

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Lobelia gaudichaudii* ssp. *koolauensis* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 58 species in Washington, Oregon, California, and Hawaii. Federal Register 75(226):71726-71729.

Lead Region/Field Office:

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

Name of Reviewer(s):

Vickie Caraway, Plant Biologist, PIFWO

Daniel Clark, Oahu, Kauai, Northwest Hawaiian and American Samoa Islands Team
Manager, PIFWO

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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 January 31, 2012. The review was based on a review of current, available information since the last five-year review for *Lobelia gaudichaudii* ssp. *koolauensis* (USFWS 2009). The National Tropical Botanical Garden provided an initial draft of portions of the five-year review and recommendations for conservation actions needed prior to the next five-year review. The document was reviewed by the Plant Biologist, Islands 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 *Lobelia gaudichaudii* ssp. *koolauensis* published on July 21, 2009 (available at http://ecos.fws.gov/docs/five_year_review/doc2452.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 *L. gaudichaudii* ssp. *koolauensis*.

This short-lived shrub is endangered and occurs on Oahu. It was known historically from the upper Waikakalaua–Kipapa drainage. The current status and trends for *Lobelia gaudichaudii* ssp. *koolauensis* are provided in the tables below.

New taxonomic information:

No new taxonomic information has been received since the last 5-year review (USFWS 2009), but as discussed then, *Lobelia gaudichaudii* ssp. *koolauensis* is now elevated to species rank as *L. koolauensis*, following the treatment by Thomas Lammers (Lammers 2007, 2012; Wagner *et al* 2012). Henceforth, for this review, this species will be referred to as *Lobelia koolauensis*.

New status information:

- Four populations are known – Kaukonahua, Kawaiiki, Kipapa, and Waiawa to Waimano. In 2010, there were 16 mature and 29 immature individuals on Army lands, and 300 immature individuals in other locations on Oahu. The Kaukonahua and Kawaiiki populations were monitored in 2010, showing only a slight decline in numbers of individuals. No significant changes in population numbers were reported in 2011 (U.S. Army Garrison 2010, 2011; Oahu Army Natural Resource Program [OANRP] 2012a).
- Over 100 individuals were found in the vicinity of Kipapa during a rare plant survey of the Oahu Forest National Wildlife Refuge (Imada *et al.* 2011).

New threats:

- Climate change - 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 (PICCC) funded climate modeling that will help resolve these spatial limitations. High spatial resolution climate outputs are expected by 2013.

New management actions:

- Ungulate exclosures – The Kawaiiki population is protected by an ungulate fence, and ungulates are controlled through hunting around the Kaukonahua population (U.S. Army Garrison 2009). However ungulates were not considered under control in 2011 (U.S. Army Garrison 2010).
- Captive propagation for genetic storage and reintroduction - Genetic storage has only been accomplished for five individuals from two populations (OANRP 2012b, c; U.S. Army Garrison 2009).
- Population viability monitoring - Monitoring of both the Kaukonahua and Kawaiiki populations was conducted in 2010. The two former subspecies, *Lobelia gaudichaudii* ssp. *koolauensis* and *L. gaudichaudii* ssp. *gaudichaudii*, can only be identified by the flowers. Since both plants occur at the Kawaiiki population, the number of immature individuals was not reported at this location (U.S. Army Garrison 2010).
- Captive propagation for genetic storage and reintroduction
 - Genetic storage is partially completed (OANRP 2012b, c; U.S. Army Garrison 2010).

- It appears that *Lobelia koolauensis* loses viability after five years in storage, and further research in collaboration with the National Center for Genetic Resource Conservation will explore alternative types of storage (OANRP 2012b, c; U.S. Army Garrison 2010).

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for plants from the island of Oahu (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Lobelia koolauensis* is a short-lived perennial, and to be considered stable, 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 Oahu. Each of these populations should be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

For downlisting, a total of five to seven populations of each taxon should be documented on Oahu 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 for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

The stabilization goals for this species have been met since three populations have over 50 mature individuals, but threats are not managed. Downlisting goals have not been met, as no population has over 300 mature individuals (Table 1) and not all threats are sufficiently controlled throughout the populations (Table 2). Therefore, *Lobelia koolauensis* 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
 - Collect cuttings or seed from tagged individuals, keeping records of maternal sources for use in *ex situ* propagation.
 - Continue to collect seeds from all existing populations and send to at least two or three different facilities for propagation and storage.
 - Seeds may lose viability after five years; further research by the National Center for Genetic Resource Conservation is needed to explore alternative types of seed storage.
- Reintroduction / translocation
 - Determine possible outplanting sites that are least threatened by invasive introduced plant species and have the highest likelihood of successful reintroductions.
 - Continue reintroduction of the species into its historical range.
- Ungulate exclosures – Construct ungulate-proof fenced exclosures around each population and monitor the fences for any signs of breaching.

- Ecosystem-altering invasive plant species control – Control invasive introduced plant species around all populations.
- Surveys / inventories – Survey geographical and historical range for a thorough current assessment of the species' status.
- Site / area / habitat protection – Develop and implement effective measures to reduce the impact of landslides, and flooding and military activities.
- Fire protection – Develop and implement fire management plans for all wild and reintroduced populations.
- Alliance and partnership development - Initiate planning and contribute to implementation of ecosystem level restoration and management to benefit this taxon.
- Genetic research – Assess genetic variability within extant populations of *Lobelia koolauensis*.
- Population biology research – Study *Lobelia koolauensis* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Threats research – Assess the modeled effects of climate change on *Lobelia koolauensis* and use the results to determine landscape needs for the recovery of the species.

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

Date	No. wild individuals	No. outplanted	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria Completed?
1996 (listing)	<250	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Unknown
			5-7 populations with 300 mature individuals each	No
1998 (recovery plan)	<280	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Unknown
			5-7 populations with 300 mature individuals each	No
2003 (critical habitat)	<270	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Unknown
			5-7 populations with 300 mature individuals each	No
2009 (5-yr review)	462	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2013 (5-yr review)	16 mature, 329 immature – total 345	0	All threats managed in all 5-7 populations	No (Table 2)
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No

Table 2. Status of threats to *Lobelia koolauensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Herbivory by slugs	C	Ongoing	Partially
Ungulates – habitat modification and herbivory	A, C, D	Ongoing	Partially
Ecosystem-altering invasive introduced plants	A, E	Ongoing	None
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2009). Only references for new information are provided below.

Imada, C., P. Clifford, and J. Lau. 2011. 2010 rare plant survey, Oahu Forest National Wildlife Refuge, Waipio, Oahu. Bishop Museum Technical Report 55. Prepared for U.S. Fish and Wildlife Service, Oahu Forest National Wildlife Refuge Complex. Honolulu, Hawaii. 92 pages. Unpublished.

Lammers, T. G. 2007. Revision of *Lobelia* sect. *Galeatella* (Campanulaceae: Lobelioideae). Journal of the Botanical Research Institute of Texas 1:789-810.

Lammers, T. G. 2012. Hawaiian Lobelioideae currently recognized; checklist based on 2007 world checklist. 10 pages. Unpublished.

[OANRP] Oahu Army Natural Resource Program. 2012a. Oahu implementation plan - population unit status; *Lobelia gaudichaudii* ssp. *koolauensis*. 1 page. Unpublished.

[OANRP] Oahu Army Natural Resource Program. 2012b. Genetic storage summary. 52 pages. Unpublished.

[OANRP] Oahu Army Natural Resource Program. 2012c. Army nursery inventory summary. 1 page. Unpublished.

U.S. Army Garrison. 2009. Status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 711 pages. Available online at <http://manoa.hawaii.edu/hpicesu/DPW/2009_OIP/2009_OIP_Edited.pdf>.

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- [USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pages, plus appendices.
- [USFWS] U.S. Fish and Wildlife Service. 2009. *Lobelia gaudichaudii* ssp. *koolauensis* (no common name) 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 12 pages. Available online at <http://ecos.fws.gov/docs/five_year_review/doc2452.pdf>.
- Wagner, W.L., D.R. Herbst, N. Khan, and T. Flynn. 2012. Hawaiian vascular plant updates: a supplement to the manual of the flowering plants of Hawaii and Hawaii's ferns and fern allies. Version 1.3. 126 pages. Available online at <http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/Hawaiian_vascular_plant_updates_1.3.pdf>.

U.S. FISH AND WILDLIFE SERVICE

SIGNATURE PAGE for 5-YEAR REVIEW of *Lobelia gaudichaudii* ssp. *koolauensis*
(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
- No Change in listing status

acting deputy

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Date *2013-08-19*