

5-YEAR REVIEW

Short Form Summary

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

Current Classification: Threatened

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. Federal Register 88(83): 20088–20092, May 7, 2018.

Lead Region/Field Office:

Interior Region 12/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer:

Cheryl Phillipson, Biologist, PIFWO

Lauren Weisenberger, Plant Recovery Coordinator, PIFWO

Megan Laut, Conservation & Restoration Team Manager, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) beginning in October 2019. The review was based on a review of current, available information since the last 5-year review for *Silene hawaiiensis* (USFWS 2015). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

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 reviews for *Silene hawaiiensis* published in the Federal Register on August 27, 2010 and August 25, 2015 (available at https://ecos.fws.gov/docs/five_year_review/doc3348.pdf and https://ecos.fws.gov/docs/five_year_review/doc4590.pdf) for a complete review of the species' status, threats, management efforts, and references cited. We are not aware of any significant new information regarding the species' biological status since listing to warrant a change in the Federal listing status of *S. hawaiiensis*.

This short-lived perennial shrub in the Caryophyllaceae (pink) family is threatened and found on the island of Hawai‘i. The current status and trends for *Silene hawaiiensis* are provided in the tables below.

New Status Information:

- At the time of the 5-year review in 2015 there were estimated to be between 2,100–4,870 wild individuals of *Silene hawaiiensis* remaining, with one new occurrence of one individual in Kahuku. There are five general locations within PTA with occurrences of *Silene hawaiiensis* (Kīpuka Kalawamauna East, Nā‘ōhule‘elua, Kīpuka ‘Alalā, Pu‘u Koli, and Ka‘ena); however, mapped survey data was last reported in 2014 (U.S. Army Garrison 2020; Hawaii Biodiversity and Mapping Program (HBMP) 2010). Two training impact areas, Impact Area East and Impact Area South, were last surveyed in 2002 and 2008, respectively, totaling at least 400 individuals (HBMP 2010). The current status of *S. hawaiiensis* in these areas is unknown. As of 2019, the U.S. Army Garrison reported *S. hawaiiensis* populations (1,324 locations) totaling 2,344 (at minimum) individuals at Pōhakuloa Training Area (PTA); however, this total may include reintroduced plants (U.S. Army Garrison 2020, p. 8). In 2020, the U.S. Army Garrison summarized their report, stating that the number of individuals of *S. hawaiiensis* at PTA is likely underreported (U.S. Army Garrison 2020, p. 6). In Hawai‘i Volcanoes National Park (HVNP) there are five general locations with occurrences of *S. hawaiiensis* (Kapāpala Upper, Kapāpala Lower, Kīlauea, Ka‘u, and Kahuku East) totaling at least 300 individuals; however, some mapped survey data is more than 10 years old (HVNP 2019). In summary, the estimated total of wild plants at both PTA and HVNP is at least 2,644 individuals.

New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this species. Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawai‘i 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 *Silene hawaiiensis* is vulnerable to the impacts of climate change, with a vulnerability score of 0.216 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.
- In 2018, a wildland fire ignited by military training at PTA burned approximately 61 ha (150 ac), impacting more than 1 percent of the *Silene hawaiiensis* locations (U.S. Army Garrison 2020, p. 9). However, no estimates of numbers of individuals affected was provided.

New Management Actions:

- Surveys and inventories—
 - In 2015, field surveys to monitor and confirm the status of reintroduced populations were conducted in Hawai‘i Volcanoes National Park (HVNP) (HVNP 2019, pp. 23–24). Plantings conducted in the Kahuku Silversword exclosure from 2007 through 2009 did not survive. In 2012, plants near

the visitor viewing site at Kilauea were being trampled by visitors and NPS staff caged the most vulnerable plants and flagged others (HVNP 2019, pp. 23–24). In 2019, local monitoring of plants at Kīlauea overlook including those at Keanakako‘i were conducted in response to recovery reconstruction activities after the dramatic 2018 collapse of the crater and plants were flagged to avoid disturbance by contractors (HVNP 2019, p. 24).

- Of those plants reintroduced to PTA between 2004 and 2015, three immature plants remained at Pu‘uwa‘awa‘a (of the 22 individuals reintroduced in 2010 through 2012), eight mature plants remained at Area of Species Recovery (ASR) 213, and six mature plants remained at ASR 214 (of the eight reintroduced between 2002 to 2014) (U.S. Army Garrison 2020, pp. 48–49). Thirteen managed plant groups at PTA were monitored between 2010 and 2015, with 1,324 locations of *Silene hawaiiensis* containing a total of 2,344 individuals (U.S. Army Garrison 2020, p. 57).
- Captive propagation for genetic storage and reintroduction—At the end of 2019, the PTA reported a total of 39 seedling accessions (U.S. Army Garrison 2020, p. 42).
- Reintroduction—
 - In 2015, HVNP reported that 87 *Silene hawaiiensis* were reintroduced in upper Kahuku. No monitoring or planting was conducted in 2016. In 2017, the planted populations in the Kahuku exclosures were monitored, with very low survivorship. Of the 87 individuals planted, only five survived, however, these individuals were observed flowering and fruiting (HVNP 2019, p. 24; HVNP 2020).
 - The USDA Forest Service reported that all reintroduction sites were fenced and that 320 *Silene hawaiiensis* were planted at PTA with 75 percent survivorship (240 individuals) (Cordell, USDA Forest Service 2015).
- Population biology—Because of low survivorship of reintroductions at Kahuku, HVNP plans to conduct trials of seed broadcast to establish new populations (HVNP 2019, p. 24).

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

Date	No. wild individuals	No. outplanted	Delisting Criteria identified in Recovery Plan	Delisting Criteria Completed?
1994 (listing)	>3,000	0	All threats managed in the 5 largest populations	Partially
			Complete genetic storage	No

			8 to 10 populations with 300 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in number	Unknown
			Populations stable for 5 consecutive years	Unknown
1996 (recovery plan)	ca 11,000	0	All threats managed in the 5 largest populations	Partially
			Complete genetic storage	Partially
			8 to 10 populations with 300 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in number	Unknown
			Populations stable for 5 consecutive years	Unknown
2003 (critical habitat)	ca 2,540	Unknown	All threats managed in the 5 largest populations	Partially
			Complete genetic storage	Partially
			8 to 10 populations with 300 mature individuals each	No
			Populations naturally reproducing, stable, and increasing in number	Unknown
			Populations stable for 5 consecutive years	Unknown
2010 (5-year review)	ca 8,360	0	All threats managed in the 5 largest populations	Partially

			Complete genetic storage	Partially
			8 to 10 populations with 300 mature individuals each	Partially
			Populations naturally reproducing, stable, and increasing in	Unknown
			Populations stable for 5 consecutive years	Unknown
2015 (5-year review)	2,100–4,870	ca 162 (30 natural recruits)	All threats managed in the 5 largest populations	Partially
			Complete genetic storage	Partially
			8 to 10 populations with 300 mature individuals each	Partially
			Populations naturally reproducing, stable, and increasing in	No
			Populations stable for 5 consecutive years	No
Date	No. wild individuals	No. outplanted	*Interim Criteria identified by HPPRCC	*Interim Criteria Completed?
2020 (5-year review)	ca 2,644+	ca 407, <245 survive	All threats managed in all 3 populations	Partially, most wild and reintroduced populations are fenced
			Complete genetic storage	Limited
			Regeneration (i.e. viable seeds, seedlings) at all 3 populations	Unknown

			3 populations with 300 mature individuals each	No, only 2 populations >300, monitoring inadequate
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* The Preventing Extinction Stage was established in 2011. Prior to 2011, the Interim Stabilization Stage was the first stage towards recovery (now it is the second stage after Preventing Extinction).

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate destruction and degradation of habitat and herbivory	A, C, D	Ongoing	Partial, most populations in exclosures
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, some nonnative plant control at PTA and HVNP
Drought destruction and degradation of habitat	A	Ongoing	None
Fire destruction and degradation of habitat	A	Ongoing	Partial, nonnative plant control efforts and firebreak at PTA and fire management plan for HVNP
Lava flow and volcanic destruction and degradation of habitat	A	Potential	None
Climate change degradation and loss of habitat	A	Ongoing	None
Collection impacts	B	Ongoing	Partial, case addressed by DOCARE and OLE
Invertebrate predation and herbivory	C	Ongoing	None
Lack of adequate hunting regulations	D	Ongoing	Partial, exclosures at PTA and HVNP
Military training activities	E	Ongoing	Partial, management following ESA consultation

Synthesis:

Currently, approximately 2,644 individuals of *Silene hawaiiensis* occur within PTA and Hawai'i Volcanoes National Park on the island of Hawai'i. A landscape-based assessment of climate change vulnerability for native plants of Hawai'i using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *S. hawaiiensis* is vulnerable to the effects of climate change. Seedlings have been propagated (39) and 407 individuals reintroduced since the last 5-year review. Approximately 245 of those reintroduced survive, but this is likely due to the limited monitoring at some sites and the low survivorship observed at other sites. Most wild and reintroduced populations are provided protection from feral ungulates by fencing and ungulate control at PTA and HVNP, with some nonnative plant management. No natural regeneration has been reported since 2015.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Big Island Plant Cluster (USFWS 1996), and have been updated according to the draft revised recovery objective guidelines developed by the Hawai'i and Pacific Plants Recovery Coordinating Committee (HPPRCC 2011). The HPPRCC identifies an additional initial objective, the Preventing Extinction Stage, in addition to the Interim Stabilization, Delisting, and Downlisting objectives. Furthermore, life history traits such as breeding system, population size fluctuation or decline, and reproduction type (sexual or vegetative), have been included in the calculation of goals for the number of populations and reproducing individuals for each stage. The goals for each stage remain grouped by life span defined as annual, short-lived perennial (fewer than 10 years), or long-lived perennial.

Silene hawaiiensis is a short-lived perennial shrub. To meet the interim stage of recovery of *Genus species*, 300 mature individuals are needed in each of three populations, with at least one population on each of the islands from which they were known historically as long as suitable habitat exists. All major threats must be controlled around the populations designated for recovery at this stage. There should also be demonstrated regeneration of seedlings and documented replacement regeneration within each of the target populations. The populations must be adequately represented in an *ex situ* collection as defined in the Center for Plant Conservation's guidelines (Guerrant *et al.* 2004) that is secure and well managed. Adequate monitoring must be in place and conducted to assess individual plant survival, population trends, trends of major limiting factors, and response of major limiting factors to management.

The interim goals for this species have not been met. Currently, although there are as many as 2,644 individuals, only two populations total more than 300 individuals, and it is unknown how many are reproducing. Recent reintroductions declined from over 400 individuals to 245, with no reported recruitment. Monitoring of some previously known populations is not adequate. Genetic representation is incomplete (Table 1). In addition, all threats are not being managed (Table 1, Table 2). Therefore, *Silene hawaiiensis* meets the definition of Threatened and is likely to become Endangered if the number of individuals continues to decline and the level of threats continues to increase.

Recommendations for Future Actions:

We are not aware of any new threats or significant new information regarding the species' biological status since the last 5-year review in 2015. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—Continue to conduct thorough surveys of all current and historical range for an assessment of the species' status.
- Ungulate monitoring and control—Continue to construct and maintain fenced exclosures to protect individuals from the negative impacts of habitat destruction and degradation, and browsing and trampling by ungulates.
- Established ecosystem-altering invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species, and those that compete with *Silene hawaiiensis* at all populations.
- Fire management—Continue to implement fire management plans.
- Habitat protection—Continue to implement effective measures to reduce the impacts of military training.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for the recovery of the species.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction into protected suitable habitat within historical range.
- Reintroduction and translocation—Determine optimal sites for reintroduction and recruitment success, including areas less likely to be impacted by volcanic activity, and continue to reintroduce individuals into these areas that are managed for known threats.
- Population biology research—Continue trials to research the effectiveness of seed broadcast.
- Alliance and partnership development—Continue to work with the Hawai'i Volcanoes National Park, the U.S. Army Garrison, and other partners and land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

References:

- Cordell, USDA Forest Service. 2015. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai'i.
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- Guerrant, E.O., K. Havens, and M. Maunder. 2004. *Ex Situ Plant Conservation: Supporting Species Survival in the Wild*. Island Press, Washington, D.C. 504 pp.

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- [HVNP] 2020. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai'i.
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U.S. FISH AND WILDLIFE SERVICE

SIGNATURE PAGE for 5-YEAR REVIEW of *Silene hawaiiensis* (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

For Field Supervisor, Pacific Islands Fish and Wildlife Office

_____ Date _____