

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Phyllostegia hirsuta* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

Lead Region/Field Office:

Region 1/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 2018. The review was based on a review of current, available information since the last 5-year review for *Phyllostegia hirsuta* (USFWS 2013). The evaluation completed 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 *Phyllostegia hirsuta* published in the Federal Register on January 18, 2008 and August 7, 2013 (available at https://ecos.fws.gov/docs/five_year_review/doc1854.pdf and https://ecos.fws.gov/docs/five_year_review/doc4230.pdf) for a complete review of the species' status, threats, and management efforts. 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 *P. hirsuta*.

This short-lived perennial subshrub to scandent liana in the Lamiaceae (mint) family is endangered and endemic to O'ahu. The current status and trends for *Phyllostegia hirsuta* are provided in the tables below.

New Status Information:

- *Phyllostegia hirsuta* occurs in nine population units and 20 subpopulations from Ka‘ala to Palikea in the Wai‘anae mountains, and from Wai‘eli to Waimano in the Ko‘olau mountains, totaling 34 mature individuals and 18 immature individuals (Army Natural Resources Program-O‘ahu (ANRP) 2018; Plant Extinction Prevention Program (PEPP) 2019). These population estimates represent an overall population decline of greater than 90 percent since the last five year review.
- In 2012, 32 critical habitat units in four ecosystems (lowland mesic, lowland wet, montane wet, and wet cliff) were designated for *Phyllostegia hirsuta* in the Wai‘anae and Ko‘olau mountains of O‘ahu (39,256 ac, 15,885 ha) (77 FR 57648, September 18, 2012).

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 *Phyllostegia hirsuta* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.68 (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.

New Management Actions:

- Ungulate and nonnative plant control—*Phyllostegia hirsuta* occurs in 11 areas fenced and managed for ungulates by the ANRP (Ka‘ala, Līhu‘e, Kaluaa-Wai‘eli, Poamoho, Kaipapa‘u, and Palikea in the Wai‘anae mountains and Koloa, Kawai Iki, ‘Ōpae‘ula, Helemano, and Kaukonahua in the Ko‘olau mountains) (ANRP 2018) Lihue and Palikea are currently ungulate-free (ANRP 2018).
- Nonnative plant control—Nonnative plants are controlled by the ANRP in three areas: Līhu‘e, Kōloa, and Palikea (ANRP 2018).
- Invertebrate control—The ANRP has found that Ferroxx® is a more effective slug control than Sluggo®, and this toxicant is currently used in management of slugs in areas including Līhu‘e, Palikea, Kaluaa–Wai‘eli and ‘Ōpae‘ula (ANRP 2018).
- Propagation and reintroduction—
 - PEPP monitors and collects from individuals at Helemano and Kaipapa‘u (PEPP 2016).
 - There are 37 founders from six populations represented in genetic storage, with the 34 of them adequately represented (three replicates per plant in the nursery or 50 or more seeds in the seed bank) (ANRP 2018).

- The Lyon Arboretum Micropropagation Laboratory reports propagation of 1,055 explants from 11 subpopulations (Lyon Arboretum 2018, in litt.).
- There have been outplantings at the Hale‘au‘au to Mohiākea, Kōloa, and Pu‘u Palikea populations. There are currently 75 mature and 15 immature outplants. Seedlings (recruits) have been seen at the Pu‘u Palikea reintroduction (ANRP 2018).

Synthesis:

Currently there are 52 wild individuals of *Phyllostegia hirsuta* in the Wai‘anae and Ko‘olau mountains of O‘ahu. 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 *P. hirsuta* is highly vulnerable to the effects of climate change. Almost all the known individuals of *P. hirsuta* occur within fenced and managed areas. Methodology used for slug control has improved. Many founders have been collected from, propagated, and stored.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the O‘ahu Plants (USFWS 1998), 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.

Phyllostegia hirsuta is a short-lived perennial subshrub to scandent liana. To prevent extinction, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and have 50 individuals (or the total number of individuals if fewer than 50 exist) from each of three populations represented in *ex situ* (secured off-site, such as a nursery or seed bank) collections. In addition, a minimum of three populations should be documented on O‘ahu where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e.*, viable seeds, seedlings, saplings) and increasing in number, with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are no populations totaling more than 50 individuals. Although most threats are managed; however, genetic representation is incomplete (Table 1, Table 2). Numbers of *Phyllostegia hirsuta* continue to decline drastically, from ~360 to 52 since the last five year review. Therefore, *P. hirsuta* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

Other than the new data on this taxon's vulnerability to climate change, we are not aware of any new threats or significant new information regarding the species' biological status since the last 5-year review in 2013. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2019.

- Surveys and inventories—Survey known population areas that have not been visited in three or more years to assess seedbank and current status.
- Ungulate monitoring and control—Continue to construct and monitor fencing around all populations to provide protection from the negative impacts of feral ungulates.
- Invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species, and those that compete with *Phyllostegia hirsuta* at all populations.
- Fire management—Implement wildfire management plans for all populations and coordinate control efforts.
- 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.
- Predator and herbivore control—Continue to implement effective control methods for slugs.
- Captive propagation—
 - Continue seed collection to complete representation for all founders for *ex situ* genetic storage.
 - Keep close track of maternal source used for *ex situ* propagation.
- Reintroduction—Reinitiate reintroduction efforts to establish new populations or augment existing populations that are managed for current threats.
- Population biology research—Study *Phyllostegia hirsuta* 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.
- Alliance and partnership development—Work with the ANRP, the Division of Forestry and Wildlife, and other land managers to contribute to implementation of ecosystem-level restoration and management to benefit this species.

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (listing)	150–200	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	No
1998 (recovery plan)	150–200	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2003 (critical habitat)	214–227	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
2008 (5-year review)	160	72	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	Partially, one population
2012 (critical habitat)	160	Unknown	All threats managed in all three populations	Partially
			Complete genetic storage	Partially

			Three populations with 50 mature individuals each	Partially
2013 (5-year review)	330–396	All available stock, unreported numbers	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	Partially
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2019 (5-year review)	52	0	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Reproduction (<i>i.e.</i> viable seeds, seedlings) at all three populations	Unknown
			Three populations with 50 mature individuals each	No

* 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 after Preventing Extinction).

Table 2. Threats to *Phyllostegia hirsuta* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate destruction and degradation of habitat	A	Ongoing	Partial, ungulate control at 11 management areas
Degradation of habitat by established ecosystem-altering invasive plant species	A	Ongoing	Partial, nonnative plant control at three management areas
Fire management	A	Ongoing	Partial, fire management plan available
Climate change degradation or loss of habitat	A	Ongoing	None
Ungulate predation and herbivory	C	Ongoing	Partial, ungulate control at 11 management areas
Invertebrate predation and herbivory—Slugs	C	Ongoing	Partial, control at four management areas
Competition with established invasive plant species	E	Ongoing	Partial, nonnative plant control at four management areas
Military training activity	E	Ongoing	Partial, 11 management areas
Low numbers	E	Ongoing	Partial, seed collection and propagation ongoing

References:

See previous 5-year reviews for a full list of references (USFWS 2008, 2013). Only references for new information are provided below.

[ANRP] Army Natural Resources Program-O‘ahu. 2018. 2018 status report for the Makua and Oahu implementation plans. 217 pp.

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. 134 pp.

[HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.

Lyon Arboretum 2018, in litt., Report on controlled propagation of listed and candidate 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, Hawaii.

- [PEPP] Plant Extinction Prevention Program. 2016. Extinction Prevention Program FY 2016 Annual Report (Oct 1, 2015-Sep 30, 2016), US FWS CFDA Program #15.657; Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F14AC00174, December 24, 2016, UH Manoa, PCSU, PEPP, 237 pp.
- [PEPP] 2017. Plant Extinction Prevention Program FY 2017 Annual Report (Oct 1, 2016-Sep 30, 2017), Coop Agreement: F14A00174, U.S. Fish and Wildlife Service CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, 235 pp.
- [USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; Endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Department of the Interior, Federal Register 77 (181): 57648–57862, September 18, 2012.
- [USFWS] 2013. *Phyllostegia hirsuta* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI.
https://ecos.fws.gov/docs/five_year_review/doc4230.pdf.
- [USFWS] 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Phyllostegia hirsuta* (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
- X No Change in listing status

For Field Supervisor, Pacific Islands Fish and Wildlife Office

Date _____