

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Remya kauaiensis* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2008. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 70 species in Idaho, Montana, Oregon, Washington, and the Pacific Islands. Federal Register 73(83):23264-23266.

Lead Region/Field Office:

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

Name of Reviewer(s):

Marie Bruegmann, Pacific Islands Fish and Wildlife Office, Plant Recovery Coordinator
Marilet A. Zablan, Pacific Islands Fish and Wildlife Office, Assistant Field Supervisor for Endangered Species
Jeff Newman, Pacific Islands Fish and Wildlife Office, Acting Deputy Field Supervisor

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on April 29, 2008. The review was based on the final critical habitat designation for *Remya kauaiensis* (USFWS 2003) and other species from the island of Kauai, as well as a review of current, available information. The National Tropical Botanical Garden 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 the Plant Recovery Coordinator. The document was then reviewed by the Assistant Field Supervisor for Endangered Species and Acting Deputy Field Supervisor before submission to the Field Supervisor for approval.

Background:

For information regarding the species listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species (http://ecos.fws.gov/tess_public).

Application of the 1996 Distinct Population Segment (DPS) Policy:

This Policy does not apply to plants.

Review Analysis:

Please refer to the final critical habitat designation for *Remya kauaiensis* published in the Federal Register on February 27, 2003 (USFWS 2003) for a complete review of the species' status (including biology and habitat), threats, and management efforts. No new threats and no significant new information regarding the species biological status have

come to light since listing to warrant a change in the Federal listing status of *R. kauaiensis*.

Remya kauaiensis is one of three species of the endemic Hawaiian genus *Remya*. It is one of the two species that are also a single-island endemic for Kauai. It was believed extinct before four populations were discovered in 1983 and 1985 (Wagner *et al.* 1990). Since that time more extensive survey efforts have shown that while it is still rare, it is not infrequent within the mountainous areas in and around Kokee State Park. In 2003, there were 17 known populations of *Remya kauaiensis* with a total of 106 to 114 individuals on State-owned land. These were located in Hipalau Valley, Awini Valley, Koaie Canyon, Mohihi Stream, the left branch of Kalalau Valley, Kalalau Valley Rim, Awaawapuhi and Nualolo Valleys, Kuia and Kawaiula Valleys, Makaha Valley and Makaha Ridge, Poopooiki Valley, Kauhao Valley, Waialae Valley, and Kaulaula Valley (USFWS 2003).

In Awaawapuhi Valley, twelve or more individuals were seen in April 1992 along the trail at 1,075 meters (3,527 feet) elevation (Wood 2009). Two patches were seen in 1994 at 1,067 meters (3,501 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). Five individuals were seen at 945 meters (3,100 feet) elevation and seven at 975 meters (3,200 feet) elevation in March 1999 (Hawaii Biodiversity and Mapping Program 2009). In December 2003, a patch of *Remya kauaiensis* was observed at 1,076 meters (3,530 feet) elevation (Perlman 2009). In May 2005, a large clump was seen climbing three meters (ten feet) into a tree at 1,012 meters (3,320 feet) elevation (Perlman 2009; Tangalin 2009). In December 2006, one large patch was seen at 997 meters (3,270 feet) elevation (Perlman 2009). This population was visited most recently in January 2009 (National Tropical Botanical Garden 2009b).

At the Kalalau Valley Rim, *Remya kauaiensis* was observed in 1991 at 1,091 meters (3,580 feet) elevation (Perlman 2009). In 1995, one mature individual was observed there at 1,090 meters (3,575 feet) elevation and another at 1,237 meters (4,060 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). In March 2000, three individuals were seen at 1,219 meters (4,000 feet) elevation (Wood 2009).

In Hipalau, off Kaluahaula Ridge, just to the south of the dividing ridge between Kawaiiki and Hipalau, *Remya kauaiensis* was observed in August 2000. About six individuals were seen in Kawaiiki drainages going into Koaie Canyon, at 914 meters (3,000 feet) elevation and another patch of as many as four individuals was seen at 960 meters (3,150 feet) elevation (Wood 2009).

Remya kauaiensis was observed in the Nualolo Valley in the Kuia Natural Area Reserve and was visited at least annually from 1989 to 1993 at 950 to 1,050 meters (3,117 to 3,445 feet) elevation (Perlman 2009; Wood 2009). In August 1996, 15 patches were seen scattered along the slope of Nualolo Valley, south of Awaawapuhi Trail, at 1,006 meters (3,301 feet) elevation (National Tropical Botanical Garden 2009b). In January 2005, 10 individuals were observed on steep slopes just above the gulch bottom at 1,021 meters (3,350 feet) elevation (Wood 2009).

In Upper Kuia drainage, *Remya kauaiensis* was seen occasionally at 914 to 975 meters (3,000 to 3,200 feet) elevation throughout mesic valleys, according to observations in November 1994 (Wood 2009). In March 2000, five individuals were observed in Kuia in a 1,000 square meter (10,764 square foot) area at 914 meters (3,000 feet) elevation in the northern fork of the upper headwaters of Kuia (National Tropical Botanical Garden 2009b). In April 2000, 24 individuals were observed and mapped in one square kilometer (0.386 square mile) area at 823 to 1,006 meters (2,700 to 3,300 feet) elevation (Wood 2009), and 5 individuals at 867 meters (2,840 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). In 2001, five individuals were observed at 866 meters (2,840 feet) elevation (National Tropical Botanical Garden 2009b).

Remya kauaiensis was “occasional in the area” of Kawaiula Valley at 823 to 1,006 meters (2,700 to 3,300 feet) elevation in 1994 (Wood 2009). Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife personnel relocated a population of *Remya kauaiensis* in the Kawaiula Valley in Kuia Natural Area Reserve (Hawaii Department of Land and Natural Resources 2005).

At Makaha Ridge, *Remya kauaiensis* was seen at 823 to 860 meters (2,700 to 2,820 feet) elevation from 1990 to 2000 (Perlman 2009; Wood 2009). In March 1996, between 10 and 50 individuals were noted at 867 meters (2,844 feet) elevation and between 10 and 50 individuals at 792 meters (2,598 feet) elevation (National Tropical Botanical Garden 2009b). In December 2004, about five individuals were seen on a steep northern exposure at 732 meters (2,400 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; Wood 2009).

In Poopooiki Valley, 5 patches of *Remya kauaiensis* were seen in November 1996, at 671 meters (2,200 feet) elevation (Wood 2009). In April 2000, about five individuals of *Remya kauaiensis* were observed at 686 meters (2,250 feet) elevation on a hill above Poopooiki (Wood 2009). In August 2000, 2 large patches were seen at 747 meters (2,450 feet) elevation and another patch seen at 741 meters (2,430 feet) elevation (Perlman 2009; Wood 2009).

In a Waialae Valley headwater streamlet south of Kaluahaula Ridge Trail, several patches of *Remya kauaiensis* were observed in August 2001 along north facing slopes of this drainage, containing about 10 individuals at 945 meters (3,100 feet) elevation (Perlman 2009; Wood 2009).

Locations recorded before 1999 include Kalalau Valley, Kauhao Ridge, Koaie Canyon, Kohua Ridge, Lapa Reservoir at Haeleele Road, Mohihi, and Waialae Ridge. In the Kalalau Valley in 1992, *Remya kauaiensis* was seen climbing up the east and west sides of a ridge at the back of the valley at 580 meters (1,903 feet) elevation (Wood 2009). *Remya kauaiensis* was seen on Kauhao Ridge near the gauging station at 994 meters (3,260 feet) in 1994 (Wood 2009). In Koaie Canyon, it was seen in 1993 on a steep north facing slope, at 841 meters (2,760 feet) elevation (Perlman 2009). Forty or more individuals of *R. kauaiensis* were seen on Kohua Ridge on the Maile Flat Trail in 1990 at

850 to 900 meters (2,789 to 2,953 feet) elevation (Wood 2009). At Kaulaula - Lapa Reservoir, by Haelele Road, at 1,055 meters (3,460 feet) elevation, several scattered individuals of *Remya kauaiensis* were seen in 1994 (Perlman 2009). On Mohihi, above the stream toward the falls and Poomau, *R. kauaiensis* was seen growing ten meters (33 feet) into a *Metrosideros* tree at 1,082 meters (3,550 feet) elevation in 1994 (Perlman 2009; Wood 2009). On Waialae Ridge, about 20 individuals were seen at 950 to 1,000 meters (3,117 to 3,281 feet) in 1993 (Wood 2009). These populations have not been observed since 1999 or earlier (M. Clark, National Tropical Botanical Garden, pers. comm. 2009).

Remya kauaiensis grows chiefly on steep, north- or northeast-facing slopes between 560 and 1,247 meters (1,836 and 4,090 feet) elevations. It is found primarily, but not exclusively, in *Acacia koa* (koa) – *Metrosideros polymorpha* (ohia) lowland mesic forest with *Alphitonia ponderosa* (kauila), *Alyxia stellata* (maile), *Bobea brevipes* (ahakea lau lii), *Chamaesyce* spp. (akoko), *Chamaesyce atrococca* (akoko), *Cheirodendron* sp. (olapa), *Claoxylon sandwicense* (laukea), *Coprosma* sp. (pilo), *Dianella sandwicensis* (uki uki), *Dicranopteris linearis* (uluhe), *Diospyros* spp. (lama), *Dodonaea viscosa* (aalii), *Dubautia* sp. (naenae), *Kadua affinis* (manono), *Leptecophylla tameiameiae* (pukiawe), *Melicope barbiger*a (uahiapele), *M. haupuensis* (alani), *M. ovata* (alani), *Myrsine knudsenii* (kolea), *Nestegis sandwicensis* (olopua), *Pouteria sandwicensis* (alaa), *Psychotria greenwelliae* (kopiko), *P. mariniana* (kopiko), *Schiedea* spp. (no common name [NCN]), *Tetraplasandra* spp. (ohe), and *Xylosma hawaiiense* (maua) (Tangalin 2009; USFWS 2003).

In the Awaawapuhi Valley - Honopu area, *Remya kauaiensis* grows with *Alyxia stellata*, *Artemisia australis* (ahinahina), *Bobea brevipes*, *Chamaesyce atrococca*, *Cheirodendron* sp., *Claoxylon sandwicense*, *Coprosma waimeae* (olena), *Cryptocarya mannii* (holio), *Cyrtandra* sp. (haiwale), *Dianella sandwicensis*, *Dicranopteris linearis*, *Dodonaea viscosa*, *Dubautia* sp., *Elaeocarpus bifidus* (kalia), *Exocarpos luteolus* (heau), *Ilex anomala* (kawau), *Kadua* spp. (NCN), *Leptecophylla tameiameiae*, *Lobelia yuccoides* (panaunau), *Lysimachia* sp. (NCN), *Melicope anisata* (mokihana), *M. barbiger*a, *M. haupuensis*, *M. ovata*, *M. pallida* (alani), *Myrsine knudsenii*, *Nestegis sandwicensis*, *Perrottetia sandwicensis* (olomea), *Pipturus* sp. (mamake), *Pouteria sandwicensis*, *Psychotria greenwelliae*, *P. hexandra*, *P. mariniana*, *Scaevola procera* (naupaka kuahiwi), *Xylosma* sp., and *Zanthoxylum dipetalum* (kawau) (National Tropical Botanical Garden 2009b; Perlman 2009; Tangalin 2009; Wood 2009).

On Kaulaula - Lapa Ridge, *Remya kauaiensis* grows in *Acacia koa* – *Metrosideros polymorpha* mesic forest mostly with *Alphitonia ponderosa*, *Alyxia stellata*, *Coprosma kauensis* (koi), *Cyanea leptostegia* (haha lua), *Dodonaea viscosa*, *Dianella sandwicensis*, *Doodia kunthiana* (okupukupu), *Ilex anomala*, *Melicope anisata*, *M. barbiger*a, *Myrsine* sp., *Nestegis sandwicensis*, *Perrottetia sandwicensis*, *Pleomele aurea* (hala pepe), *Pouteria sandwicensis*, *Psychotria* spp., and *Tetraplasandra kawaiensis* (ohe ohe) (Perlman 2009).

In Kalalau, *Remya kauaiensis* grows in *Metrosideros polymorpha* mesic- wet cliffs diverse mesic and *Metrosideros polymorpha* – *Diospyros sandwicensis* – *Dicranopteris linearis* forests with *Artemisia australis*, *Astelia menziesiana* (kaluaha), *Boehmeria grandis* (akolea), *Charpentiera elliptica*, *Coprosma* sp., *Dubautia laevigata* (naenae), *Eragrostis variabilis* (kawelu), *Exocarpos luteolus*, *Kadua flynnii* (NCN), *Lepidium serra* (anaunau), *Lobelia yuccoides*, *Lysimachia glutinosa* (NCN), *L. kalalauensis*, *Melicope pallida*, *Nototrichium divaricatum* (kului), *Panicum lineale* (NCN), *Peucedanum sandwicense* (makou), *Plantago princeps* var. *anomala* (laukahi kuahiwi), *Pritchardia minor* (loulu), and *Xylosma hawaiiense* (Perlman 2009; Wood 2009).

On Kauhao Ridge, *Remya kauaiensis* grows in mesic forest with *Alphitonia ponderosa*, *Acacia koa*, *Dubautia latifolia*, *Melicope anisata*, *Metrosideros polymorpha*, *Panicum nephelophilum* (konakona), *Pleomele aurea*, *Poa mannii* (NCN), *Pouteria sandwicensis*, *Zanthoxylum dipetalum*, and *Z. kauaense* (ae) (Wood 2009).

In Hipalau - Kawaiiki, *Remya kauaiensis* grows in *Metrosideros polymorpha* mixed mesic forest with *Acacia koa*, *Alphitonia ponderosa*, *Antidesma platyphylla*, *Bohea brevipes*, *Cryptocarya mannii*, *Diospyros* sp., *Dodonaea viscosa*, *Hibiscus waimeae* subsp. *waimeae* (kokio keokeo), *Melicope anisata*, *M. barbiger*, *M. ovata*, *Myrsine lanaiensis* (kolea), *Pittosporum glabrum* (hoawa), *Pleomele aurea*, *Pouteria sandwicensis*, *Pritchardia minor*, *Psychotria greenwelliae*, *P. mariniana*, *Santalum freycinetianum* (iliahi), *Streblus pendulinus* (aiai), *Tetraplasandra kavaiensis*, and *Xylosma hawaiiense* (National Tropical Botanical Garden 2009b; Wood 2009).

In Kawaiula Valley, *Remya kauaiensis* grows in *Metrosideros polymorpha* mesic forest with *Acacia koa*, *Alphitonia ponderosa*, *Alyxia stellata*, *Antidesma platyphyllum* (hame), *Bohea brevipes*, *Bonamia menziesii* (NCN), *Carex meyenii* (NCN), *Charpentiera elliptica*, *Cheirodendron trigynum* (olapa), *Diospyros sandwicensis* (lama), *Elaeocarpus bifidus*, *Euphorbia haeleleana* (NCN), *Kadua knudsenii*, *Leptecophylla tameiameia*, *Lysimachia kalalauensis*, *Peperomia cookiana* (ala ala wai nui), *P. kokeana* (ala ala wai nui), *Perrottetia sandwicensis*, *Pipturus kauaiensis* (mamake), *Smilax melastomifolia* (hoi kuahiwi), *Syzygium sandwicensis* (ohia ha), *Tetraplasandra kavaiensis*, *Vaccinium dentata* (ohelo), *Wilkesia gymnoxiphium* (iliau), and *Xylosma hawaiiense* (Hawaii Biodiversity and Mapping Program 2009; Wood 2009).

In Koaie Canyon, *Remya kauaiensis* grows in *Diospyros sandwicensis* – *Metrosideros polymorpha* mesic – wet forest with *Alectryon macrococcus*, *Antidesma platyphyllum*, *Bohea* sp., *Cryptocarya mannii*, *Dodonaea viscosa*, *Nestegis sandwicensis*, *Pleomele aurea*, *Pouteria sandwicensis*, *Pritchardia minor*, *Tetraplasandra* sp., *Syzygium sandwicensis*, *Xylosma hawaiiense*, and *Zanthoxylum dipetalum* (Perlman 2009).

The Kohua Ridge, Maile Flat Trail *Remya kauaiensis* population grows in *Acacia koa* – *Metrosideros polymorpha* mesic forest with *Alphitonia ponderosa*, *Dodonaea viscosa*, *Lysimachia kalalauensis*, *Melicope* spp., *Myrsine* spp., *Pittosporum* spp., *Pleomele aurea*, and *Psychotria* spp. (Wood 2009).

In the Kuia area, *Remya kauaiensis* grows in *Metrosideros polymorpha* – *Alphitonia ponderosa* – *Acacia koa* montane mesic forest associated with *Bobea brevipes*, *Carex meyenii*, *Cheirodendron* spp., *Cyperus phleoides* (NCN), *Dodonaea viscosa*, *Eragrostis variabilis*, *Leptecophylla tameiameiae*, *Melicope barbigera*, *M. ovata*, *Microlepia strigosa* (palapalai), *Panicum nephelophilum*, *Polypodium pellucidum* (ae lau nui), *Pouteria sandwicensis*, *Psychotria greenwelliae*, *Scaevola procera*, *Tetraplasandra kavaiensis*, *Wikstroemia furcata* (akia), and *Wilkesia gymnoxiphium* (iliau) (National Tropical Botanical Garden 2009b; Wood 2009).

On Makaha Ridge and Makaha Valley, *Remya kauaiensis* grows near *Eragrostis variabilis* lowland dry grassland and in *Acacia koa* – *Metrosideros polymorpha* mesic forest with *Alphitonia ponderosa*, *Alyxia stellata*, *Artemisia* sp., *Antidesma platyphyllum*, *Bidens* sp. (kookoolau), *Carex* spp., *Chamaesyce halemanui* (akoko), *Coprosma* spp., *Diospyros sandwicensis*, *Dodonaea viscosa*, *Elaeocarpus bifidus*, *Euphorbia haeleleana*, *Isodendron laurifolium* (aupaka), *Melicope anisata*, *Myrsine* spp., *Pteralyxia kauaiensis* (kaulu), *Schiedea membranacea*, *Syzygium sandwicense*, and *Zanthoxylum dipetalum* (National Tropical Botanical Garden 2009b; Wood 2009).

In Mohihi, *Remya kauaiensis* grows in *Metrosideros polymorpha* montane wet forest with *Cheirodendron* spp., *Coprosma kauensis*, *Kadua affinis*, *Labordia hirtella* (kamakahala), and *Psychotria mariniana* (Wood 2009). In Nualolo Valley, *Remya kauaiensis* grows in *Acacia koa* – *Metrosideros polymorpha* montane mesic, summer dry forest with *Alphitonia ponderosa*, *Bobea* sp., *Carex* spp., *Claoxylon sandwicense*, *Dodonaea viscosa*, *Kadua* spp., *Lysimachia kalalauensis*, *Melicope barbigera*, *Myrsine* spp., *Pleomele aurea*, *Pouteria sandwicensis*, *Psychotria mariniana*, *P. greenwelliae*, *Scaevola* spp., *Stenogyne purpurea* (NCN), *Tetraplasandra kavaiensis*, *Xylosma hawaiiense*, and *Zanthoxylum* spp. (Wood 2009).

In Poopooiki Valley, *Remya kauaiensis* grows in *Acacia koa* – *Metrosideros polymorpha* mesic forest with *Alyxia stellata*, *Antidesma platyphylla*, *Carex meyenii*, *Chamaesyce halemanui*, *Claoxylon sandwicense*, *Delissea kauaiensis* (NCN), *Diplazium sandwichianum* (hoio), *Dodonaea viscosa*, *Dicranopteris linearis*, *Diospyros sandwicensis*, *Doodia kunthiana*, *Dryopteris fusco-atra* (ii), *D. unidentata* (akole), *Euphorbia haeleleana*, *Freycinetia arborea* (ie ie), *Gahnia becheyi* (NCN), *Isodendron laurifolium*, *Kadua affinis*, *K. knudsenii*, *Lepisorus thunbergianus* (pakahakaha), *Leptecophylla tameiameiae*, *Melicope anisata*, *M. barbigera*, *Nestegis sandwicensis*, *Panicum nephelophilum*, *Peucedanum sandwicense*, *Pleomele aurea*, *Santalum freycinetianum*, and *Scaevola procera* (Hawaii Biodiversity and Mapping Program 2009; Wood 2009).

Waialae Ridge above the falls, has a habitat of *Metrosideros polymorpha* – *Acacia koa* mixed montane mesic forest with associated species including *Alphitonia ponderosa*, *Antidesma platyphylla*, *Panicum nephelophilum*, *Chamaesyce halemanui*, *Charpentiera elliptica*, *Claoxylon sandwicense*, *Coprosma foliosa*, *Cyperus pennatifolius* (NCN), *Dianella sandwicensis*, *Diospyros sandwicensis*, *Dodonaea viscosa*, *Hibiscus waimeae* subsp. *waimeae*, *Isodendron laurifolium*, *Kadua knudsenii*, *Lepidium serra*,

Leptecophylla tameiameia, *Melanthera fauriei* (nehe), *Lysimachia kalalauensis*, *Melicope anisata*, *M. barbiger*, *Pipturus argutus* (mamake), *Perrottetia sandwicensis*, *Peucedanum sandwicense*, *Poa sandwicensis* (NCN), *Pouteria sandwicensis*, *Pritchardia minor*, *Psychotria mariniana*, *Pteralyxia kauaiensis*, *Scaevola procera*, *Schiedea membranacea* (NCN), *Sida fallax* (ilima), *Streblus pendulinus*, *Syzygium sandwicensis*, *Urera glabra* (opuhe), *Zanthoxylum dipetalum*, and endemic ferns in cool, shady gulches including *Doodia kunthiana*, *Doryopteris decipiens* (kumuniu), *Dryopteris fusco-atra*, *D. unidentata*, *Microlepia strigosa*, and *Pteris excelsa* (waimakanui) (Wood 2009).

The primary threats to *Remya kauaiensis* include habitat degradation by feral goats (*Capris hircus*), pigs (*Sus scrofa*), cattle (*Bos taurus*), and deer (*Odocoileus hemionus*) (Factors A and C) and competition from invasive introduced plant species including *Axonopus fissifolius* (narrow-leaved carpetgrass), *Blechnum appendiculatum* (hammock fern), *Bryophyllum pinnatum* (airplant), *Erigeron karvinskianus* (daisy fleabane), *Rubus argutus* (blackberry), *Grevillea robusta* (silk oak), *Lantana camara* (lantana), *Passiflora tarminiana* (banana poka), *P. ligularis* (sweet granadilla), *Hedychium gardnerianum* (Kahili ginger), *Psidium cattleianum* (strawberry guava), *Pluchea carolinensis* (sourbush), *Rubus rosifolius* (thimbleberry), *Psidium guajava* (common guava), *Oplismenus hirtellus* (basketgrass), and *Nasturtium microphyllum* (watercress) (Factor E) (Perlman 2009; Wood 2009). Other threats include erosion (Factor E), fire (Factor E), and risk of extinction from naturally occurring events, such as landslides or hurricanes (Factor E), and/or reduced reproductive vigor due to the small number of remaining populations and individuals (Factor E) (USFWS 2003). Herbivory by feral goats, pigs, cattle, and deer has been frequently noted and regeneration in the wild is not observed (Factor C) (Perlman 2009; Wood 2009).

Climate change may also pose a threat to *Remya kauaiensis* (Factors A and E). However, current climate change models do not allow us to predict specifically what those effects, and their extent, would be for this species.

In addition to all of the other threats, species like *Remya kauaiensis* that are endemic to small portions of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes, landslides, flooding, and disease outbreaks (Factor E). The effects of these processes on this single-island endemic are exacerbated by anthropogenic threats, such as habitat loss for human development or predation by introduced species (Factor E) (USFWS 1995).

To safeguard existing genetic material, propagation for genetic storage and reintroduction is occurring at the Hawaii Division of Forestry and Wildlife personnel collected seeds from the Makaha population (Hawaii Department of Land and Natural Resources 2005). Approximately 62,550 seeds are in storage at the National Tropical Botanical Garden in Kalaheo from several populations (National Tropical Botanical Garden 2009a). Plants of *Remya kauaiensis* were started in the National Tropical Botanical Garden Lawai Nursery and currently there are 2,500 propagated plants in the nursery. Three individuals were outplanted for genetic storage in their Limahuli Garden in Haena, and three were

reintroduced into the Kuia Natural Area Reserve (National Tropical Botanical Garden 2009a).

Habitat degradation caused by feral ungulates and invasive introduced plants has increased steadily since this species was listed. While it has been seen in flower and seed, regeneration in the wild has not reported.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for plants from the island of Kauai (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Remya kauaiensis* 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* (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 Kauai. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have not been met (see Table 1), as only one population has more than 50 mature individuals and all threats are not being managed. Therefore, *Remya kauaiensis* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Fence wild occurrences of *Remya kauaiensis* to prevent further disturbance and browsing by feral ungulates.
- Control invasive introduced species within exclosure fences.
- Survey locations where *Remya kauaiensis* was previously seen but not recorded in the last ten years: Awini Valley, Koaie Canyon, Mohihi, Kauhao Valley, and Kaulaula.
- Collect seeds from all remaining populations for storage and propagation.
- Conduct research to determine genetic diversity in and between populations.
- Propagate for reintroduction.
- Work with Hawaii Division of Forestry and Wildlife and Hawaii State Parks to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

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Personal Communications

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Service, Pacific Islands Fish and Wildlife Office, dated May 12, 2009. Subject:
Remya kauaiensis.

Table 1. Status of *Remya kauaiensis* from listing through 5-year review.

Date	No. wild indivs.	No. outplanted	Stability Criteria identified in Recovery Plan	Stability 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)	<200	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2003 (critical habitat)	106-114	Unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2009 (5-year review)	106-114	3	All threats managed	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially

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SIGNATURE PAGE for 5-YEAR REVIEW of *Remya kauaiensis* (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
- No Change in listing status

^{PS} Field Supervisor, Pacific Islands Fish and Wildlife Office



Date AUG 27 2010