Phyllostegia renovans

(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 renovans* (No common name)

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5-YEAR REVIEW
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1.0 GENERAL INFORMATION

1.1 Reviewers:

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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 in June 2016. The review was based on the final rule listing this species; the final critical habitat designation; the recovery outline; peer reviewed scientific publications; unpublished field observations by the USFWS, State of Hawaii, and other experienced biologists; unpublished survey reports; notes and communications from other qualified biologists; as well as a review of current, available information.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 of Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Gregory Koob, Conservation and Restoration Team Manager.

1.3 Background:

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

[USFWS] U.S. Fish and Wildlife Service. 2015. Endangered and threatened wildlife and plants; 5-year status reviews of 133 species in Hawaii, Oregon, Idaho, and Washington. Federal Register 80(30): 8100–8103.

1.3.2 Listing history:

Original Listing
FR notice: USFWS. 2010a. Endangered and threatened wildlife and plants; determination of endangered status for 48 species on Kauai and designation of critical habitat, final rule. Federal Register 75(70): 18960–19165.
Date listed: April 13, 2010
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:

N/A

1.3.4 Review History:

This is the first 5-year review for this species. *Phyllostegia renovans* is a subshrub that was listed as endangered, with designation of critical habitat, on April 13, 2010 (USFWS 2010a). The recovery outline for *P. renovans* is included in the recovery outline for the Kauai Ecosystem, published in 2010 (USFWS 2010b). A draft recovery plan is in preparation.

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

At the start of the 5-year review, the Recovery Priority Number proposed for *Phyllostegia renovans* is 5 (using the USFWS scale of 1 to 18), based on the high degree of threat, a moderate potential for recovery with some threats that are well understood and easily alleviated and others that are currently difficult to alleviate, and its status as a full species (USFWS 2010b).

1.3.6 Current Recovery Plan or Outline:

Name of plan or outline: USFWS. 2010b. Recovery outline for the Kauai ecosystem. U.S. Fish and Wildlife Service, Portland, Oregon. 43 pages.
Date issued: June 17, 2010
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***

___ ***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***

_X_ ***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 criteria?

_____ ***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, B, C, D, and E) affecting this species is presented in section 2.3.2.

The recovery plan is currently being drafted. However, the Hawaii 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 USFWS 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, USFWS 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. A species with a narrow extant range is one currently known from one or two adjacent gulches or ridges within the same mountain range. Some species have historically been known from only one population. For these species, given the limited information known of their habitat requirements, the number of mature individuals needed to prevent extinction was doubled within the known population rather than expanding the known range of the species for preventing extinction and the interim stage. 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

To prevent extinction of *Phyllostegia renovans* (a short-lived subshrub with no specific characteristics known) the species needs a minimum of three populations

consisting of 100 mature individuals per population. In addition to achieving the numbers of reproducing individuals, all major threats must be controlled in the immediate vicinity of the populations, each population must show evidence of some stage of natural reproduction (*i.e.*, viable seeds or seedlings), and 50 mature individuals from each of three populations, or the total number of individuals if fewer than 50 exist in a population, must be represented in an *ex situ* collection that is secure and well managed.

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

Interim Stage
To meet the interim stage of recovery of *Phyllostegia renovans*, 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 growth to at least sapling stage for woody species 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). 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 populations 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:

Little is known about the life history of *Phyllostegia renovans*. This species has been observed flowering in January, February, March, June, September, October, and December (NTBG 2009, 2010a-d, 2011a-b, 2012, 2013a, 2014a, d, 2015a, d, 2016a, c). Lorence (pers. comm. 1995, as cited in Wagner 1999) noted that the flowers are not fragrant in the morning (10:00 to 11:00 AM), but have a light fragrance at 5:00 PM, suggesting possible moth pollination. Its pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (USFWS 2010a).

Phyllostegia renovans, a member of the mint family (Lamiaceae), is an erect subshrub when young, becoming scandent at maturity with stems up to 3 to 4 meters (9.8 to 13 feet) long. The leaves are narrowly ovate to ovate, sometimes broadly so, at 12.5 to 20 centimeters (cm) (4.9 to 7.9 inches (in)) long by 5 to 8.8 cm (2 to 3.5 in) wide. The inflorescences are racemose (simple inflorescence with flowers borne on short stalks and opening from the bottom up), 18 to 34 cm (7 to 13.4 in) long. The stem resumes vegetative growth after flowering. The corollas are white and about 19 to 22 millimeters (mm) (0.7 to 0.9 in) long. The fruits are greenish black nutlets that are about 8 to 9 mm (0.3 to 0.4 in) long (Wagner 1999).

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:

This species was discovered in 1989 in the headwaters of the Wainiha River (Wagner 1999). At the time of listing, *Phyllostegia renovans* was known from six populations after the last wild individual from Limahuli Valley died: 23 individuals at Wainiha, 10 individuals at Kalalau Valley, oen individual in Lumahai Valley, one individual at Kapalaoa, and one individual at the headwaters of Kamooloa Stream (Wood 1998; Wagner 1999; HBMP 2010). Currently, with more surveys conducted since 2010, the species is known from more locations including the Kalalau area, Limahuli, Wainiha, Lumahai, Hanalei headwaters, Iole headwaters, Waiahi, and Kapalaoa (HBMP 2010; NTBG 2009, 2010a-d, 2011a-b, 2012, 2013a-b, 2014a-d, 2015a-d, 2016a-d). The IUCN Red List of Threatened Species status assessment estimates nine "subpopulations" (considered 'populations' by USFWS) totaling 70 individuals (Edmonds 2015).

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:

Phyllostegia renovans was first discovered in 1989 and described by W.H. Wagner in 1999 from a specimen collected at the headwaters of the Wainiha River (Wagner 1999).

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 renovans occurs between 669 and 1,219 meters (2,194 to 4,000 feet) elevation in *Metrosideros polymorpha* (ohia) wet forest in the lowland wet and montane wet ecosystems (HBMP 2010; TNCH 2007).

In Limahuli Valley the habitat is *Metrosideros polymorpha – Dicranopteris linearis* (uluhe) wet forest with associated native plant species including *Cheirodendron* spp. (olopa), *Dicranopteris linearis* (uluhe), *Freycinetia arborea* (ie ie), *Kadua affinis* (NCN), *Machaerina angustifolia* (uki), *Psychotria hexandra* (kopiko), and *Syzygium sandwicensis* (ohia ha) (HBMP 2010).

In Kalalau, from Pihea to the Kilohana rim, the habitat is *Metrosideros-Cheirodendron* wet forest with slopes of *Dicranopteris* and *Sticherus* (uluhe) and the associated native plants including *Asplenium polyodon* (punana manu), *Atherium microphyllum* (akolea), *Broussaisia arguta* (kanawao), *Diplazium sandwicianum* (hoio), *Dryopteris unidentata* (akole), *Lobelia hypoleuca* (kuhiaikamoowahie), *Melicope clusiifolia* (kukaemoa), *M. wawrana* (alani), *Pipturus* spp. (mamaki), *Sadleria pallida* (amau), *Trematolobelia kauaiensis* (kolii), *Touchardia latifolia* (olona), and *Vaccinium calycinum* (ohelo) (HBMP 2010).

In Lumahai, the associated native plant species are *Dicranopteris linearis*, with *Antidesma platyphyllum* var. *hillebrandii* (hame), *Dubautia knudsenii* (naenae), *Ilex anomala* (kawau), *Psychotria* spp. (kopiko), and *Syzygium sandwicensis* (HBMP 2010).

2.3.1.7 Other:

N/A

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 degradation of habitat—Feral pigs (*Sus scrofa*), goats (*Capra hircus*), and black-tailed deer (*Odocoileus hemionus*), modify and degrade habitat by disturbing and destroying vegetative cover, trampling plants and seedlings, reducing or eliminating plant regeneration by damaging seeds and seedlings, and increasing erosion by creating large areas of bare soil. Habitat destruction and erosion caused by feral pigs and goats are noted to be a threat to all occurrences of *Phyllostegia renovans* (HBMP 2010; NTBG 2010b-d, 2011b, 2013a-b, 2014a-d, 2015a, c-d, 2016b-c). Habitat destruction and erosion caused by black-tailed deer is reported to be a threat at the Hanakoa occurrence (NTBG 2014a).

Established ecosystem-altering invasive plant modification and degradation of habitat—Invasive introduced plant species modify habitat occupied by native plant species by changing the availability of light, altering soil-water regimes, modifying nutrient cycling, and changing the fire characteristics of the native plant community. Invasive introduced plants with the greatest impacts on *Phyllostegia renovans* are: *Adiantum raddianum* (NCN), *Andropogon glomeratus* (bushy beardgrass), *Axonopus fissifolius* (narrow-leaved carpetgrass), *Blechnum appendiculatum* (NCN), *Buddleia asiatica* (dog tail), *Clidemia hirta* (Koster's curse), *Cyperus*

meyenianus (NCN), *Erigeron karvinskianus* (daisy fleabane), *Hedychium gardnerianum* (kahili ginger), *Juncus planifolius* (rush), *Kalanchoe pinnata* (air plant), *Paspalum urvillei* (vasey grass), *Psidium guajava* (common guava), P. *cattleianum* (strawberry guava), *Rhodomyrtus tomentosa* (downy myrtle), *Rubus argutus* (prickly Florida blackberry), *R. rosifolius* (thimbleberry), and *Sphaeropteris cooperi* (Australian tree fern) (NTBG 2010a-d, 2011b, 2012, 2013a-b, 2014a-d, 2015a-d, 2016a-d).

Landslides and flooding loss or degradation of habitat—Landslides and erosion due to natural weathering destabilize substrates, damage and destroy individual plants, and alter hydrological patterns (Stearns 1985). Landslides are reported to be a threat to the occurrences of *Phyllostegia renovans* at Lumahai, Limahuli, and Wainiha (HBMP 2010; NTBG 2012; PEPP 2014).

Hurricanes—Loss and degradation of habitat—In November 1982, Hurricane Iwa struck the Hawaiian Islands, with wind gusts exceeding 100 miles per hour (mph) (161 kilometers per hour (kph)), causing extensive damage, especially on the islands of Niihau, Kauai, and Oahu (Businger 1998). In September 1992, Hurricane Iniki, a category 4 hurricane with maximum sustained wind speeds recorded at 140 mph (225 kph), passed directly over the island of Kauai. Many forest trees were destroyed (Perlman 1992), which opened the canopy and facilitated the invasion of nonnative plants (Kitayama and Mueller-Dombois 1995). A destructive hurricane holds the potential of driving a localized endemic species to extinction in a single event. Hurricanes pose an ongoing and ever-present threat because they can happen at any time, although their occurrence is not predictable. Tropical cyclone frequency and intensity are projected to change as a result of climate change over the next 100 to 200 years (Vecchi and Soden 2007; Emanuel *et al.* 2008; Yu *et al.* 2010). In the central Pacific, modeling projects an increase of up to two additional tropical cyclones per year in the main Hawaiian Islands by 2100 (Murakami *et al.* 2013).

Climate change loss 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. This assessment concluded that *Phyllostegia renovans* is vulnerable to the impacts of climate change with a vulnerability score of 0.404 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions are needed to conserve this taxon into the future.

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):

Ungulate predation or herbivory—Herbivory by feral pigs and goats is a threat to all occurrences of *Phyllostegia renovans* (HBMP 2010; NTBG 2010b-d, 2011b, 2013a-b, 2014a-d, 2015a, c-d, 2016b-c; PEPP 2014).

Rodent predation or herbivory—Herbivory by rats (*Rattus* spp.) has been noted as a threat to *Phyllostegia renovans* at Limahuli (HBMP 2010, NTBG 2010c-d, 2015b), Hanakapiai (NTBG 2016b), Waiahuakua (NTBG 2016a), Hanalei headwaters (NTBG 2016d), Wainiha (NTBG 2013a-b, 2015a, c-d; PEPP 2015), Hanakoa (NTBG 2011a, 2014a; PEPP 2014), and Waiahi (NTBG 2010a-b). Rats eat virtually every part of plants and at every stage: fleshy fruits, seeds, flowers, stems, leaves, shoots, seedlings, and roots (Russell 1980; Cuddihy and Stone 1990). The effects on plants range from reduced vigor and decreased reproduction to mortality of individuals and complete lack of recruitment.

2.3.2.4 Inadequacy of existing regulatory mechanisms (Factor D):

Lack of adequate hunting regulations—Almost all occurrences of *Phyllostegia renovans* are not within State hunting areas. However, habitat modification and destruction by feral pigs, goats, and black-tailed deer is noted to be a threat to *P. renovans*. Nonnative feral ungulates pose a major ongoing threat to native species through destruction and modification of habitat, and by direct herbivory. Public hunting areas are not fenced and game mammals have unrestricted access to most areas across the landscape, regardless of underlying land use designation; therefore, all populations are at risk (DLNR 2010).

Lack of adequate biosecurity legislation— Introduction of invasive nonnative plant and animals species to the State of Hawaii and destruction of habitat and competition by nonnative plants are threats to *Phyllostegia renovans*. The U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, is authorized to prevent the introduction or dissemination of animal and plant pests on all ships, aircraft, and their cargo and baggage arriving in the U.S. and its territories; however, Federal import regulations do not address many species that could be pests in Hawaii (CGAPS 2009; Ikuma *et al.* 2002).

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

Invasive species—Established invasive plant species competition—Nonnative plant species including *Clidemia hirta*, *Cyperus meyenianus*, *Erigeron karvinskianus*, *Hedychium gardnerianum*, *Juncus planifolius*, and *Rubus argutus*, compete with *Phyllostegia renovans* for space, water, light, and nutrients (HBMP 2010; NTBG 2016b).

Stochastic events—Reduced viability due to low numbers—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; Newman and Pilson 1997). 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. Very small plant populations may experience reduced reproductive vigor due to ineffective pollination or inbreeding depression. The largest populations of *Phyllostegia renovans* consist of 20 or fewer individuals; therefore, loss of reproductive vigor is a risk.

Current Management Actions:

- Predator and herbivore monitoring and control—Outplantings at Kanaele Bog are within a fenced exclosure (NTBG 2011c; PEPP 2011).
- Surveys and inventories—Surveys are ongoing and new occurrences have been found (PEPP 2011, 2014, 2015).
- Captive propagation for genetic storage and reintroduction—Lyon Arboretum has over 1700 seeds from eight different founders from a total of three locations (Lyon Arboretum 2017). The Kokee rare Plant Facility has five plants of one of these founders (DOFAW 2016). NTBG has a few hundred seeds from six different locations. NTBG also has planted a few dozen plants in their gardens and around 300 plants in their nursery (NTBG 2017).
- Reintroduction and translocation—NTBG has reintroduced over 500 individuals in a fenced exclosure at Kanaele Bog, in which 90 individuals remain (NTBG 2011c, 2013c; PEPP 2011; PEPP 2017). PEPP reintroduced over 200 individuals at Wailua River (Blue Hole) (PEPP 2017).

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

Date	No. wild individuals	No. outplanted	Preventing Extinction Criteria identified by	Preventing Extinction

			HPPRCC	Criteria Completed?
2010 (listing and critical habitat)	36	188	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 100 mature individuals each	No
2016 (5-year review)	70	> 500	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Reproduction (*i.e.*, viable seeds, seedlings) at all three populations	Unknown
			Three populations with 100 mature individuals each	No

Table 2. Threats to *Phyllostegia renovans* and conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	None
Established ecosystem-altering invasive plant modification and degradation of habitat	A	Ongoing	Partially
Landslides and flooding destruction or degradation of habitat	A	Ongoing	None
Hurricane destruction and degradation of habitat	A	Ongoing	None
Climate change loss or degradation of habitat	A	Ongoing	None
Rodent predation or herbivory	C	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	Partially
Inadequacy of existing regulatory mechanisms—Lack of adequate hunting regulations	D	Ongoing	None

Inadequacy of existing regulatory mechanisms—Lack of adequate biosecurity legislation	D	Ongoing	None
Invasive species—Established invasive plant species competition	E	Ongoing	Partially
Stochastic events—Reduced viability due to low numbers	E	Ongoing	Partially

2.4 Synthesis

There are currently about 70 wild individuals of *Phyllostegia renovans* in nine locations. Propagation and outplanting efforts are ongoing.

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 total number of individuals if fewer than 50) from each of three populations represented in an *ex situ* (at other than the plant's natural location, such as a nursery or seed bank) collection. In addition, a minimum of three populations should be documented on Kauai where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e.*, viable seeds, seedlings, or saplings), with a minimum of 100 mature individuals per population.

The preventing extinction goals for this species have not been met, as currently the largest population only has nine individuals, genetic representation is incomplete (Table 1), and all threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Phyllostegia renovans* 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

- Surveys and inventories—Continue to survey for populations of *Phyllostegia renovans* in areas of potentially suitable habitat.
- Ungulate monitoring and control—Protect all occurrences against browsing and disturbances from feral ungulates. Continue to construct and maintain fenced exclosures around existing populations to prevent imminent extinction.
- Invasive plant monitoring and control
    - Control established ecosystem-altering nonnative invasive plant species around all populations.
    - Control invasive nonnative plant species around all populations that compete with the species.
- Rodent predation or herbivory control—Implement effective measures to control rodents around all populations.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock.
- Reintroduction and translocation—Continue reintroduction of individuals into suitable habitat within historic range that is being managed for known threats to this species.
- Population biology research—Study *Phyllostegia renovans* populations to determine viable population size and structure, geographical distribution, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Stochastic events—Build resilience and redundancy—Increase numbers of populations and individuals scattered throughout historic range to reduce impacts from landslides and storms.
- Based on the recovery criteria above, consider development of a recovery plan.

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

For **Field Supervisor, Pacific Islands Fish and Wildlife Office**

GREGORY KOOB Digitally signed by GREGORY KOOB
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