

5-YEAR REVIEW

Short Form Summary

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

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews of 44 species in Oregon, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 78(24):8185-8187.

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

Marie Bruegmann, Plant Recovery Coordinator, 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 4, 2013. The review was based on a review of current, available information since the last 5-year review for *Silene lanceolata* (USFWS 2010). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Plant Recovery Coordinator,. 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 at: http://ecos.fws.gov/tess_public.

Review Analysis:

Please refer to the previous 5-year review for *Silene lanceolata* published on August 27, 2010 (available at: http://ecos.fws.gov/docs/five_year_review/doc3349.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 *S. lanceolata*.

This short-lived perennial subshrub in the pink family (Caryophyllaceae) is endangered and known from Kauai, Oahu, Molokai, Lanai, and the island of Hawaii (Wagner *et al.* 1999). Currently, this species is found on Oahu, Molokai, and Hawaii Island (Hawaii Biodiversity and Mapping Program 2008). This species has not been observed on Lanai since the 1930s (Hawaii Biodiversity and Mapping Program 2008). The status and trends for *Silene lanceolata* are provided in the tables below.

New status information:

- When critical habitat was designated on Oahu, there were three populations totaling between 100 and 130 individuals of *Silene lanceolata* in the Waianae Mountains (USFWS 2012a).
- In 2012, there were 2 populations totaling approximately 200 individuals at Kapuaokoolau and near Kawela on Molokai (USFWS 2012b). In 2014, there was a single population containing approximately 500 individuals of *Silene lanceolata* on Molokai (Plant Extinction Prevention Program [PEPP] 2014).
- In 2010, there were 727 wild individuals (469 mature and 258 immature) of *Silene lanceolata* at Pohakuloa Training Area (PTA) (U.S. Army Garrison [U.S. Army] 2010). The total number of individuals represents a substantial decline in the number of plants when compared to 8,628 individuals (574 mature and 8,054 immature) reported in FY 2009 (U.S. Army 2010). The significant decreases in particular of immature individuals were most likely driven by prolonged drought. In addition to mortality caused directly by water stress, plants were more susceptible to other stresses such as insect herbivory (U.S. Army 2010).
- Overall, the numbers of individuals have declined from the approximately 20,000 wild mature individuals reported in the previous 5-year review to approximately 1,327 to 1,357 wild individuals in 2015. The number of reintroduced individuals increased from no individuals reported in the previous 5-year review to more than 377 individuals in 7 populations. Natural recruitment of approximately 1,111 mature and 3,473 immature individuals of *Silene lanceolata* were observed at outplanting sites located at PTA and on State-owned lands outside of PTA.

New management actions:

- Surveys / inventories
 - In 2010, two new plant locations of *S. lanceolata* were found in the Kipuka Alala North and Kipuka Alala South Fence Unit (U.S. Army 2010). Two additional plant locations were discovered within the proximity of Area of Species Recovery (ASR) 31 (U.S. Army 2010).
 - Approximately 259 locations of *S. lanceolata* were recorded within the installation wide survey area (U.S. Army 2014). The distribution of this species within the Kipuka Alala North Fence Unit was found to be larger than previously documented (U.S. Army 2014).
 - In 2014, surveys conducted in previously un-surveyed areas and previously surveyed areas discovered approximately 28 locations of *S. lanceolata* (U.S. Army 2015).
- Ungulate monitoring and control
 - In 2010, extreme drought conditions throughout PTA led to an increase in ungulate pressure to rare plants and their habitat. Consequently, emergency fences constructed of lightweight materials (plastic orange fencing) in ASR 24 were replaced with small-scale fences constructed of metal t-posts and hog wire fencing to ensure the plants were protected from ungulates (U.S. Army 2010). Additionally, existing emergency fences in ASR 13 were repaired and new emergency fencing was installed at ASRs 11 and 13 (U.S. Army 2010).
 - All known individuals of *S. lanceolata* at PTA are protected by large-scale fence units and ungulate control was expected to commence in 2011 (U.S. Army 2010).

As of 2013, the Kipuka Kalawamauna North, Naohuleelua, and the Mixed Tree Fence Units are pending ungulate removal (U.S. Army 2014). Kipuka Kalawamauna East is considered ungulate-free; however, the unit does contain less than three individual ungulates since 2011 (U.S. Army 2014).

- Invasive plant monitoring and control – Manual hand clearing and maintenance spraying of weeds is ongoing around individuals of *S. lanceolata* at PTA (U.S. Army 2010, 2014).
- Captive propagation for genetic storage and reintroduction
 - The Lyon Arboretum’s Seed Conservation Laboratory (2014) has more than 2,770 seeds in storage.
 - The Lyon Arboretum’s Micropropagation Laboratory (2013) has approximately 15 propagules in storage.
 - The National Tropical Botanical Garden (2014) has more than 9,000 seeds in storage.
 - During 2012 to 2013, more than 324,000 seeds from 36 accessions representing 5 groups and 33 founders of *S. lanceolata* were collected and placed in long-term storage at PTA (U.S. Army 2014). There are now more than 956,000 seeds in storage from 125 accessions representing 11 groups and 107 founders in long-term storage at PTA (U.S. Army 2014).
 - Three groups (ASR 13, 16, and 31) have been selected as the main sites for *ex situ* genetic conservation based on the large number of individuals located within these sites (U.S. Army 2014). In 2008, comprehensive genetic collections were made from ASR 13 and in 2006 a partial collection was made within ASR 31 (U.S. Army 2014). No genetic material has been collected from ASR 16 (U.S. Army 2014). Additional founders and seeds are needed to achieve genetic conservation goals for this species.
 - In July 2014, 400 seeds of *S. lanceolata* were provided to the U.S. Department of Agriculture Forest Service, Pacific Southwest Research Station Institute of Pacific Island Forestry for use in a Department of Defense-funded Environmental Security Technology Certification Program (U.S. Army 2015).
- Captive propagation protocol development – Propagation trials were conducted at PTA to determine appropriate storage and propagation techniques for *S. lanceolata*. The trials indicated that seeds of *S. lanceolata* germinated readily at a rate of more than 50 percent (U.S. Army 2015). Seed longevity for *S. lanceolata* is estimated at greater than five years (U.S. Army 2015).
- Population viability monitoring and analysis
 - At site 214 within the Kipuka Alala South fence unit, monitoring of the site in 2014 tallied two reintroduced individuals and approximately 800 naturally recruited mature and 1,500 immature individuals at the site (U.S. Army 2015).
 - Near Saddle Road on State-owned lands, natural recruitment of 1 mature and approximately 513 immature individuals were observed in 2014 (U.S. Army 2015).
 - In North Kona on State-owned lands, natural recruitment of 10 mature and approximately 60 immature individuals were observed in 2014 (U.S. Army 2015).
 - At Puu Waawaa Cone Unit on State-owned lands monitoring conducted in 2014 recorded natural recruitment of approximately 300 mature and 1,400 immature

- individuals of *S. lanceolata* (U.S. Army 2015). This species have persisted for several generations at this site (U.S. Army 2015).
- In 2015, there were 12 individuals of *S. lanceolata* at Waikoloa Dry Forest Initiative with some of those individuals producing fruits (J. Lawson, Waikoloa Dry Forest Initiative, pers. comm. 2015).
 - Reintroduction / translocation
 - In 2014, a single individual of *S. lanceolata* was outplanted at site 213 in the Mixed Tree fence unit (U.S. Army 2015).
 - During 2002 to 2012 at site 214 within the Kipuka Alala south fence unit, 75 individuals were reintroduced to the site (U.S. Army 2015).
 - Near Saddle Road on State-owned lands, 51 individuals were outplanted during 2002 to 2012, no individuals were added in 2014, and 10 plants remained in 2014 (U.S. Army 2015).
 - In North Kona on State-owned lands, 199 individuals were outplanted during 2004 to 2009 and no outplants remained in 2014 (U.S. Army 2015).
 - At Puu Waawaa Cone Unit on State-owned lands, 340 individuals were outplanted during 2005 to 2012 (U.S. Army 2015). In 2014, only two outplanted individuals remained.
 - On County-owned lands in North Kona, 12 individuals were outplanted during 2008 to 2012 and no outplants remained in 2014 (U.S. Army 2015).
 - During 2013 to 2014, 350 individuals of *S. lanceolata* were outplanted at Puu Waawaa Forest Reserve (State of Hawaii Department of Land and Natural Resources [DLNR] 2014).
 - Predator / herbivore monitoring and control – In 2010, evidence of recent herbivory were present on approximately 9 percent of the monitored individuals of *S. lanceolata* at PTA, with the majority due to insect herbivory at 94 percent (U.S. Army 2010). Argentine ants (*Linepithema humile*) were noted once again in ASR 18; however, without further studies the direct and indirect impacts of Argentine ant to this species is unknown (U.S. Army 2010).
 - Fire monitoring and control
 - On July 21, 2012, a wildland fire burned approximately 445 square meters within Training Area 22 of PTA (U.S. Army 2014). The area was surveyed in August and no individuals of *S. lanceolata* were affected; however, they were located approximately 189 meters (620 feet) from the burned area.
 - On November 15, 2012, a wildland fire was ignited as a result of detonating unexploded ordnance within the Kipuka Kalawamauna East Fence Unit and burned approximately 188 hectares (465 acres) (U.S. Army 2014). A post-fire survey was conducted from December 2012 to March 2013 to assess the impacts of the fire on Federally listed plant species. *Silene lanceolata* was located within and surrounding the burned area and may have been impacted by the fire, but there was little to no impact on the distribution of the species (U.S. Army 2014). The specific impacts to *S. lanceolata* were not described in the report.
 - Listing and critical habitat designation
 - Eight units of critical habitat were designated in the dry cliff ecosystem on Oahu for *S. lanceolata* (USFWS 2012a).

- Two units of critical habitat for *S. lanceolata* were proposed in the lowland dry ecosystem on Molokai (USFWS 2012b). On Lanai, critical habitat for *S. lanceolata* was proposed in two units in the lowland dry ecosystem. The final rule for critical habitat designations has not been published at the time of this review.
- Climate change adaptation strategy – 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 *S. lanceolata* is moderately vulnerable to the impacts of climate change. Therefore, additional management actions are needed to conserve this taxon into the future.

Synthesis:

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 stable, the taxon 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 Molokai, 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.

The interim stabilization goals for this species have been partially met in terms of containing three populations with a minimum of 50 mature individuals per population.

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.

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

Recommendations for Future Actions:

- Surveys / inventories – Survey geographical and historical range for a current assessment of the species’ status.
- 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 genetic resources in long-term storage due to this species' vulnerability to climate change.
- Ungulate monitoring and control – Maintain existing exclosures and monitor for potential incursions.
- Invasive plant monitoring and control – Eradicate invasive introduced plants within ungulate exclosures and maintain exclosures free of invasive plants.
- Population viability monitoring and analysis – Continue monitoring wild and reintroduced individuals.
- Fire monitoring and control – Develop and implement a fire management plan at the existing exclosures.
- Climate change adaptation strategy – Research the suitability of habitat for reintroducing this species in the future due to the impacts of climate change.
- 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 *Silene lanceolata* from listing through current 5-year review.

Date	No. wild indivs	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, & increasing in number	Unknown
			Stable for 5 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, & increasing in number	Unknown
			Stable for 5 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, & increasing in number	Unknown
			Stable for 5 consecutive years	Unknown
2010 (5-yr review)	>20,000	0	All threats managed in all 5-7 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
			Naturally reproducing, stable, & increasing in number	Unknown
			Stable for 5 consecutive years	Unknown
2012 (proposed critical habitat)	200 (Molokai only)	n/a	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,	No

Date	No. wild indivs	No. outplanted	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria Completed?
			& increasing in number	
			Stable for 5 consecutive years	No
2015 (5-yr review)	1,327-1,357	377 (4,584 natural recruits)	All threats managed in all 5-7 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
			Naturally reproducing, stable, & increasing in number	No
			Stable for 5 consecutive years	No

Table 2. Threats to *Silene lanceolata* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, PTA is fenced
Invasive introduced plants	A, E	Ongoing	Partially, weed control ongoing at PTA
Ant predation – Argentine ant	C	Ongoing	None
Drought	E	Ongoing	None
Fire	E	Ongoing	Partially, tied to weed control efforts at PTA
Military activities	E	Ongoing	Partially, ESA consultations at PTA
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2010). 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. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Micropropagation storage Microsoft Access database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Harold L. Lyon Arboretum Seed Conservation Laboratory. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Seed storage Microsoft Access database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

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National Tropical Botanical Garden. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2014. Plant Extinction Prevention Program annual report, fiscal year 2014 (July 1, 2013-June 30, 2014). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[DLNR] State of Hawaii Department of Land and Natural Resources. 2014. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 annual performance report for plant restoration and enhancement, threatened, endangered, candidate, and species of concern outplanting, Hawaii; interim report. July 1, 2013 – June 30, 2014. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[U.S. Army] U.S. Army Garrison Pohakuloa. 2010. Natural Resources Program, annual report, Pohakuloa Training Area, Island of Hawaii. 01 October 2009 to 30 September 2010. U.S. Army Garrison Pohakuloa LTC Rolland C. Niles, Commanding December 2010. Prepared in cooperation with the Center for Environmental Management of Military Lands, Colorado State University. 147 pages.

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[U.S. Army] U.S. Army Garrison. 2015. FY 2014 annual report for the natural resources office, Pohakuloa Training Area, Island of Hawaii. 84 pages. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[USFWS] U.S. Fish and Wildlife Service. 1996. Recovery plan for the Molokai plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 143 pages.

[USFWS] U.S. Fish and Wildlife Service. 2010. *Silene lanceolata* 5-year review summary and evaluation. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 17 pages.

[USFWS] U.S. Fish and Wildlife Service. 2012a. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Federal Register 77(181):57648-57862.

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

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawaii. University of Hawaii Press and Bishop Museum Press, Honolulu, Hawaii.

Personal communications

Lawson, Jen. 2015. Project manager, Waikoloa Dry Forest Initiative. E-mail to Chelsie Javar-Salas, Pacific Islands Fish and Wildlife Office, dated April 30, 2015. Subject: Request for info for 5-year reviews.

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

Appropriate Listing/Reclassification Priority Number, if applicable: _____

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Date 2015-08-20