5-YEAR REVIEW

Short Form Summary

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

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 58 species in Washington, Oregon, California, and Hawaii. Federal Register 75(226):71726-71729.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Jiny Kim, Fish and Wildlife Biologist, PIFWO
Daniel Clark, Oahu, Kauai, Northwest Hawaiian and American Samoa Islands Team Manager, PIFWO
Marie Bruegmann, Plant Recovery Coordinator, PIFWO
Recovery Program Lead, 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 January 31, 2012. The review was based on a review of current, available information since the last five-year review for *Phyllostegia mollis* (USFWS 2009). The National Tropical Botanical Garden provided an initial draft of portions of the 5-year review and recommendations for conservation actions needed prior to the next 5-year review. The document was reviewed by the Fish and Wildlife Biologist, Islands Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. 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 (http://ecos.fws.gov/tess_public).

Review Analysis:

Please refer to the previous 5-year review for *Phyllostegia mollis* published on July 21, 2009 (available at http://ecos.fws.gov/docs/five_year_review/doc2442.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. mollis.*

This short-lived perennial is endangered and occurs on the island of Oahu. The current status and trends for *Phyllosgtegia mollis* are provided in the tables below.

New status information:

- The Oahu Army Natural Resources Program (OANRP) reported Mohiakea contains only two wild individuals. All other populations are the result of reintroductions, and are discussed under new management actions below (OANRP 2012a).
- The last wild mature individual at the Kaluaa population unit died, but one new wild seedling was discovered (OANRP 2012a).

New taxonomic information:

- No new taxonomic information has been received since the last 5-year review (USFWS 2009). In 2012, USFWS revised the taxonomic status for this species when it revised critical habitat on Oahu and Maui Nui (USFWS 2012a, b). *Phyllostegia mollis* is now considered endemic to Oahu (USFWS 2012a), with the populations on known from Molokai, Lanai, and East Maui considered *P. haliakalae* and *P. pilosa* only known from East Maui (USFWSS 2012b). Only *Phyllostegia mollis* is addressed in this review.

New threats:

- Climate change may also pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative (PICCC) funded climate modeling that will help resolve these spatial limitations. High spatial resolution climate outputs are expected in 2013.

New management actions:

- Ungulate exclosures - The populations at Kaluaa, Mohiakea and Pualii are fenced and fully protected from ungulates. The population at Ekahanui is partially protected (U.S. Army Garrison 2009, 2011).
- Ecosystem-altering invasive plant species control - Weeds are being managed in the Kaluaa population area, and partially in Pualii (U.S. Army Garrison 2009, 2011).
- Invertebrate control –Slug control and monitoring of seedling recruitment, as an indicator of slug activity are being conducted around *Phyllostegia mollis* (U.S. Army Garrison 2011). Slugs are not currently being sufficiently managed in any of the populations (U.S. Army Garrison 2009).
- Threats research:
    - Research by Joe (2006) indicated that invasive slugs negatively impacted the regeneration of *Phyllostegia mollis.*
    - In 2009, slug control research using Sluggo, a slug and snail bait, began in the field at the Kahanahaiki population unit on U.S. Army lands (U.S. Army Garrison 2009, 2010).
    - In October 2010, Sluggo was registered for use by the Hawaii Department of Agriculture (U.S. Army Garrison 2011) for control of slugs and non-native snails in forested areas for the protection of native, threatened, and endangered plants of Hawaii. However, since native snails also exist in

areas where threatened and endangered plants occur, additional research is need to find a control method that can be used in areas where native snail species co-occur with listed plants to prevent non-target effects of treatment.

- Captive propagation for genetic storage and reintroduction:
    - Harold L. Lyon Arboretum (2012) contains 524 plants of *Phyllostegia mollis* in micropropagation and 496 seeds in seed storage.
    - Waimea Valley Arboretum has three individuals in its nursery (Waimea Valley 2011).
    - Both of the mature wild individuals are represented in genetic storage, along with 15 additional individuals that have since died in the wild (OANRP 2012b). One hundred and fifty plants existed in the OANRP nursery in 2012, awaiting reintroduction (OANRP 2012c).
    - Only four of the 63 plants reintroduced in 2007 and 2008 remained as of 2009 at the reintroduction site in Ekahanui. No regeneration has been observed at this site (U.S. Army Garrison 2009).
    - Reintroductions at Ekahanui and Kaluaa have not done well and are considered to be in decline. In the Kaluaa portion of the population, 21 of the 103 plants reintroduced from 2006 to 2008 remained in 2009 (U.S. Army Garrison 2009). A small amount of regeneration was observed in 2011 (OANRP 2012a).
    - The Huliwai and Pualii populations have not been recently monitored (OANRP 2012a).

Synthesis:
Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for plants from the island of Oahu (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Phyllostegia mollis* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (*e.g*., fenced) andbe 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 the island of Oahu. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The stabilization goals for this species have not been met, as only one population of 50 or more mature (reintroduced) individuals exists (Table 1), and it is considered to be in decline. All threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Phyllostegia mollis* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Captive propagation for genetic storage and reintroduction
    - Collect cuttings or seed from tagged individuals, keeping close track of the maternal source for use in *ex situ* propagation.
    - Continue to collect seeds from all existing populations and send to at least two or three different facilities for propagation and storage.
- Reintroduction / translocation
    - While surveying for new populations or reintroduced populations, determine which sites are least invaded by invasive introduced plant species and which appear to have the highest likelihood of maintaining new reintroductions.
    - Continue to reintroduce the species back into its known historical range.
- Ungulate exclosures – Complete and monitor ungulate-proof exclosures around all remaining wild and reintroduced populations.
- Ecosystem-altering invasive plant species control – Control invasive introduced plant species around all populations.
- Fire protection – Develop and implement fire management plans for all wild and reintroduced populations.
- Alliance and partnership development - Initiate planning and contribute to implementation of ecosystem level restoration and management to benefit this taxon.
- Genetic research – Assess genetic variability within extant populations.
- Population biology research – Study *Phyllostegia mollis* 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.
- Threats research – Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

Table 1. Status of *Phyllostegia mollis* from listing through current 5-year review.

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (listing)	<50	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 (recovery plan)	120-140	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2003 (critical habitat)	85-105	unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2009 (5-yr review)	<2; unknown on Maui	67	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2013 (5-yr review)	2 mature, 1 immature – total 3	70 mature, 56 immature total 126	All threats managed in all 3 populations	Partially (see Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially, 1 population

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Pigs and goats degrade habitat and may eat plants	A, C, D	Ongoing	Partially: yes in Kaluaa, Mohiakea, Pualii, partially in Ekahanui and Waieli, not in Huliwai
Established ecosystem-altering invasive plant species	A, E	Ongoing	Partially: yes, in Kaluaa. Not in Waieli, Huliwai, Mokiahea. Partial in Pualii.
Arthropod herbivory	C	Ongoing	None
Slug herbivory	C	Ongoing	None
Rodent predation or herbivory - Rats	C	Ongoing	Partially in Ekahanui
Powdery mildew	C	Ongoing	None
Low population numbers exacerbate risks from random demographic fluctuations	E	Ongoing	Partially: reintroductions could mitigate this if successful
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2007). Only references for new information are provided below.

Harold L. Lyon Arboretum. 2012. Micropropagation and seed storage databases. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Joe, Stephanie M. 2006. Impact of alien slugs on native plant seedlings in a diverse mesic forest, Oahu, Hawaii, and a study of slug food plant preferences; Thesis submitted to the Graduate Division of the University of Hawaii in partial fulfillment of the requirements for the Degree of Master of Science in Botanical Sciences. 95 pages. Available online at <http://scholarspace.manoa.hawaii.edu/handle/10125/14955>. Accessed December 30, 2011.

[OANRP] Oahu Army Natural Resources Program. 2012a. Oahu implementation plan - population unit status; *Phyllostegia mollis.* 1 page. Unpublished.

[OANRP] Oahu Army Natural Resources Program. 2012b. Oahu implementation plan – genetic storage; *Phyllostegia mollis.* 7 pages. Unpublished.

[OANRP] Oahu Army Natural Resources Program. 2012c. Oahu implementation plan – nursery summary; *Phyllostegia mollis.* 1 page. Unpublished.

U.S. Army Garrison. 2009. 2009 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 711 pages. Available online at <http://manoa.hawaii.edu/hpicesu/DPW/2009_OIP/2009_OIP_Edited.pdf>.

U.S. Army Garrison. 2010. 2010 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 588 pages. Available online at <http://manoa.hawaii.edu/hpicesu/DPW/2010_YER/2010_YER_Edited.pdf>.

U.S. Army Garrison. 2011. 2011 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 269 pages. Available online at <http://manoa.hawaii.edu/hpicesu/DPW/2011_YER/2011_YER_Edited.pdf>.

[USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. Portland, Oregon. 207 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2009. *Phyllostegia mollis* (no common name) 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 15 pages. Available online at < http://ecos.fws.gov/docs/five_year_review/doc2442.pdf>.

[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 77:57648-57862.

[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. Available online at <http://www.gpo.gov/fdsys/pkg/FR-2012-06-11/pdf/2012-11484.pdf>.

Waimea Valley. 2011. Controlled Propagation Report to U.S. Fish and Wildlife Service. 15 pages. Unpublished.

U.S. FISH AND WILDLIFE SERVICE

SIGNATURE PAGE for 5-YEAR REVIEW of *Phyllostegia mollis* (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

acting deputy
Field Supervisor, Pacific Islands Fish and Wildlife Office

Maria M Buesgmann Date 2013-08-12