

*Phyllostegia helleri*  
(no common name)

**5-Year Review  
Summary and Evaluation**

**U.S. Fish and Wildlife Service  
Pacific Islands Fish and Wildlife Office  
Honolulu, Hawai'i**

**5-YEAR REVIEW**  
Species reviewed: *Phyllostegia helleri* (no common name)

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**5-YEAR REVIEW**  
***Phyllostegia helleri* (no common name)**

**1.0 GENERAL INFORMATION**

**1.1 Reviewers:**

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Lauren Weisenberger, Plant Recovery Coordinator, PIFWO  
Megan Laut, Conservation and Restoration Team Manager, PIFWO

**Lead Regional Office:**

Interior Region 12, Portland Regional Office

**Lead Field Office:**

Pacific Islands Fish and Wildlife Office

**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 (Service), beginning in October 2019. The review was based on the final rule listing this species; peer reviewed scientific publications; unpublished field observations by the Service, State of Hawai‘i, and other experienced biologists; unpublished survey reports; notes and communications from other qualified biologists; as well as a review of current, available information. The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

**1.3 Background:**

**1.3.1 FR Notice citation announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. Federal Register 88(83): 20088–20092, May 7, 2018.

**1.3.2 Listing history:**

Original Listing

**FR notice:** [USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; endangered status for 49 species from the Hawaii

Islands; final rule. Department of the Interior, Federal Register 81: 67786, September 30, 2016.

**Date listed:** September 30, 2016  
**Entity listed:** *Phyllostegia helleri*  
**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:**  
N/A

**1.3.4 Review History:**  
This is the first 5-year review for *Phyllostegia helleri*.

**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 Outline for the Multi-Island Species (draft)  
**Date issued:** N/A  
**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  
 No

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

## **2.2 Recovery Criteria**

**2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?**

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?**

Yes  
 No

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

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 (Listing Factors A, C, D, and E) affecting this species is presented in section 2.3.2 and Table 2. Listing Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

The recovery plan is currently being drafted. However, the Hawai'i and Pacific Plants Recovery Coordinating Committee (HPPRCC) has outlined the actions and

goals for stages leading towards recovery (2011). These stages are described below.

Current information is lacking for many Hawaiian plant species on the status of the species and their habitats, breeding systems, genetics, and propagule storage options. The following downlisting and delisting criteria for plants have therefore been adopted from the revised recovery objective guidelines developed by the HPPRCC (2011). Many of the Hawaiian plant species are at very low numbers, so the Service also developed criteria for avoiding imminent extinction and an interim stage before downlisting, based on the recommendations of the HPPRCC, to assist in tracking progress toward the ultimate goal of recovery. These criteria are assessed on a species-by-species basis, especially as additional information becomes available.

In general, long-lived perennials are those taxa either known or believed to have life spans greater than 10 years; short-lived perennials are those known or believed to have life spans greater than one year but less than 10 years; and annuals are those known or believed to have life spans less than or equal to one year. When it is unknown whether a species is long- or short-lived, the Service has erred on the side of caution and considered the species short-lived. This will be revised as more is learned about the life histories of these species. Narrow extant range and broad contiguous range are recognized as not needing different numbers of individuals or populations, but that the populations will be distributed more narrowly or more broadly, respectively, across the landscape. Obligate outcrossers are those species that either have male and female flowers on separate plants or otherwise require cross-pollination to fertilize seeds, and therefore require equal numbers of individuals contributing to reproduction as males and females, doubling the number of mature individuals. Species that reproduce vegetatively may reproduce sexually only on occasion, resulting in the majority of the genetic variation being between populations, therefore requiring additional populations. Species that have a tendency to fluctuate in number from year to year require a larger number of mature individuals on average to allow for decline in years of extreme habitat conditions and recuperation in numbers in years of more normal conditions.

### **Preventing Extinction**

Stabilizing (interim), downlisting, and delisting objectives have been updated according to the draft revised recovery objective guidelines developed by the 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 helleri* is a short-lived perennial herb. To prevent extinction, which is the first milestone 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 that are well managed. In addition, a minimum of three populations should be documented on the island of Kaua‘i where they now occur or occurred historically. Each of these populations must be naturally reproducing (i.e., viable seeds, seedlings) and increasing in number, with a minimum of 50 mature, reproducing individuals per population.

This recovery objective has not been met (see Table 1).

### **Interim Stage**

To meet the interim stage of recovery of *Phyllostegia helleri*, 300 mature individuals are needed in each of three populations and all major threats must be controlled around the populations designated for recovery at this stage. There should also be demonstrated regeneration of seedlings and documented replacement regeneration within each of the target populations. The populations must be adequately represented in an *ex situ* collection as defined in the Center for Plant Conservation’s guidelines (Guerrant *et al.* 2004) that is secured and well-managed. Adequate monitoring must be in place and conducted to assess individual plant survival, population trends, trends of major limiting factors, and response of major limiting factors to management.

This recovery objective has not been met (see Table 1).

### **Downlisting Criteria**

In addition to achieving 5 to 10 populations with 500 mature individuals per population and all of the goals of the interim stage, all target populations must be stable, secure, and naturally reproducing for a minimum of 10 years. Species-specific management actions are not ruled out. Downlisting should not be considered until an adequate population viability analysis (PVA) has been conducted to assess needed numbers more accurately based on current management and monitoring data collected at regular intervals determined by demographic parameters of the species, although they should only be one of the factors used in making a decision to downlist. Information necessary for the PVA that should be available through monitoring (ideally annually) includes major limiting factors, breeding system, population structure and density, and proven management methods for major threats.

This recovery objective has not been met (see Table 1).

### **Delisting Criteria**

In addition to achieving 5 to 10 populations with 500 mature individuals per population and all of the goals of the interim and downlisting stages, all target populations must be stable, secure, naturally reproducing, and within secure and viable habitats for a minimum of 20 years. Species-specific management actions must no longer be necessary, but ecosystem-wide management actions are not ruled out if there are long-term agreements in place to continue management. These numbers are initial targets, but may be revised upward as additional information is available, including adequate PVAs for individual species based on current management and monitoring data collected at regular intervals determined by demographic parameters of the species, although they should only be one of the factors used in making a decision to delist. Genetic analyses should be conducted to ensure that adequate genetic representation is present within and among populations compared to the initial variation assessed in the interim stage. Numbers need to be considered on a species-by-species basis.

This recovery objective has not been met (see Table 1).

## **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:**

*Phyllostegia helleri* is a weakly erect to climbing perennial herb; stems with hairs 0.5 to 1 millimeter (mm) (0.02 to 0.03 inches (in)) long. Leaves are thin, somewhat wrinkled, ovate, 10 to 14.5 centimeters (cm) (3.9 to 5.7 in) long, 3.5 to 6.5 cm (1.4 to 2.6 in) wide, hairy, inconspicuously glandular-dotted, margins with rounded to pointed teeth, leaf stalks 2.5 to 5 cm (1 to 2 in) long and also hairy. Flowers are 6 per false whorl, in leafy, compound, inflorescences usually 8 to 19 cm (3.1 to 7.5 in) long, consisting of the primary branch and two to several lateral branches immediately below. Flower stalks are 3 to 5 mm (0.1 to 0.2 in) long, hairy, with sepals narrowly bell-shaped. Corolla is white with lobes tinged lavender. Nutlets are about 2.5 mm (0.1 in) long (Wagner *et al.* 1999, pp. 816–817).

The specific life history characteristics of *Phyllostegia helleri* have not been studied. Flowering has been observed in January, February, June, and October and fruiting in January through May (BISH 1911; Hawai'i Biodiversity and Mapping Program (HBMP) 2010; National Tropical Botanical Garden (NTBG) 1993, 2020; Plant Extinction Prevention Program (PEPP) 2015, 2019). The flowers of Hawaiian *Phyllostegia* have prominent lower-lipped, mostly white pink-colored corollas, associated with insect pollination (Lindqvist and Albert 2002, p. 3; Wood *et al* 2019, p. 1). Members of this taxon in Hawai'i have well-developed fleshy fruits, a feature commonly found in plants requiring birds for dispersal (Carlquist

1980, p. 96). Based on germination research on congeners on O‘ahu, seeds of some species of *Phyllostegia* are suspected to be dormant; therefore requiring additional time to germinate, while seeds of other species are not (Chambers 2020, pers. comm.).

**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:**

*Phyllostegia helleri* was first collected on Kaua‘i in 1895 by Heller at Kahōluamanu on the plateau above Waimea Canyon (Sherff 1934, p. 138). This species historically occurred in wet forest and shrubland and mesic forests and shrubland of Wainiha, Anahola, Kīlauea, Wai‘oli, Lumaha‘i, Hanalei, Alaka‘i-Wai‘ale‘ale, Hanakoa, Kahōluamanu, and Olokele on Kaua‘i. From 1972 until the 1990s, there were 11 populations documented on northeastern Kaua‘i, ranging in the northwest from Hanakoa, south to the summit of Wai‘ale‘ale, and east to Makaleha, totaling about 100 individuals (HBMP 2010). After 1998, the species was thought to be extinct until its rediscovery (of about 30 individuals) in Wainiha Valley in 2014 (PEPP 2014). The area was fenced, but not all of the ungulates removed until 2015, and by then only four individuals remained (PEPP 2015). In a survey of this population conducted in 2018, no individuals could be found, and currently *P. helleri* is considered extirpated from Kaua‘i, possibly extinct (PEPP 2018, 2019).

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

N/A

**2.3.1.4 Taxonomic classification or changes in nomenclature:**

The type specimen for *Phyllostegia helleri* was collected in 1895 by Heller and described by Sherff in 1934. The species is recognized in Wagner *et al.* (1999) and is the currently accepted taxonomy. Collections from Mount Kahili (Makaleha mountains) are considered to be *P. kahiliensis*.

**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.):**

See section 2.3.1.2 above for spatial distribution of the species.

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

*Phyllostegia helleri* occurs in wet forest and shrubland from 984 to 1,536 m (1,400 to 5,040 ft) elevation. Dominant associated native plants are

*Pipturus albidus* (waimea), *Machaerina angustifolia* (‘uki), *Sadleria cyatheoides* (‘ama‘u), *Perrottetia sandwicensis* (olomea) *Cyrtandra wainihaensis* (hahala), and *Boehmeria grandis* (‘ākōlea) (HBMP 2010; PEPP 2019). Other associated native species include *Adenophorus periens* (palai la‘au), *Antidesma platyphyllum* (hame), *Astelia* spp. (kaluaha), *Bidens* spp. (ko‘oko‘olau), *Carex alligata* (no common name (NCN)), *Cheirodendron* spp. (‘ōlapa), *Cibotium* spp. (hāpu‘u), *Coprosma* spp. (pilo), *Cyanea rivularis* (hāhā), *Dicranopteris* spp. (uluhe), *Diplazium sandwichianum* (hō‘i‘o), *Dubautia* spp. (na‘ena‘e), *Eurya* spp. (ānini), *Freycinetia arborea* (‘ie‘ie), *Gunnera* spp. (‘ape‘ape), *Hesperomannia lydgatei* (NCN), *Hydrangea arguta* (kanawao), *Isodendron longifolium* (aupaka), *Joinvillea ascendens* subsp. *ascendens* (‘ohe), *Kadua affinis* (manono), *K. centranthoides*, *Leptecophylla tameiameiae* (pūkiawe), *Melicope* spp. (alani), *Metrosideros* spp. (‘ōhi‘a), *Myrsine* spp. (kōlea), *Peperomia* spp. (‘ala‘ala wai nui), *Phyllostegia waimeae* (NCN), *Plantago* spp. (laukahi kuahiwi), *Pritchardia* spp. (loulu), *Psychotria* spp. (kōpiko), *Stenogyne purpurea* (NCN), *Syzygium sandwicensis* (‘ōhi‘a hā), *Tetraplasandra* spp. (‘ohe), *Touchardia latifolia* (olonā), *Vaccinium* spp. (‘ōhelo), *Wikstroemia* spp. (‘ākia), and numerous pteridophytes and bryophytes (HBMP 2010, in litt.; NTBG 1989, 1991, 1993, 1994).

## 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 (Factor A):

Ungulate destruction and degradation of habitat—Destruction and degradation of habitat by feral pigs and goats (and possibly now Columbian blacktail deer (*Odocoileus hemionus* ssp. *columbianus*)) is a threat to the habitat known to support *Phyllostegia helleri* (HBMP 2010; USFWS 2016). Feral ungulates are highly destructive to native vegetation, and contribute to erosion by eating young trees and young shoots of plants before they can become established, creating trails that damage native vegetative cover, promoting erosion by destabilizing substrate and creating gullies that convey water, and dislodging stones from ledges that can cause rockfalls and landslides and damage vegetation below (Cuddihy and Stone 1990, pp. 63–64). All of these impacts lead to the subsequent conversion of native plant communities to plant communities dominated by nonnative species.

Established ecosystem-altering invasive plant destruction and degradation of habitat—Invasive introduced plants modify habitats occupied by native plant species by changing the availability of light, altering soil-water regimes, changing nutrient cycling and the fire characteristics of the native plant community (Cuddihy and Stone 1990, pp. 73–91). Habitat destruction and degradation by invasive nonnative plants negatively

affected the last known occurrence of *Phyllostegia helleri* (HBMP 2010; PEPP 2015, 2019). The nonnative invasive plants with the greatest impacts on *P. helleri* include *Ageratum conyzoides* (maile honohono), *Axonopus fissifolius* (narrow-leaved carpet grass), *Cecropia obtusifolia* (trumpet tree), *Clidemia hirta* (Koster's curse), *Conyza bonariensis* (hairy horseweed), *Cyperus meyenianus* (NCN), *Erechtites valerianifolia* (fireweed), *Erigeron karvinskianus* (daisy fleabane), *Kalanchoe pinnata* (air plant), *Melastoma malabathricum* (planter's rhododendron) *Paspalum conjugatum* (Hilo grass), *Psidium cattleianum* (strawberry guava), *P. guajava* (common guava), *Rubus argutus* (prickly Florida blackberry), *R. rosifolius* (thimbleberry), *Sacciolepis indica* (glenwood grass), *Schizachyrium condensatum* (little bluestem), *Setaria gracilis* (bristly foxtail), and *S. parviflora* (yellow foxtail) (HBMP 2010; NTBG 1993, 1994, 1998). It was observed that *C. hirta* likely outcompeted the last individuals of *P. helleri* and was the likely cause of their death (PEPP 2019).

Degradation and destruction by flash floods and landslides—Populations of *Phyllostegia helleri* were found near waterfalls and streams and flash flooding is reported to be a threat to this species (Clark 2015, in litt.). Landslides are also reported as a threat to *P. helleri*. Landslides, including the erosion associated with them, can have a significant effect on small populations by destabilizing substrate, altering hydrological patterns, and by damaging and destroying individual plants (HBMP 2010; Stearns 1985, pp. 99–107, 291–305).

Climate change loss or degradation of habitat—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 helleri* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.569 (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.

#### **2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes (Factor B):**

Not a threat.

#### **2.3.2.3 Disease or predation (Factor C):**

Predation and herbivory by rats—Herbivory and seed predation by rats is noted to be a threat to *Phyllostegia helleri* at the last known occurrence

(Clark 2015, in litt.; PEPP 2015, 2019). Rats eat virtually every part of plants and at every stage: fleshy fruits, seeds, flowers, stems, leaves, shoot, seedlings, and roots (Abe and Umeno 2011, p. 35; Russell 1980, pp. 269–272; Cuddihy and Stone 1990, pp. 68–69). The effects on plants range from reduced vigor and decreased reproduction to mortality of individuals and complete lack of recruitment.

Herbivory by nonnative slugs and snails—Nonnative snails and slugs are found in wet forest and shrub ecosystems where *Phyllostegia helleri* occurs and are considered to be a threat to seedling recruitment (NTBG 2020). Slugs are known to consume leaves, stems, flowers, including entire seedlings and new vegetative growth (81 FR 67786, September 30, 2016) and can have the same deleterious effects on this species. Predation by nonnative snails and slugs adversely impacts native plant species through mechanical damage, destruction of plant parts, and mortality. Joe and Daehler (2008, p. 252) found that native Hawaiian plants are more vulnerable to slug damage than nonnative plants. In particular, they found that native species of *Cyanea* (e.g., *C. superba*) had a 50 percent higher mortality when exposed to slugs when compared to individuals of the same species that were protected within slug exclosures. Research investigating slug herbivory and control methods shows that slug impacts on seedlings resulted in up to 80 percent seedling mortality (U.S. Army Garrison 2005, p. 3-51). Herbivory by introduced snails and slugs on *P. helleri* results in reduced resiliency of the species.

#### **2.3.2.4 Inadequacy of existing regulatory mechanisms (Factor D):**

Nonnative feral ungulates are an ongoing threat to *Phyllostegia helleri* through destruction and modification of habitat and by direct predation. The State of Hawai‘i provides game mammal (feral pigs, goats, and deer) hunting opportunities (e.g., “sustained yield”) in public hunting areas on Kaua‘i (DLNR 2012). The last population of *P. helleri* was fenced; however, most plants disappeared before the last ungulates were removed. Public hunting areas are not fenced and game mammals have unrestricted access for most areas across the landscape, regardless of underlying land use designation; therefore, any unfenced populations of *P. helleri* are at risk (DLNR 2010).

Currently, four agencies are responsible for inspection of goods arriving in Hawai‘i (CGAPS 2009). The Hawai‘i Department of Agriculture (HDOA) inspects domestic cargo and vessels and focuses on pests of concern to Hawai‘i, especially insects or plant diseases. The U.S. Department of Homeland Security-Customs and Border Protection (CBP) is responsible for inspecting commercial, private, and military vessels and aircraft and related cargo and passengers arriving from foreign locations, focusing on non-propagative plant materials, and internationally regulated commercial species under the Convention in International Trade in Endangered

Species (CITES). Also included are federally listed noxious seeds and plants, soil, and pests of concern for forests and agriculture. The U.S. Department of Agriculture-Animal and Plant Health Inspection Service-Plant Protection and Quarantine (USDA-APHIS-PPQ 2010) inspects propagative plant material, provides identification services for arriving plants and pests, and conducts pest risk assessments among other activities (HDOA 2009). The Service inspects arriving wildlife products, enforces the injurious wildlife provisions of the Lacey Act (18 U.S.C. 42; 16 U.S.C. 3371 et seq.) and prosecutes CITES violations. The State of Hawai‘i allows the importation of most plant taxa, with limited exceptions. Many invasive plants established in Hawai‘i have expanding ranges. Resources available to reduce the spread of these species and counter their negative ecological effects are limited. Control of established nonnative invasive plants is largely focused on a few invasive species that cause significant economic or environmental damage to public and private lands, and comprehensive control of an array of invasive plants remains limited in scope. The introduction of new invasive plant species to the State of Hawai‘i is a significant risk to *Phyllostegia helleri* and other federally listed species.

#### **2.3.2.5 Other natural or manmade factors affecting its continued existence (Factor E):**

Low numbers of populations and individuals—Small, isolated populations often exhibit reduced levels of genetic variability, which diminishes the species’ capacity to adapt and respond to environmental changes, thereby lessening the probability of long-term persistence (Barrett and Kohn 1991, pp. 3, 7; Newman and Pilson 1997, pp. 354–362). The problems associated with small population size and vulnerability to random demographic fluctuations or natural catastrophes are further magnified by synergistic interactions with other threats, such as anthropogenic impacts like habitat loss from human development or predation by nonnative species. The last known occurrence of four individuals of *Phyllostegia helleri* was in an area of less than 0.01 km<sup>2</sup> (0.3 mi<sup>2</sup>). This species is susceptible to threats from habitat degradation or loss by feral ungulates, nonnative plants, landslides, flash floods, and predation by feral ungulates, rats, and slugs, the effects of which are compounded by its limited distribution.

#### **Current Management Actions:**

- Surveys and monitoring—Surveys for new populations and monitoring of the area of the last known occurrence are ongoing (PEPP 2015, 2019).
- Captive propagation for genetic storage and reintroduction—The Lyon Arboretum Seed Conservation Laboratory reports storage of 50 seeds representing two founders from Wainiha (Lyon Arboretum 2019).

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

Date	No. wild individuals	No. outplanted	Preventing Extinction Criteria identified by HPPRCC	Preventing Extinction Criteria Completed?
2013 (listing)	<50	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2020 (5-year review)	0	0	All threats managed in all 3 populations	Partially, enclosure at area of last known occurrence
			Complete genetic storage	Yes (currently; as no known wild individuals)
			3 populations with 50 mature individuals each	No

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

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, enclosure at area of last known occurrence
Degradation of habitat by established ecosystem-altering invasive plant species	A	Ongoing	None
Degradation and destruction by flash flooding and landslides	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Predation and herbivory by rodents and slugs	C	Ongoing	None
Inadequacy of regulatory mechanisms	D	Ongoing	Partial, last known occurrence within fenced area
Reduced viability due to low numbers	E	Ongoing	Partial, seeds in storage

## 2.4 Synthesis

The last four known wild individuals of *Phyllostegia helleri* at Wainiha on the island of Kaua‘i could not be relocated. 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. helleri* is highly vulnerable to the effects of climate change. Seeds were collected from two of these last four individuals and 50 are in storage. The last known population of this species was fenced and ungulates were removed, the invasive plant species *Clidemia hirta* is suspected of out-competing the last individuals of *P. helleri*. No other conservation measures for this species are currently being conducted.

Preventing extinction, interim stabilization, downlisting, and delisting objectives are provided in HPPRCC’s Revised Recovery Objective Guidelines (2011). 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 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 Kaua‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e.*, viable seeds, seedlings) with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. No wild individuals remain and therefore genetic representation is considered complete (Table 1). In addition, threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Phyllostegia helleri* 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*

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 and inventories—Continue to search suitable habitat for individuals of *Phyllostegia helleri* in current and historical locations.
- Ungulate monitoring and control—Maintain fenced exclosures to protect the area of the last known occurrence and possible seed bank from the negative impacts of feral ungulates.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species and those that compete with *P. helleri* in the area of the last known occurrence.
- Predation and herbivory by rats and slugs—Implement effective control measures for rats and slugs at the area of the last known occurrence.
- Captive propagation for genetic storage and reintroduction—If individuals are discovered, collect seeds and cuttings for storage and propagation efforts.
- Reintroduction and translocation—Reintroduce propagules in suitable habitat to reduce the impacts of ungulates, predation, landslides, flash flooding, climate change, and low numbers.
- Climate change adaptation strategy—Research suitability of habitat in the future due to the impacts of climate change.
- Alliance and partnership development—Continue to collaborate with partners in planning and implementation of ecosystem-level restoration and management to benefit this species.

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

**Current Classification:** Endangered

**Recommendation resulting from the 5-Year Review:**

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

**Appropriate Listing/Reclassification Priority Number, if applicable:** \_\_\_\_\_

**Review Conducted By:**

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**FIELD OFFICE APPROVAL:**

for

\_\_\_\_\_  
**Field Supervisor, Pacific Islands Fish and Wildlife Office**