

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Phyllostegia parviflora* (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 *Phyllostegia parviflora* (USFWS 2008). 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 *Phyllostegia parviflora* published on January 18, 2008 (available at: http://ecos.fws.gov/docs/five_year_review/doc1786.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 *P. parviflora*.

This short-lived perennial herb is a member of the mint family (Lamiaceae) and is endangered (Wagner *et al.* 1999; USFWS 1999). Historically, *Phyllostegia parviflora* was known from the islands of Oahu, Hawaii, and Maui (Wagner *et al.* 1999; Wagner 1999). Currently, three varieties are recognized: *P. parviflora* var. *glabriuscula* is known only from Hawaii Island, *P. parviflora* var. *parviflora* is found on Maui and in the Koolau Mountains of Oahu, and *P. parviflora* var. *lydgatei* is known from the Waianae Mountains of Oahu (Wagner 1999). As mentioned in the previous 5-year review, *P. parviflora* var. *lydgatei* remains extinct in wild (USFWS 2008, Plant Extinction

Prevention Program [PEPP] 2009). *Phyllostegia parviflora* var. *parviflora* is extirpated from Maui (PEPP 2012). The status and trends for *P. parviflora* are provided in the tables below.

New status information:

Phyllostegia parviflora var. *glabriuscula*

In 2009, there were three populations containing 75 individuals of *P. parviflora* var. *glabriuscula* on Hawaii Island (PEPP 2009, 2010). There is confusion on the identity of *P. parviflora* var. *glabriuscula* and *P. stachyoides* (J. VanDeMark, pers. comm. 2014). Plants from three different locations have been interchangeably called both names but all of the plants look very different. For example, the plants at Hawaii Volcanoes National Park have been determined to be *P. stachyoides*, but when compared to the plants from South Kona Forest Reserve named as *P. stachyoides* by the National Tropical Botanical Garden, they look very different (J. VanDeMark pers. comm. 2014). Meanwhile plants from Hualalai called *P. parviflora* var. *glabriuscula* are likely correctly identified. Specimens from each location will be collected and examined by various plant experts to determine the identification of each species at each location (J. VanDeMark pers. comm. 2014). Consequently as of 2013, the individuals previously identified as *Phyllostegia parviflora* var. *glabriuscula* by Hawaii Volcanoes National Park (2013) are now identified as *Phyllostegia stachyoides*, a species with no federal listing status.

Phyllostegia parviflora var. *parviflora*

In 2009, there was a single population of *Phyllostegia parviflora* var. *parviflora* on Oahu (PEPP 2009). In 2011, there were 100 mature wild individuals of *P. parviflora* var. *parviflora* in the Koolau Mountains on Oahu (PEPP 2011). These 100 wild individuals of *P. parviflora* var. *parviflora* were known when critical habitat was designated on Oahu (USFWS 2012).

Phyllostegia parviflora var. *lydgatei*

In 2009, this species was extinct in the wild on Oahu (PEPP 2009). In 2010, there was a single wild mature individual of *P. parviflora* var. *lydgatei* known from Oahu (PEPP 2011). In 2010, the reintroduced population at Palikea contained 18 individuals of *P. parviflora* var. *lydgatei* (PEPP 2011). When critical habitat was designated on Oahu in 2012, all four wild individuals of *P. parviflora* var. *lydgatei* in the Waianae Mountains was extirpated; however, 100 individuals have been reintroduced (USFWS 2012). In 2013, the wild individual died on Oahu and is now only represented by six reintroduced individuals (PEPP 2014).

Overall, the numbers of individuals have decreased from the approximately 200 wild individuals reported in the previous 5-year review to approximately 175 wild individuals in 2015. Since there are taxonomic issues of *Phyllostegia parviflora* var. *glabriuscula* on Hawaii Island the status of the species is unclear and will remain at 75 individuals from 3 populations (PEPP 2010). The number of reintroduced individuals decreased from the estimated 195 individuals reported in the previous 5-year review to 6 individuals.

New threats:

- Climate change destruction or degradation of habitat – 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 *Phyllostegia parviflora* is minimally vulnerable to the impacts of climate change.
- Stochastic events – Drought mortality or reduced viability – Drought may exacerbate the effects of ungulates and has direct adverse impacts on *P. parviflora* var. *lydgatei* (PEPP 2012).

New management actions:

- Invasive plant monitoring and control – Weeds were controlled at the Palikea reintroduction site for *P. parviflora* var. *lydgatei* (PEPP 2012, 2014).
- Population viability monitoring and analysis
 - The reintroduced population containing 16 individuals of *P. parviflora* var. *lydgatei* was monitored at Palikea on Oahu (PEPP 2010). Propagules were collected for storage at the Lyon Arboretum’s Micropropagation Laboratory (PEPP 2010). In 2011, six wild individuals were monitored at Palikea and the 16 reintroduced individuals were monitored at Palikea as well (PEPP 2012).
 - Ten individuals of *P. parviflora* var. *parviflora* were monitored at Punaluu on Oahu (PEPP 2011). In 2012, 21 mature and 2 immature individuals of *P. parviflora* var. *parviflora* were monitored at Punaluu and cuttings were collected from 8 individuals (PEPP 2012).
 - In 2013, *P. parviflora* var. *glabriuscula* was identified as one of 38 PEPP species for which no secure collection exist in genetic storage facilities (PEPP 2013).
- Captive propagation for genetic storage and reintroduction
 - Both founders of *P. parviflora* var. *lydgatei* are represented in the Lyon Arboretum’s Micropropagation Laboratory, however; seeds from reintroduced individuals needs to be collected and stored (PEPP 2012).
 - The Lyon Arboretum’s Seed Conservation Laboratory (2014) has 113 seeds of *P. parviflora* var. *glabriuscula* in storage from Puu Waawaa.
 - The Volcano Rare Plant Facility (2013) has four individuals of *parviflora* var. *glabriuscula* growing in their nursery from two locations. The Facility propagated a single individual for reintroduction at Hawaii Volcanoes National Park. In 2014, the Volcano Rare Plant Facility (2014) had four individuals of *parviflora* var. *glabriuscula* growing in their nursery from two locations.
 - The National Tropical Botanical Garden (2014) has 365 seeds of *P. parviflora* var. *parviflora* in storage.
- Listing and critical habitat designation
 - Three units of critical habitat were designated for *P. parviflora* var. *lydgatei* on Oahu in the lowland mesic ecosystem (USFWS 2012).
 - Eighteen units of critical habitat were designated for *P. parviflora* var. *parviflora* in the lowland mesic, lowland wet, and wet cliff ecosystems on Oahu (USFWS 2012).

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Phyllostegia parviflora* 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 islands 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 not been met. While there are approximately 175 wild individuals, the species is declining, especially *Phyllostegia parviflora* var. *lydgatei*, with none of the populations containing more than 50 individuals (Table 1). Likewise, taxonomic issues of *P. parviflora* var. *glabriuscula* on Hawaii Island need to be resolved. Furthermore, all threats are not being sufficiently managed throughout all of the populations and the species is not genetically represented in storage facilities (Table 2). Therefore, *Phyllostegia parviflora* 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.
- 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.
- Taxonomy research – Determine whether the Hawaii Volcanoes National Park population is this species or *Phyllostegia stachyoides*.
- 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 *Phyllostegia parviflora* from listing through current 5-year review.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 (listing)	23	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1999 (recovery plan)	49	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	30	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2008 (5-yr review)	200	195	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Yes
2012 (critical habitat)	0-var. <i>lydgatei</i> ; 100-var. <i>parviflora</i>	100-v. <i>lydgatei</i> ; 0-var. <i>parviflora</i>	All threats managed in all 3 populations	Partially
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2015 (5-yr review)	100-var. <i>parviflora</i> ; 75-var. <i>glabriuscula</i> ; 0-var. <i>lydgatei</i>	0-var. <i>parviflora</i> ; 0-var. <i>glabriuscula</i> ; 6-var. <i>lydgatei</i>	All threats managed in all 3 populations	Partially

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Partially

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, Palikea, Pualii, Puu Hapapa are fenced
Invasive introduced plants	A, E	Ongoing	Partially, weed control at Palikea
Landslides and flooding loss or degradation of habitat	A	Ongoing	None
Invertebrate predation or herbivory – white fly, mites, mealy bugs	C	Ongoing	None
Rodent predation or herbivory – rats	C	Ongoing	None
Slug herbivory	C	Ongoing	None
Disease – powdery mildew fungus	C	Ongoing	None
Fire	E	Ongoing	None
Drought	E	Ongoing	None
Low numbers	E	Ongoing	Partially, captive propagation for genetic storage and reintroduction
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2008). 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 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.

Hawaii Volcanoes National Park. 2013. Annual permit report on threatened and endangered plants. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

- 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. 2009. Plant Extinction Prevention Program annual report, fiscal year 2009 (July 1, 2008-June 30, 2009). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [PEPP] Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [PEPP] Plant Extinction Prevention Program. 2011. Plant Extinction Prevention Program annual report, fiscal year 2011 (July 1, 2010-June 30, 2011). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [PEPP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [PEPP] Plant Extinction Prevention Program. 2013. Plant Extinction Prevention Program progress report, fiscal year 2013, qtr 1-2 (July 1, 2012-December 31, 2012). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [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.
- [USFWS] U.S. Fish and Wildlife Service. 1999. Recovery plan for multi-island plants. U.S. Fish and Wildlife Service, Portland, Oregon. 206 pages + appendices.
- [USFWS] U.S. Fish and Wildlife Service. 2008. *Phyllostegia parviflora* 5-year review summary and evaluation. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 14 pages.
- [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. Federal Register 77(181):57648-57862.

- Volcano Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.
- Volcano Rare Plant Facility. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.
- 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.
- Wagner, W.L. 1999. A new species of Hawaiian *Phyllostegia* (Lamiaceae) from Kauaʻi and recognition of a Waiʻanae Mountain, Oʻahu, endangered variety of *Phyllostegia parviflora*. *Novon* 9(2):280–283.

Personal communication

- VanDeMark, Joshua R. 2014. Hawaii Island Coordinator, Plant Extinction Prevention Program. E-mail to Donna Ball, Pacific Islands Fish and Wildlife Office, dated September 26, 2014. Subject: status updates.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Phyllostegia parviflora* (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: _____

for **Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office**

Mae M. Bluegrass

Date 2015-08-06