), *Buddleia asiatica* (dogtail), *Grevillea robusta* (silk oak), *Psidium guajava* (common guava), *Rubus rosifolius* (thimbleberry), and *Tibouchina herbacea* (glorybush) are invasive introduced plants which have modified the habitat for *Lysimachia lydgatei* (Hawaii Biodiversity and Mapping Program 2009; Perlman 2010; Wood 2010).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Not a threat.

2.3.2.3 Disease or predation:

Rats (*Rattus* spp.) and slugs (species unknown) are predators of *Lysimachia lydgatei* (Hawaii Biodiversity and Mapping Program 2009; Perlman 2010; Wood 2010). Insects (species unknown) attack the young seed capsules and no seeds, only frass, are found within (H. Oppenheimer, pers. comm. 2010).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

No new information.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

The introduced invasive plant species discussed in section 2.3.2.1 above are also a threat to *Lysimachia lydgatei* because they compete with the species for water, light, and nutrients.

In addition to all of the other threats, species like *Lysimachia lydgatei* that are endemic to small portions of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes, landslides, flooding, and disease

outbreaks. The extent of these natural processes on this single island endemic are exacerbated by anthropogenic threats, such as habitat loss for human development or predation by introduced species (USFWS 1997).

Climate change may also 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 has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

Lysimachia lydgatei is being monitored by Plant Extinction Prevention Program. Their plan for this species is to continue to attempt to collect seeds for genetic storage and reintroduction, and propagate and reintroduce the species into protected areas within suitable habitat (Hawaii Department of Land and Natural Resources 2008; Hawaii Department of Land and Natural Resources 2007). Cuttings from Puehuhunui plants were taken to the Olinda Rare Plant Facility but none rooted (H. Oppenheimer, pers. comm.2010)

2.4 Synthesis

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Maui plant cluster (USFWS 1997), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Lysimachia lydgatei* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on islands where they now occur or occurred historically. For the species to be considered stable, 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 is no confirmed population of more than 50 individuals (Table 1) and all threats have not been managed (Table 2). Therefore, *Lysimachia lydgatei* meets the definition of endangered as it remains in danger of extinction throughout its range.

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

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	240	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1997 (recovery plan)	150-250	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	240	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2010 (5-year review)	35	0	All threats managed in all 3 populations	No (Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No: 35 individuals spread over 3 populations

Table 2. Threats to *Lysimachia lydgatei*.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Fire	A, E	Ongoing	No
Landslides	A, E	Ongoing	No
Rats – herbivory	C	Ongoing	No
Slugs – herbivory	C	Ongoing	No
Invertebrates – seed predation	C	Ongoing	No
Invasive introduced plants	A, E	Ongoing	No
Climate change	A, E	Increasing	No
Small population size	E	Ongoing	Seed collection

3.0 RESULTS

3.1 Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist

Extinction

Recovery

Original data for classification in error

No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: _____

Reclassification (from Endangered to Threatened) Priority Number: _____

Delisting (regardless of current classification) Priority Number:

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Survey areas where *Lysimachia lydgatei* have been reported to assess current status of the species.
- Monitor known populations and collect any available seeds.
- Fence existing populations to protect from negative impacts of ungulates.
- Control invasive introduced species around known populations.
- Develop and implement methods to control rats and slugs.
- Propagate to augment the existing populations.
- Establish additional populations within protected suitable habitat.
- Work with Hawaii 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 species.
- Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

5.0 REFERENCES

- Hawaii Biodiversity and Mapping Program. 2009. Program database. Hawaii Biodiversity and Mapping Program. Honolulu, Hawaii.
- Hawaii Department of Land and Natural Resources. 2007. Statewide endangered plant program; endangered plant restoration and enhancement Plant Extinction Prevention (formerly Genetic Safety Net) Program. Honolulu, Hawaii. 65 pages. Unpublished.
- Hawaii Department of Land and Natural Resources. 2008. Statewide Endangered Plant Program Endangered Species Act - Section 6. Unpublished report, submitted to, Division of Forestry and Wildlife. 88 pages.
- Marr, K. L. and B. A. Bohm. 1997. A Taxonomic Revision of the Endemic Hawaiian *Lysimachia* (Primulaceae) Including Three New Species. Pacific Science 51(3): pages 254-287.
- National Tropical Botanical Garden. 2009. Living collections database. National Tropical Botanical Garden, Kalaheo, Hawaii. Unpublished.

Perlman, S. 2010. *Lysimachia lydgatei*. National Tropical Botanical Garden, Kalaheo, Hawaii. 2 pages. Unpublished.

Plant Extinction Prevention Program. 2009. Hawaii State PEP, ROI, POP LIST, by designation - DRAFT as of May 22, 2009 (final list *in prep*).

[USFWS] U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; determination of threatened or endangered status for 15 plants from the island of Maui, Hawaii; final rule. Federal Register 57(95):20772-20788.

[USFWS] U.S. Fish and Wildlife Service. 1997. Recovery plan for the Maui plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 130 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations and nondesignations of critical habitat for 60 plant species from the island of Maui, Hawaii; final rule. Federal Register 68(93):25934-26165.

[USFWS] U.S. Fish and Wildlife Service. 2009. Press release: Fish and Wildlife Service provides \$1 million in land acquisition funds to Hawaii. Honolulu, Hawaii. April 17, 2009.

Wood, K.R. 2010. Notes on *Lysimachia lydgatei*. National Tropical Botanical Garden, Kalaheo, Hawaii. 1 page. Unpublished.

Personal Communications:

Bakutis, Ane. 2009. Molokai Coordinator, Plant Extinction Prevention Program, Kaunakakai, Molokai, Hawaii. E-mail to Margaret A. Clark, National Tropical Botanical Garden, dated August 19, 2009. Subject: USFWS 5 yr review list and schedule.

Garnett, Bill. 2009. Wiliwili Rare Plant Nursery, Kalae, Molokai, Hawaii. Interview with Margret Clark, National Tropical Botanical Garden, dated August 19, 2009 and November 22, 2009.

Oppenheimer, Hank. 2010. Maui Nui Island Coordinator, Plant Extinction Prevention Program. E-mail to Margaret Clark, National Tropical Botanical Garden, dated January 15, 2010. Subject: *Lysimachia lydgatei* 5-year review comments and edits.

Signature Page

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Lysimachia lydgatei* (no common name)

Current Classification: E

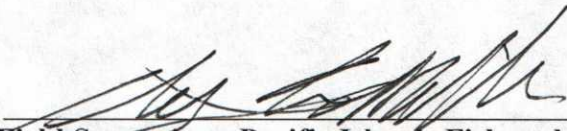
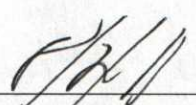
Pre-1996 DPS listing still considered a listable entity? N/A

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

Review Conducted By:

Chelsie Javar, Fish and Wildlife Biologist
Marie Bruegmann, Plant Recovery Coordinator
Jess Newton, Recovery Program Lead
Assistant Field Supervisor for Endangered Species

Approved  Date 
Field Supervisor, Pacific Islands Fish and Wildlife Office
