Phyllostegia glabra var. *lanaiensis*
(No common name)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW

Species reviewed: *Phyllostegia glabra* var. *lanaiensis* (No common name)

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1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia, (503) 231-2071

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808) 792-9400

Cooperating Field Office(s):
N/A

Cooperating Regional Office(s):
N/A

1.2 Methodology used to complete the 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 April 8, 2010. The review was based on the designation of critical habitat for *Phyllostegia glabra* var. *lanaiensis* and the Lanai plant cluster recovery plan (USFWS 2003, 1995), as well as a review of current, available information. The Bernice Pauahi Bishop Museum provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Samuel Aruch, biological consultant, was reviewed by a recovery biologist and the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before submission to the Field Supervisor for approval.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; 5-year review status of 69 species in Idaho, Washington, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 75(67):17947-17950.

1.3.2 Listing history

Original Listing
FR notice: USFWS. 1991. Endangered and threatened wildlife and plants; determination of endangered status for six plants from the island of Lanai, Hawaii; final rule. Federal Register 56(183):47686-47695.
Date listed: September 20, 1991
Entity listed: Variety
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.3.3 Associated rulemakings:

USFWS. 2003. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, Hawaii; final rule. Federal Register 68(6):1220-1274.

Critical habitat was not designated for *Phyllostegia glabra* var. *lanaiensis* because it had not been seen on Lanai since 1914 and it was not possible to determine essential habitat for its conservation (USFWS 2003). Also cited was the lack of genetic material in storage or under propagation. The taxon was among 28 plant species for which proposed critical habitat designation for 5,861 hectares (14,482 acres) surrounding Lanaihale (Lanai D) was deferred because of a preexisting cooperative agreement between the USFWS and Castle and Cooke Resorts, LLC to manage the lands in proposed unit Lanai D, as well as adjacent lands, for the conservation benefit of the 28 listed species. Because large portions of proposed unit D were already being managed under the Lanai Forest and Watershed Partnership by Castle and Cooke on a voluntary basis in cooperation with the USFWS and the State of Hawaii to achieve important conservation goals, and critical habitat designation threatened to reduce the landowner's cooperation, it was decided that the benefits of excluding unit Lanai D from critical habitat designation outweighed the costs (USFWS 2003).

1.3.4 Review History:

Species status review [FY 2010 Recovery Data Call (August 2010)]:
Declining

Recovery achieved:
1 (0-25%) (FY 2007 Recovery Data Call)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

6

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: USFWS. 1995. Lanai plant cluster recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 138 pages.
Date issued: September 29, 1995
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?
_____ ***Yes***
__X_ ***No***

2.1.2 Is the species under review listed as a DPS?
____ ***Yes***
__X_ ***No***

2.1.3 Was the DPS listed prior to 1996?
____ ***Yes***
____ ***No***

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?
____ ***Yes***
____ ***No***

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?
____ ***Yes***
____ ***No***

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?
____ ***Yes***
__X_ ***No***

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?
_X_ ***Yes***
____ ***No***

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-

to date information on the biology of the species and its habitat?

_X_ ***Yes***
____ ***No***

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

_X_ ***Yes***
____ ***No***

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

The threats (Listing Factors A, C, D, and E) affecting this species is presented in Section 2.3.2 and Table 2.

Stabilizing, downlisting, and delisting objectives are provided in the Lanai plant cluster recovery plan (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Phyllostegia glabra* var. *lanaiensis* is a short-lived perennial, and to be considered stabilized in the interim, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g*., fenced, weeding, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on the island of Lanai. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Phyllostegia glabra* var. *lanaiensis* should be documented on the island of Lanai. 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.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Phyllostegia glabra* var. *lanaiensis* should be documented on the island of Lanai. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors of *Phyllostegia glabra* var. *lanaiensis* remain unknown (USFWS 1995, 2003).

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Historically, *Phyllostegia glabra* var. *lanaiensis* was known from only two collections from Lanai, one from "mountains of Lanai," and the other from Kaiholena Gulch, where it was last collected in 1914 (USFWS 1991, 1995, 2003; Wagner 1999; Hawaii Biodiversity and Mapping Program 2010). A report of this species from the early 1980s in a gulch feeding into the back of Maunalei Valley probably was erroneous and should be referred to *Phyllostegia glabra* var. *glabra* (USFWS 1995, 2003; Wagner 1999).

As of 2010, the taxon was last seen in 1914 and no individuals or populations are currently known to exist (USFWS 2010). In their latest annual report, the Plant Extinction Prevention Program (2010) included *Phyllostegia glabra* var. *lanaiensis* on their list of taxa that, after evaluation, are believed to be extinct. However, since the gulches and valleys of Lanaihale are rugged, steep-walled, and only rarely explored by botanists, there may be hope that the taxon still exists (USFWS 1991, 1995).

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No new information.

2.3.1.4 Taxonomic classification or changes in nomenclature:

Using phylogenetic analyses of DNA sequence data, Lindqvist and Albert (2002) evaluated the hypothesized origin of the three endemic genera of Hawaiian mints (*Haplostachys*, *Phyllostegia*, *Stenogyne*) from its supposedly closely related East Asian relatives. Surprisingly, Lindqvist and Albert discovered that the Hawaiian mints were most closely related to a group of temperate North American *Stachys* from the Pacific coast,

suggesting that they were derived from a single colonization event from western North America to the Hawaiian Islands. Furthermore, the Hawaiian genera were found to be monophyletic but deeply nested inside the genus *Stachys*, and Lindqvist and Albert suggested that it would be biologically logical to transfer *Haplostachys*, *Phyllostegia*, and *Stenogyne* into the genus *Stachys*, in the strict sense defined in their paper. They point out that it would be a nomenclaturally daunting task, as 26 of the 60 specific epithets of recognized Hawaiian mints already exist in *Stachys* and new epithets would have to be provided for them. A potential alternative would be to retain the three genera of Hawaiian mints (whose common ancestor was of hybrid origin), but to describe new genera for other recognized lineages of hybrid origin within *Stachys* (Lindqvist and Albert 2002). As of 2010, no nomenclatural changes have been published.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

This species has not been observed since it was last collected in 1914 (see Section 2.3.1.2 above).

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

Very little is known of the preferred habitat or associated species of *Phyllostegia glabra* var. *lanaiensis* on the island of Lanai. It has been observed in lowland mesic to wet forest in gulch bottoms and sides, often in quite steep areas, in the same habitat as the endangered *Cyanea macrostegia* subsp. *gibsonii* (also known as *C. gibsonii*) (USFWS 1995).

2.3.1.7 Other:

No new information.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:
Threats:

- Ungulate degradation of habitat – Assuming that this taxon remains extant in its known habitat, there are a number of potential threats to its continued survival, including browsing and habitat disturbance by axis deer (*Axis axis*) (USFWS 1991, 1995).

- Established ecosystem-altering invasive plant species degradation of habitat - Assuming that this taxon remains extant in its known habitat, ecosystem-altering invasive plant species could potentially threaten its survival (USFWS 1991, 1995).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Not a threat.

2.3.2.3 Disease or predation:

Threats:

- Ungulate predation or herbivory – If the taxon is still extant, browsing by axis deer is a threat (USFWS 1991, 1995).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

No new information.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Threats:

- Low numbers – Last collected in 1914, this species may be extinct in the wild (USFWS 2003; Plant Extinction Prevention Program 2010).
- Climate change may pose a threat to this species, if it is rediscovered. 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) has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

Current conservation efforts:

- Captive propagation for genetic storage and reintroduction – There are no reports of controlled propagation of this species, nor any genetic seed in storage by Harold L. Lyon Arboretum (2011), the Center for Conservation Research and Training Seed Storage Facility (2011), or National Tropical Botanical Garden (2011).

2.4 Synthesis

The interim stabilization goals for this species have not been met as no extant individuals are currently known to exist (Table 1) and not all threats are being managed (Table 2). Additional targeted surveys are needed to definitively confirm if the species is extinct. Therefore, *Phyllostegia glabra* var. *lanaiensis* currently meets the definition of endangered as it remains in danger of extinction throughout its range.

Table 1. Status of *Phyllostegia glabra* var. *lanaiensis* from listing through 5-year review.

Date	**No. wild individuals**	**No. outplanted**	**Stabilization Criteria identified in Recovery Plan**	**Stabilization Criteria Completed?**
1991 (listing)	Unknown	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1995 (recovery plan)	Unknown	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	0	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2012 (5-year review)	0 (needs confirmation)	0	All threats managed in all 3 populations	No (see Table 2)
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No

Table 2. Threats to *Phyllostegia glabra* var. *lanaiensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Degradation of habitat and herbivory	A, C	Ongoing	No
Established ecosystem-altering invasive plant species degradation of habitat	A	Ongoing	No
Low numbers	E	Ongoing	No
Climate change	A, E	Increasing	No

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X_ No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Surveys / inventories – Conduct a thorough survey of the historical range of the species and any additional potentially suitable habitat on the island of Lanai.
- Captive propagation for genetic storage and reintroduction – If the species is rediscovered, collect material for genetic storage.
- Ungulate exclosure – If the species is rediscovered, construct ungulate-proof fenced exclosures around the newly found population.
- Alliance and partnership development – Work with Hawaii Division of Forestry and Wildlife and other land managers to initiate planning and contribute to implementation of

ecosystem-level restoration and management for sites to reintroduce this species if it is rediscovered.

5.0 REFERENCES

Center for Conservation Research and Training Seed Storage Facility. 2011. Seed conservation lab database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Harold L. Lyon Arboretum. 2011. Micropropagation inventory. Honolulu, Hawaii. Microsoft Access database. Unpublished.

Hawaii Biodiversity and Mapping Program. 2010. Element occurrence record: *Phyllostegia glabra* var. *lanaiensis*. 2 pages. Unpublished.

Lindqvist, C. and V. A. Albert. 2002. Origin of the Hawaiian endemic mints within North American *Stachys* (Lamiaceae). American Journal of Botany 89(10):1709-1724.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Phyllostegia glabra* var. *lanaiensis* (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

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
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