

Silene lanceolata
(no common name)

**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: *Silene lanceolata* (no common name)

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5-YEAR REVIEW
***Silene lanceolata* / (no common name)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

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Lead Field Office:

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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 April 29, 2008. The review was based on the final critical habitat designation for *Silene lanceolata* and other species from the islands of Kauai, Oahu, Molokai, Lanai, and Hawaii, as well as a review of current, available information (USFWS 2003a,b,c,d,e). The National Tropical Botanical Garden provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next 5-year review. The evaluation of Samuel Aruch, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Assistant Field Supervisor for Endangered Species and Acting Deputy Field Supervisor before submission to the Field Supervisor for approval.

1.3 Background:

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

USFWS. 2008. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 70 species in Idaho, Montana, Oregon, Washington, and the Pacific Islands. Federal Register 73(83):23264-23266.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1992. Endangered and threatened wildlife and plants; determination of endangered or threatened status for 16 plants from the island of Molokai; final rule. Federal Register 57(196):46325-46340.

Date listed: October 18, 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 rule makings :

USFWS. 2003a. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, Hawaii; final rule. Federal Register 68(39):9116-9479.

USFWS. 2003b. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 101 plant species from the island of Oahu, Hawaii; final rule. Federal Register 68(116):35949-35998.

USFWS. 2003c. Endangered and threatened wildlife and plants; final designations and nondesignations of critical habitat for 42 plant species from the island of Molokai, Hawaii; final rule. Federal Register 68(52):12982-13141.

USFWS. 2003d. Endangered and threatened wildlife and plants; final designation and nondesignation of critical habitat for 46 plant species from the island of Hawaii, Hawaii; final rule. Federal Register 68(127):39624-39761.

USFWS. 2003e. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, Hawaii; final rule. Federal Register 68(6):1220-1274.

Critical habitat was designated for *Silene lanceolata* in 1 unit totaling 113 hectares (281 acres) on the island of Oahu (USFWS 2003b). This designation includes habitat on State lands (USFWS 2003a). Critical habitat was designated for *S. lanceolata* in 1 unit totaling 289 hectares (719 acres) on the island of Molokai (USFWS 2003c). These designations includes habitat on private lands (USFWS 2003c). Critical habitat was not designated on Lanai because *S. lanceolata* is no longer extant on this island and suitable habitat for the recovery of the species could not be identified (USFWS 2003a). Critical habitat was not designated on the

island of Hawaii because management actions by the U.S. Army already protect the habitat for this species (USFWS 2003d). These determinations may be revisited.

1.3.4 Review History:

Species status review [FY 2009 Recovery Data Call (August 2009)]:

Declining

Recovery achieved:

1 (0-25%) (FY 2007 Recovery Data Call – this was that last year this was reported)

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

2

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: USFWS. 1996. Recovery plan for the Molokai plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 143 pages.

Date issued: September 26, 1996.

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 (Factors A, C, D, and E) affecting this species is presented in section 2.4. 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 Recovery Plan for the Molokai Plant Cluster (USFWS 1996), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Silene lanceolata* 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 Kauai and Oahu 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 *Silene lanceolata* 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 *Silene lanceolata* 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

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section 1.3.3 ("Associated Rulemakings") and in section 2.4 ("Synthesis") below, which also includes any new information about the status and threats of the species.

Table 1. Status of *Silene lanceolata* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria Completed?
1992 (listing)	<230	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	No
			5-7 populations with 300 mature individuals each	No
			Naturally reproducing, stable, and increasing in number	Unknown
			Stable for five consecutive years	Unknown
1996 (recovery plan)	<1,500	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
			Naturally reproducing, stable, and increasing in number	Unknown
			Stable for five consecutive years	Unknown
2003 (critical habitat)	unknown	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
			Naturally reproducing, stable, and increasing in number	Unknown
			Stable for five consecutive years	Unknown
2008 (5-year review)	>20,000	0	All threats managed in all 5-7 populations	Partially
			Complete genetic	Partially

			storage	
			5-7 populations with 300 mature individuals each	No
			Naturally reproducing, stable, and increasing in number	Unknown
			Stable for five consecutive years	Unknown

2.3.1 Biology and Habitat

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

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:

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

2.3.1.4 Taxonomic classification or changes in nomenclature:

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.):

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

2.3.1.7 Other:

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:

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

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

A study was conducted in 1996 to evaluate the influences of seed source, seed dormancy, and scarification on germination of *Silene lanceolata* in order to establish germination protocols for conservation. A temperature of 20 degrees Celsius, and 8 hours light per day were determined to be optimal. Hormonal treatments were of limited effectiveness in stimulating germination in the populations evaluated. Scarification enhanced germination in seeds from capsules not fully ripened; however, most forms of scarification also significantly increased both the proportion of abnormal seedlings and the incidence of fungal infection. The length of the after-ripening period in the populations evaluated was relatively short (40-60 days). It was concluded that in propagating for conservation purposes, it may be more efficient to wait until seeds pass through their natural after-ripening phase, rather than attempt to stimulate earlier germination through scarification or chemical pretreatments (Halward 1996).

In 2005, the Army reported 12 subpopulations in Pohakuloa Training Area with a total of 10,463 to 10,720 individuals. Survey and monitoring at that time suggested that the population was flourishing. Numbers had quadrupled since the early 1990s with many factors contributing to these increases: higher precipitation over the two years that followed six years of drought; intensive surveys increasing the number of recorded locations; and implementation of fencing, weed control, and ungulate control activities all helped the species increase in number (U.S. Army Garrison, Hawaii 2005). In 2007, 148 to 153 new individuals were found in Areas 12 and 31, and the Kipuka Kalawamauna West and Naohulelua management units of the Training Area, increasing the total to 10,394 individuals within 18 different identified areas of the Pohakuloa Training Area. These locations are along the western border of the military impact area (U.S. Army Garrison, Hawaii 2007).

On Oahu, there were four known populations in 2003, with 62 individuals located in Koiahi Gulch and Waianae Kai on Federal and State lands (USFWS 2003a). In 1998, botanist Joel Lau reported 12 individuals at Waianae Kai, in the Waianae Mountains, at 671 to 732 meters (2,200 to 2,400 feet) elevation. In 2002, he observed 40 to 50 mature individuals and 40 to 50 immature individuals at another location in Waianae Kai, near Puu Kepauula, at 427 to 549 meters (1,400 to 1,800 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). In 2001, 15 individuals were seen at two locations on Ohikilolo Ridge in the Makua Valley at 677 to 695 meters (2,220 to 2,280 feet) elevation (Perlman 2008).

On Molokai, 1 population of approximately 100 individuals was found in 1987 on private land near Puu Kolekole (USFWS 2003b). From 1987 through 2001, 50 to 100

individuals of *Silene lanceolata* were observed at various times and locations in Makolelau Gulch between 792 and 927 meters (2,600 and 3,040 feet) elevation (National Tropical Botanical Garden 2009; Perlman 2008). At the most recent visit in 2001, however, only four individuals remained at 878 meters (2,880 feet) elevation, in an area that was devastated by goats (*Capra hircus*) (Perlman 2008). In 1999, two individuals were observed at 893 meters (2,930 feet) elevation in Kawela on East Molokai (Hawaii Biodiversity and Mapping Program 2009) and in 2005 about 300 individuals were observed on steep slopes and cliffs of Kawela at 823 meters (2700 feet) elevation growing with *Silene alexandri* (Perlman 2008). In April and again in August 2007, *S. lanceolata* was seen at Kapuaokoolau, Waiakuilani with 16 individuals between two locations at 911 to 914 meters (2,990 and 3,000 feet) elevation (Perlman 2008). In January 2009, 200 mature individuals of *Silene lanceolata* were observed East of Kawela and west of Makolelau, along cliffs in an unnamed gulch east of the jeep road to Kolekole cabin at 823 meters (2,700 feet) elevation (National Tropical Botanical Garden 2009).

A recent study of the genetics of the genus *Silene* indicates a single introduction from North America as the most likely origin of all the Hawaiian *Silene* species (Eggens *et al.* 2007).

Silene lanceolata occurs in Pohakuloa Training Area in a wide variety of plant communities including *Dodonaea viscosa* (aalii) mixed shrubland, dense *Dodonaea viscosa* shrubland, open *Dodonaea viscosa* shrubland, open *Metrosideros polymorpha* (ohia) treeland with sparse shrub understory, open *Metrosideros polymorpha* treeland with dense shrub understory, intermediate mixed sparse *Metrosideros polymorpha* forest, *Myoporum sandwicense* (naio) – *Sophora chrysophylla* (mamane) mixed shrubland, and *Leptecophylla tameiameia* (pukiawe) mixed shrubland (U.S. Army Garrison, Hawaii 2005). Other areas in the Pohakuloa Training Area that support *S. lanceolata* are *Eragrostis atropioides* (lovegrass) – *Panicum* sp. (no common name[NCN]) montane dry grassland, *Chamaesyce olowaluana* (akoko) montane dry forest, *Myoporum sandwicense* - *Sophora chrysophylla* montane dry forest, *Dodonaea viscosa* – *Leptecophylla tameiameia* montane dry shrubland, and *Dodonaea viscosa* – *Chenopodium oahuense* (aheahea) montane dry shrubland (Hawaii Biodiversity and Mapping Program 2009). The species occurs on both aa and pahoehoe types of lava flows of varying ages (U.S. Army Garrison, Hawaii 2005). Other associated species include *Bidens menziesii* (kookoolau), *Dubautia linearis* (naenae), *Eragrostis atropioides* (lovegrass), and *Sida fallax* (ilima) (Hawaii Biodiversity and Mapping Program 2009).

On Oahu, the habitat for *Silene lanceolata* occurs on cliff faces or ledges of gullies in dry to mesic shrubland or cliff communities containing associated native plant species including *Artemisia australis* (ahinahina), *Bidens cervicata* (kookoolau), *B. torta* (kookoolau), *Carex wahuensis* (NCN), *Chamaesyce* sp., *Dodonaea viscosa*, *Dubautia herbstobatae* (naenae), *Eragrostis variabilis* (kawelu), *Kadua parvula* (NCN), *Lipochaeta tenuifolia* (nehe), *Lobelia niihauensis* (NCN), *Lysimachia hillebrandii* (NCN), *Lysimachia remyi* (NCN), *Nototrichium humile* (kului), *Osteomeles*

anthyllidifolia (ulei), *Pittosporum glabrum* (hoawa), *Psilotum nudum* (moa), *Psychotria hathewayi* (kopiko), *Schiedea mannii* (NCN), and *Tetramolopium filiforme* (NCN) at 328 to 978 meters (1,076 to 3,208 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; Perlman 2008; USFWS 2003a; Wood 2009).

On Molokai, *Silene lanceolata* grows in *Metrosideros polymorpha* – *Dodonaea viscosa* – *Leptecophylla tameiameiae* shrubland on gulch slopes, ridge tops, and cliffs in dry to mesic shrubland between 581 and 1,043 meters (1,906 and 3,421 feet) in elevation. Associated native plant species include *Bidens menziesii* (kookoolau), *Carex wahuensis* (NCN), *Chamaesyce multiformis* (akoko), *Chenopodium oahuense* (aheahea), *Coprosma foliosa* (pilo), *Diospyros sandwicensis* (lama), *Dodonaea viscosa*, *Doryopteris decipiens* (kumuniu), *Dubautia linearis* subsp. *opposita* (naena), *Eragrostis* sp., *Lepidium bidentatum* (anaunau), *Leptecophylla tameiameiae*, *Lipochaeta rockii* (nehe), *Melicope hawaiiensis* (mokihana kukae moa), *Metrosideros polymorpha*, *Nestegis sandwicensis* (olopua), *Ochrosia compta* (holei), *Osteomeles anthyllidifolia*, *Panicum* sp., *Pittosporum argentifolium* (hoawa), *Pleomele auwahiensis* (hala pepe), *Pritchardia munroi* (lulu), *Scaevola gaudichaudii* (naupaka kuahiwi), *Schiedea lydgatei* (NCN), *Schiedea sarmentosa* (NCN), *Sicyos* sp. (anunu), *Sida fallax*, *Silene alexandri* (NCN), *Streblus pendulinus* (aiai), *Viola chamissoniana* (pamakani), and *Wikstroemia* sp. (akia) (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2009; Perlman 2008; USFWS 2003b; Wood 2009).

The introduced grass species *Pennisetum setaceum* (fountain grass) is a threat to *Silene lanceolata* in the Pohakuloa Training Area because it both displaces and competes with it, and also because it greatly increases fire risk. A plan is being developed to use satellite imagery to target areas of high *Pennisetum setaceum* encroachment for control and to minimize impacts on native vegetation in the future (U.S. Army Garrison, Hawaii 2005).

On Oahu, threats to *Silene lanceolata* are habitat destruction by feral goats and pigs (*Sus scrofa*); fire; and competition with invasive introduced plant species including *Ageratina riparia* (spreading mist flower), *Digitaria insularis* (sourgrass), *Erigeron karvinskianus* (daisy fleabane), *Lantana camara* (lantana), *Leucaena leucocephala* (haole koa), *Melinis minutiflora* (molasses grass), *M. repens* (Natal redtop), *Urochloa maximum* (Guinea grass), *Pluchea carolinensis* (sourbush), and *Schinus terebinthifolius* (Christmas berry) (Hawaii Biodiversity and Mapping Program 2009; USFWS 2003a).

Habitat destruction by feral ungulates (goats and pigs), fire, and competition by invasive introduced plants *Ageratina adenophora* (sticky snakeroot), *Fraxinus uhdei* (tropical ash), *Lantana camara*, *Melinis minutiflora*, *M. repens*, and *Ricinus communis* (castor bean) are immediate threats to *Silene lanceolata* on Molokai (USFWS 2003b; Wood 2009).

Climate change may also pose a threat to *Silene lanceolata* (Factors A and E). However, current climate change models do not allow us to predict specifically what those effects, and their extent, would be for this species.

Overall, herbivory recorded on *Silene lanceolata* in Pohakuloa in 2007 was negligible with the exception of two areas. In one area, *Silene lanceolata* had browsing damage because this area was unprotected by large-scale fence units. Large-scale fence units have prevented ungulates from browsing within monitored sites (U.S. Army Garrison, Hawaii 2005). The process of constructing large-scale fences for this area is underway, with a scheduled completion date of 2011. In the interim, many smaller emergency fence enclosures have been erected to protect plants. The primary insect predator is the Argentine ant (*Linepithema humile*). Only about nine percent of individuals are affected, but significant impact of ants on meristems and inflorescence stalks has been noted (U.S. Army Garrison, 2007). A control program to prevent negative impacts by Argentine ants on *S. lanceolata* is being implemented. Monitoring the timing of ant activity around *S. lanceolata* will make most efficient use of control efforts (U.S. Army Garrison, Hawaii 2005).

Approximately 20,000 seeds of *Silene lanceolata* from five natural locations and three outplanting sites are in storage at Pohakuloa Training Area. Eight outplanting sites contain 258 plants representing genetic stock from two natural occurrences (U.S. Army Garrison, Hawaii 2005).

On Oahu, 18 individuals of *Silene lanceolata* were grown at the Pahole Rare Plant Facility in 2007 to 2008 (Hawaii Department of Land and Natural Resources 2008). The Honolulu Botanical garden has one individual in cultivation (Honolulu Botanical Garden 2007). The National Tropical Botanical Garden has over 50,000 seeds in storage and 150 propagated plants (National Tropical Botanical Garden 2009). The Olinda Rare Plant Facility has three individuals (Olinda Rare Plant Facility 2009). The Pohakuloa Training Area has over 10,000 seeds in storage and reintroduced 73 individuals (Pohakuloa Training Area 2009).

The downlisting goals for this species have not been met (see Table 1), as only 2 populations have greater than 300 mature individuals and all threats are not being managed. Therefore, *Silene lanceolata* meets the definition of endangered as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.3 Recommended Classification:

___ **Downlist to Threatened**

___ **Uplist to Endangered**

___ **Delist**

___ *Extinction*

___ *Recovery*

___ *Original data for classification in error*

X 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

- Continue to collect seed for adequate genetic storage and reintroduction purposes.
- Fence wild populations to protect plants and their habitat from ungulates.
- Work with U.S. Army Garrison, Hawaii, and other landowners to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Silene lanceolata* / (no common name)

Current Classification: _____ T _____

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

Marie Bruegmann, Plant Recovery Coordinator
Marilet A. Zablan, Assistant Field Supervisor for Endangered Species
Jeff Newman, Acting Deputy Field Supervisor

Approved  Date **AUG 27 2010**
₁₀₃ **Field Supervisor, Pacific Islands Fish and Wildlife Office**