Phyllostegia parviflora
(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 parviflora* (No common name)

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5-YEAR REVIEW
Phyllostegia parviflora (No common name)

1.0 GENERAL INFORMATION

1.1 Reviewers

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

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor for Endangered Species, (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 (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) between June 2006 and September 2007. The Hawaii Biodiversity and Mapping Program provided most of the updated information on the current status of *Phyllostegia parviflora*. They also provided recommendations for conservation actions that may be needed prior to the next five-year review. The evaluation of the Plant Recovery Coordinator was reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before final approval.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:
USFWS. 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

1.3.2 Listing history

Original Listing
FR notice: USFWS. 1996. Endangered and threatened wildlife and plants; determination of endangered status for 14 plants from the Hawaiian Islands; final rule. Federal Register 61(198):53180-53124.

Date listed: October 10, 1996
Entity listed: Species
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. 2003a. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 101 plant species from the island of Oahu, HI; final rule. Federal Register 68(116):35950-36406.

USFWS. 2003b. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, HI; Final Rule. Federal Register 68(93)25933-26165.

USFWS. 2003c. Endangered and threatened wildlife and plants; final designation and nondesignation of critical habitat for 46 plant species from the island of Hawaii, HI; final rule. Federal Register 68(127):39624-39722.

Critical habitat was designated for *Phyllostegia parviflora* in four units totaling 1,590 hectares (21,055 acres) on Oahu. This designation includes habitat on Federal, state, and private lands (USFWS 2003a). No critical habitat was designated on the islands of Maui or Hawaii, due to a lack of information on the species' preferred habitat on those islands (USFWS 2003b and c).

1.3.4 Review History:
Species status review [FY 2006 Recovery Data Call (September 2006))]: Decreasing

Recovery achieved:
1 (0-25%) (FY 2006 Recovery Data Call)

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

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: Recovery plan for multi-island plants. 1999. U.S. Fish and Wildlife Service, Portland, Oregon. 206 pages + appendixes.
Date issued: July 10, 1999
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:

A synthesis of the threats (Factors A, C, D, and E) affecting this species is presented in section 2.4. Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than ten 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* (off-site) 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.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Phyllostegia parviflora* should be documented on islands where they now occur or occurred historically. 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 parviflora* should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for long-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

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section 1.3.3

("Associated Rulemakings") above and in section 2.4 ("Synthesis") below, which also includes any new information about the status and threats of the species.

Status of *Phyllostegia parviflora* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	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	Partial
			3 populations with 50 mature individuals each	No
2003 – critical habitat	30	0	All threats managed in all 3 populations	Partial
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	No
2007 – 5-yr review	200	195	All threats managed	Partial
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	Yes

2.3.1 Biology and Habitat

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

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:

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

2.3.1.4 Taxonomic classification or changes in nomenclature:

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.):

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

2.3.1.7 Other:

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:

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

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

Historically, *Phyllostegia parviflora* was known from the islands of Oahu, Hawaii, and Maui. At the time this species was listed, only two varieties were recognized, *Phyllostegia parviflora* var. *glabriuscula* and *P. parviflora* var. *parviflora* (USFWS 1996). Currently, three varieties are recognized, the third variety being P. *parviflora* var. *lydgatei*, from Oahu (Wagner *et al.* 1999). *Phyllostegia parviflora* var. *glabriuscula* was only known from the island of Hawaii on private land and had not been seen since the 1800's, until it was rediscovered in 2006 at Kipuka Maunaiu, in the Kahuku extension of Hawaii Volcanoes National Park. Fifty individuals were counted at the time of discovery (USFWS 2007). One hundred individuals are estimated to be in that population as of late 2006 and another 95 have been outplanted from nursery stock since then (Hawaii Volcanoes National Park 2007). In recent times, *Phyllostegia parviflora* var. *lydgatei* has been found at three locations in the Waianae Mountains of Oahu, but currently, only 100 outplanted individuals and stock

in cultivation remain of this variety (Perlman 2007; National Tropical Botanical Garden 2007; The Nature Conservancy 2007; S. Ching, U.S. Army, pers. comm. 2007). *Phyllostegia parviflora* var. *parviflora* was known on both Oahu and West Maui. It has not been seen on Maui for many years. On Oahu it occurs on State and Federal lands in the Koolau Mountains, in the back of Punaluu Valley. Occurrences are scattered in south side gulches, stream banks and below a waterfall, between 1850 to 2100 feet (564 to 640 meters) elevation. Perhaps a total of 100 plants have been seen as recently as 2001 (National Tropical Botanical Garden 2007). Currently, the species as a whole totals 200 naturally occurring individuals and 195 outplanted individuals in four populations.

In a 1999 taxonomic treatment and 2003 revision, Wagner (Wagner *et al.* 1999, Wagner and Herbst 2003) recognized *P. parviflora* var. *lydgatei* as a variety of *P. parviflora*, and not of *P. mollis* as previously considered. This species' variation needs closer taxonomic examination. *Phyllostegia mollis* at one time co-occurred in Palawai, Pualii, and Ekahanui gulches, and is at times difficult to differentiate from *Phyllostegia parviflora*. *P. mollis* plants, which closely resemble the variety *lydgatei*, were found in the immediate vicinity of the *Phyllostegia parviflora* var. *lydgatei* plants at the Palawai and Pualii populations. This has lead to some confusion with regard to the identity of existing collections. In order to clarify this issue, Dr. Clifford Morden from the University of Hawaii conducted genetic analyses. The results were inconclusive but do indicate that there is likely a hybrid. It will be treated separately in future management and reintroduced into the Pualii area, and not mixed with any pure *P. mollis* stocks (The Nature Conservancy 2007).

Phyllostegia parviflora var. *lydgatei* was typically found in loose granular soil, with some talus, often in wet side bowls of gulches or near the bottom of small side streams. It likes high humidity and wet, but well drained soils. It grows on moderate to steep slopes in mesic to wet *Metrosideros* (ohia) – *Dicranopteris* (uluhe) forest from 555 to 881 meters (1,820 to 2,890 feet) elevation. Associated native species include *Acacia koa* (koa), *Antidesma platyphyllum* (hame), *Broussaisia arguta* (kanawao), *Cheirodendron* (olapa), *Chamaesyce multiformis* (akoko), *Claoxylon sandwicense* (po ola), *Coprosma foliosa* (pilo), *Coprosma longiflora* (pilo), *Cyanea acuminata* (haha), *Cyanea membranaceae* (haha), *Dryopteris unidentata* (akole), *Ilex* (kawau), *Kadua centranthoides* (no common name (NCN)), *Machaerina* (uki), *Myrsine lessertiana* (kolea lau nui), *Neraudia angulata* (NCN), *Perrottetia sandwicensis* (olomea), *Phyllostegia mollis* (NCN), *Pipturus albidus* (mamake), *Pouteria sandwicensis* (alaa), *Pritchardia* sp. (loulu), *Psychotria hathewayi* (kopiko), *Pteralyxia macrocarpa* (kaulu), *Rubus* (ohelo eleele), *Selaginella arbuscula* (lepelepe a moa), *Silene perlmanii* (NCN), *Solanum sandwicense* (popolo), *Streblus pendulinus* (aiai), *Trematolobelia* (kolii), *Touchardia latifolia* (olona), *Xylosma hawaiiense* (maua), and *Zanthoxylum kauaense* (ae, manele, heae) (Perlman 2007; Wagner *et al.* 1999; National Tropical Botanical Garden 2007). In Honouliuli, associated native species also include *Pleomele* (halapepe), *Freycinetia* (ie ie), *Urera kaalae* (opuhe),

Urera glabra (opuhe, hopue), *Psychotria* sp. (kopiko), *Myrsine* sp. (kolea), and *Cyrtandra cordifolia* (kanawao) (The Nature Conservancy 2007).

Phyllostegia parviflora var. *parviflora* occurs in the Koolau Mountains, at elevations from 232 to 867 meters (761 to 2,844 feet) on the east side of Puu Pauao, between Poamoho and Schofield trails, in drainages of the Punaluu valley in *Metrosideros-Dicranopteris linearis* (uluhe) lowland wet forest with *Alyxia stellata* (maile), *Antidesma platyphyllum* (hame), *Astelia* (painiu), *Broussaisia arguta* (kanawao, puahanui), *Cheirodendron* sp. (olapa), *Cibotium* sp. (hapuu), *Coprosma longiflora* (pilo), *Cyanea acuminata* (haha), *Cyrtandra subumbellata* (haiwale), *C. paludosa* (moa) and *C. hawaiiensis* (kanawao), *Diplazium sandwichianum* (hoio), *Dubautia laxa* and *D. plantaginea* (naenae pua melemele), *Elaphoglossum* (hoe a Maui), *Ilex* (kawau), *Kadua affinis* (manono), *Kadua centranthoides* (NCN), *Machaerina angustifolia* (uki), *Melicope clusifolia* (kolokolo mokihana) and *Melicope honoluluensis* (alani), *Metrosideros tremuloides* (ahihi lehua), *Myrsine sp* (kolea), *Perrottetia* (olomea), *Phyllostegia glabra* (ulihi), *Phyllostegia grandiflora* (kapana), *Pipturus* sp. (mamake), *Pittosporum* (hoawa), *Pritchardia martii* (loulu), *Rubus* (akala), *Scaevola mollis* (naupaka kuahiwi), *Syzygium sandwicensis* (ohia ha), *Tetraplasandra* sp. (ohe ohe), or *Touchardia latifolia* (olona), and *Trematolobelia* (kolii), *Wikstroemia oahuensis* (akia) (Perlman 2007; Hawaii Biodiversity and Mapping Program 2005; USFWS 1996; Wagner *et al.* 1999).

A habitat description for the newly rediscovered *Phyllostegia parviflora* var. *glabriuscula* is not yet available.

The major threats to the habitat of *Phyllostegia parviflora* var. *lydgatei* and var. *parviflora* are habitat degradation and destruction of individuals by feral pigs (*Sus scrofa*) (Factors A and D). In addition, feral goats (*Capra hircus*) and mouflon (*Ovis musimon*) are threats to *P. parviflora* var. *glabriuscula* (Factors A and D). Landslides and rockfall also threaten *Phyllostegia parviflora* var. *lydgatei*, given its preference for steep, unstable talus slopes near cliff lines. Fire is a potential threat in the Waianae Mountains (Factor E). Habitat degradation by and competition with invasive introduced plant species (Factor E) is another threat to *Phyllostegia parviflora*, including such invasive species as *Ageratina adenophora* (pamakani haole), *Christella parasitica* (NCN), *Clidemia hirta* (Koster's curse), *Erigeron karvinskianus* (daisy fleabane), *Melinis repens* (molasses grass), *Oplismenus hirtellus* (basket grass), *Passiflora suberosa* (corky passion vine), *Physalis peruviana* (Cape gooseberry), *Psidium cattleianum* (strawberry guava), *Ricinus communis* (castor bean), *Rivina humilis* (coral berry), *Rubus rosifolius* (thimbleberry), and *Schinus terebinthifolius* (Christmasberry) (Perlman 2007; The Nature Conservancy 2007; USFWS 2003a). Wild plants and nursery stock are highly susceptible to powdery mildew (Factor C). Mildew fungus is lethal for some wild plants, especially seedlings or immature individuals. Sulfur or other fungicides can be helpful. Plants should not be sprayed with water and should kept away from overhead misters to keep leaf surfaces dry. Slug predation on seedlings and older plants is also assumed to be a very significant threat (Factor C). Rats (Factor C) are also a threat (Perlman 2007). The species is

susceptible to standard nursery pests including white flies, broadleaf and other mites, mealy bugs, and fungi in cultivation (Factor C) (The Nature Conservancy 2007).

Approximately 50 individuals of *Phyllostegia parviflora* var. *lydgatei* stock were outplanted and are still growing in The Nature Conservancy's Palikea fence. Approximately 50 plants from Pualii stock, which were planted in December 2006, are still growing in the Pualii fence. New outplanting sites are planned for the North Kalua/Puu Hapapa fence, the Hapapa Bench site and the Gulch Site. Another outplanting is planned for the Pualii fence (The Nature Conservancy. 2007). The Army Nursery Facility at Wahiawa, Oahu has grown five *Phyllostegia parviflora* var. *lydgatei* plants for outplanting (U.S. Army 2006). Additional material is in storage or being propagated for reintroduction at the Harold L. Lyon Arboretum Micropropagation Laboratory, Hawaii Volcanoes National Park, and the Volcano Rare Plant Facility (Harold L. Lyon Arboretum Micropropagation Laboratory 2007; Hawaii Volcanoes National Park 2007; Volcano Rare Plant Facility 2007). Some of the stored seed will be used in direct seeding plots and planting sites for a limiting factors study by U.S.G.S. Biological Resources Discipline. The 95 individuals planted in Hawaii Volcanoes National Park are monitored as part of this study (Hawaii Volcanoes National Park 2007).

The stabilization and recovery goals for this species have not been met. While there are four populations with 50 or more individuals, two of those populations were only established within the last year and their overall survival rate is unclear at this time, the threats have not all been controlled, and there is not yet full genetic representation in storage. Therefore, *Phyllostegia parviflora* meets the definition of endangered as it remains in danger of extinction throughout its range.

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:

- Continue seed collection for genetic storage and reintroduction.
- Continue to survey historical sites for additional populations.
- Control introduced invasive plant species around wild and outplanted plants.
- Fence populations to control feral pigs.
- Continue research on limiting factors and threats to *Phyllostegia parviflora.*
- Continue genetic studies to determine taxonomic status of all three varieties.

5.0 REFERENCES:

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Hawaii Volcanoes National Park. 2007. Report on controlled propagation of species, as designated under the U.S. Endangered Species Act. Unpublished.

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Personal Communications:

Ching, Susan. 2007. Implementation Plan Project Manager, Oahu Army Natural Resources Program. Emails to Marie Bruegmann, USFWS. July 16 and August 14, 2007.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Phyllostegia parviflora* (No common name)

Current Classification: E

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
Marilet A. Zablan, Recovery Program Leader and Acting Assistant Field Supervisor for Endangered Species, October 30, 2007
Marie Bruegmann, Plant Recovery Coordinator, September 6, 2007

Approve Patrick Leonard Date 1/18/08
Lead Field Supervisor, Fish and Wildlife Service