Isodendrion longifolium
(aupaka)

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: Isodendrion longifolium / aupaka

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5-YEAR REVIEW
*Isodendrion longifolium* (aupaka)

1.0 GENERAL INFORMATION

1.1 Reviewers

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

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

**Cooperating Field Office(s):**
N/A

**Cooperating Regional Office(s):**
N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on March 16, 2009. The review was based on final critical habitat designations for *Isodendrion longifolium* and other species from the islands of Kauai and Oahu (USFWS 2003a, b) 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 Tamara Sherrill, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Lead and the Assistant Field Supervisor for Endangered Species before submission to the Deputy Field Supervisor for approval.
1.3 Background:

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

1.3.2 Listing history

Original Listing
Date listed: October 10, 1996
Entity listed: Species
Classification: Threatened

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

1.3.3 Associated rulemakings:


Critical habitat was designated for *Isodendrion longifolium* in five units totaling 1,412 hectares (3,488 acres) on Kauai (USFWS 2003a) and two units totaling 714 hectares (1,762 acres) on Oahu (USFWS 2003b). These designations include habitat on State, Federal, and private lands.

1.3.4 Review History:
Species status review [FY 2010 Recovery Data Call (September 2010)]: Declining

**Recovery achieved:**  
1 (0-25%) (FY 2007 Recovery Data Call – most recent year reported)

1.3.5 *Species’ Recovery Priority Number at start of this 5-year review:*  
8

1.3.6 **Current Recovery Plan or Outline**  
*Date issued:* June 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  
___ 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 [X]  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 [X]  No

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

Yes [X]  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.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Isodendrion longifolium* is a short-lived perennial that was listed as threatened. To be considered for delisting, a minimum of eight to ten populations 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.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

No new information.

2.3.1 Biology and Habitat

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

*Isodendrion longifolium* plants are generally shrubs 1 to 2 meters (3 to 6 feet) tall, but in Wainiha on Kauai, this woody violet has been seen as tall as 4 meters (13 feet) (Wood 2009a).

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:

Since 2003, seven populations containing 103 individuals were observed on Kauai and no individuals were observed on Oahu. However, as described below, before 2003, on Kauai an additional six populations contained at least 554 to 674 individuals, and on Oahu four populations contained 32 individuals.

When designating critical habitat in 2003, the U.S. Fish and Wildlife Service identified a total of 804 to 854 *Isodendrion longifolium* individuals on Kauai, in 15 populations on State and private lands in Limahuli Valley, Hanakapiai, Pohakea, Waioli Valley, the left branch of Kalalau Valley, Honopu Valley, Kawaiula Valley, and Haupu (USFWS 2003a).

On Kauai in Limahuli Valley, 100 mature individuals of *Isodendrion longifolium* were seen in 1979 at two different elevations, 503 and 610 meters (1,650 and 2,000 feet) (Hawaii Biodiversity and Mapping Program 2009). It was observed in 1987 at 488 to 628 meters (1,600 to 2,060 feet) elevation.
(National Tropical Botanical Garden 2010a), and in 1990, 20 or more individuals including seedlings were reported at “Pritchardia Gulch” west of Limahuli Falls at 579 meters (1,900 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). In 1991, 30 to 50 individuals were seen at 518 to 564 meters (1,700 to 1,850 feet) elevation above the falls. Five individuals were reported in 2002 from 503 meters (1,650 feet) elevation (Perlman 2009) and in 2005, 28 individuals were reported from Upper Limahuli at 518 meters (1,699 feet) elevation (National Tropical Botanical Garden 2010b).

In the Kalalau Valley on Kauai, 10 individuals were seen in 1989 at 488 meters (1,600 feet) elevation (Hawaii Biodiversity and Mapping Program 2009), 30 individuals in 1990, and 4 in 1992 at 457 to 512 meters (1,500 to 1,680 feet) elevation (Perlman 2009).

In Hanakapiai Valley on Kauai, 20 individuals were seen in 1989 on the east side of the falls plunge pools (National Tropical Botanical Garden 2010a). In 1990, 15 individuals were seen at 250 meters (820 feet) elevation at this same site (National Tropical Botanical Garden 2010a). In 1991, one individual was observed at Hanakapiai-Hoolulu Ridge at 610 meters (2,000 feet) elevation (Hawaii Biodiversity and Mapping Program 2009), and 20 individuals at 244 meters (800 feet) elevation at Hanakapiai Falls. In 1999, 10 to 100 individuals were recorded at Hanakapiai (National Tropical Botanical Garden 2010b). In 2001, 8 to 10 individuals were seen on the east side of Hanakapiai Falls, at 213 meters (700 feet) elevation (National Tropical Botanical Garden 2010b), and in 2009, 3 individuals were seen on a rock shelf by Hanakapiai Falls at 259 meters (850 feet) elevation (Perlman 2009).

In the Wahiawa Stream area on Kauai, in the Hanapepe drainage (Wainonoa Stream), 25 individuals of *Isodendrion longifolium* were seen at 518 to 603 meters (1,700 to 1,980 feet) elevation in 1980 (Hawaii Biodiversity and Mapping Program 2009). All other observations in this area were made in 1991. In the Wahiawa Mountains above Alexander Dam, two individuals were seen in that year west of Kanaele Bog on banks of the Wahiawa Stream at 570 meters (1,870 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). Also in 1991, 77 individuals were observed at 555 to 658 meters (1,820 to 2,160
feet) elevation, and 80 to 100 scattered individuals were seen northeast of Puu Auuka at 600 to 658 meters (1,969 to 2,158 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; Perlman 2009). In the Wahiawa Stream drainage, *Isodendrion longifolium* was also observed between Hulua and Puu Auuka at 630 to 730 meters (2,067 to 2,395 feet) elevation. Since 1991, no observations of *Isodendrion longifolium* were made in the Wahiawa Stream area; however, Ken Wood and Steve Perlman of the National Tropical Botanical Garden believe it may still be there as good habitat still exists, despite damage caused by the hurricane in 1992 (K. Wood, National Tropical Botanical Garden, pers. comm. 2009).

In Waioli Valley on Kauai, Steve Perlman of the National Tropical Botanical Garden saw occasional scattered individuals in 1991 (National Tropical Botanical Garden 2010a). David Lorence, also of the National Tropical Botanical Garden, saw 60 to 80 individuals in 1992 at 410 meters (1,345 feet) elevation (National Tropical Botanical Garden 2010a) and Ken Wood of National Tropical Botanical Garden saw it in the same year at 470 to 530 meters (1,542 to 1,739 feet) elevation. Thirty individuals were observed between 402 and 488 meters (1,320 and 1,600 feet) elevation in 1993 and 100 to 200 individuals between 396 and 579 meters (1,300 and 1,900 feet) elevation (National Tropical Botanical Garden 2010a). Six individuals were also observed in 1993 at 335 to 427 meters (1,100 to 1,400 feet) elevation (National Tropical Botanical Garden 2010a). No observation has been recorded in Waioli Valley since 1993.

On Mt. Haupu on Kauai, 30 individuals were seen at 580 to 680 meters (1,903 to 2,231 feet) elevation in 1992 (National Tropical Botanical Garden 2010a). One 4-meter (13-foot) high individual containing flowers and immature fruits was reported in 2001 at 610 meters (2,000 feet) elevation, on a slope below the summit (National Tropical Botanical Garden 2010a), and in 2005, 10 individuals were noted at the summit at 671 meters (2,200 feet) elevation (Wood 2009b).

In Kauai’s Iliiliula Valley in 1994, Perlman estimated there were 1,000 individuals at 585 meters (1,920 feet) elevation. In 2004, only ten individuals were seen in the back of the valley, on a northern slope below the dividing ridge and the flats of Iole
Valley at 610 meters (2,000 feet) elevation (National Tropical Botanical Garden 2010a, 2010b; Wood, 2009b).

On Mt. Kahili summit on Kauai, 100 individuals were seen in 1975 at 762 meters (2,500 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; Wood 2009b). In 1999, 25 to 50 individuals were seen from the top of the ridge trail from Kahili Mountain Park toward Kahili summit (National Tropical Botanical Garden 2010a). In 2004, observations were made at 536 meters (1,760 feet) elevation by Perlman and Natalia Tangalin (National Tropical Botanical Garden 2010b).

On Kauai at Nualolo in the Kuia Natural Area Reserve, Ken Wood saw 20 individuals at 1,131 meters (3,710 feet) elevation in 1993. In 1994 at Kaahole, *Isodendrion longifolium* was seen again below Nualolo Trail at 640 meters (2,100 feet) elevation (Wood 2009b). *Isodendrion longifolium* was collected in Mahanaloa, in the same general area, in 2009 from at least two individuals (National Tropical Botanical Garden 2010b).

In the Honopu Valley on Kauai, 20 individuals of *Isodendrion longifolium* were seen at 1,152 meters (3,780 feet) elevation in 1995 (Hawaii Biodiversity and Mapping Program 2009) and again in 1996 at 1,067 to 1,128 meters (3,500 to 3,700 feet) elevation. In 2001, 100 mature individuals, 20 juveniles, and 20 seedlings were recorded at 1,082 meters (3,550 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2010b; Wood 2009b), 30 mature individuals, 10 juveniles, and 20 seedlings at 1,058 meters (3,470 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; Wood 2009b), and 50 individuals at 1,100 meters (3,610 feet) elevation (National Tropical Botanical Garden 2010a; Wood 2009b).

Joel Lau observed nine *Isodendrion longifolium* individuals in Kawaiula Valley on Kauai in 1987 at 732 meters (2,400 feet) elevation. In 1996, *Isodendrion longifolium* was observed at 640 meters (2,100 feet) elevation. Three individuals were reported in 2000 at 640 meters (2,100 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; Wood 2009b).

In Kauai, in Pohakuao Valley in 2001, two mature individuals of *Isodendrion longifolium* were observed at 549 to 610 meters
(1,800 to 2,000 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; Wood 2009b).

In Wainiha on Kauai, 20 individuals of *Isodendrion longifolium* were seen in 2008, at 732 meters (2,400 feet) elevation (National Tropical Botanical Garden 2010a; Wood 2009b). In 2009, ten individuals were observed at 579 meters (1,900 feet) elevation and seven at 518 meters (1,700 feet) elevation. Extensive observations were made there in 2008 to 2009 at elevations from 472 to 732 meters (1,550 to 2,400 feet) by Ken Wood, and approximately 50 individuals were found (Wood 2009a).

When designating critical habitat in 2003, the U.S. Fish and Wildlife Service identified a total of 30 *Isodendrion longifolium* individuals on Oahu, in seven populations on Federal, State, and private lands in Palikea Gulch, Kaawa Gulch, Makaua Gulch, and Kaukonahua Stream (USFWS 2003b).

In Oahu’s Waianae Mountains in the Mt. Kaala Natural Area Reserve at Palikea Gulch, ten individuals were seen in 1986 from 640 to 701 meters (2,100 to 2,300 feet) elevation and at Puu Pane eight individuals were identified in 1987 (National Tropical Botanical Garden 2010a). In West Makaleha Gulch, in the Mokuleia Forest Reserve, 10 to 15 individuals were observed in 1987 at 610 meters (2,000 feet) elevation (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2010a). In 1998, three individuals were seen there (National Tropical Botanical Garden 2010a), but these had been killed by feral goats (*Capra hircus*) in 1999 (Hawaii Biodiversity and Mapping Program 2009).

In Oahu’s Koolau Mountains a few individuals of *Isodendrion longifolium* were seen in Makaua Gulch (Hidden Valley), located above Kaawa, in 1987, growing in shade on the left side of the stream bank in the back of the valley (National Tropical Botanical Garden 2010a). At Kaawa Gulch, in 2002, Joel Lau saw 15 mature, one juvenile, and five dead individuals at 640 to 671 meters (2,100 to 2,200 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). At Schofield Barracks, on Kaukonahua Stream’s south fork two individuals were seen in 1993 at 497 to 500 meters (1,630 to 1,640 feet) elevation, but were gone by 1999. A few individuals were seen in 1994 at 457 meters (1,500 feet) elevation (Hawaii Biodiversity and Mapping
Program 2009). In the same year, five mature and three juvenile individuals of *Isodendrion longifolium* were seen at Kaukonahua Stream at 539 meters (1,770 feet) elevation (Hawaii Biodiversity and Mapping Program 2009).

Since 2003, seven populations containing a total of at least 103 individuals have been observed on Kauai; an additional six populations containing between 554 to 674 individuals may exist, but the status of these populations are unknown as they were last observed in 1991, 1992, 1993, 2000, or 2001. Similarly, no individuals of *Isodendrion longifolium* have been observed on Oahu since 2003, however, an additional four populations containing 32 individuals may exist, but the status of these populations are unknown as they were last observed in 1987, 1999, or 2002. The total census for *I. longifolium* statewide is seven populations containing at least 103 individuals.

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:

No new information.

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.

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

The habitat in Limahuli Valley on Kauai is closed *Metrosideros polymorpha* (ohia) – *Diospyros sandwicensis* (lama) lowland mesic forest with associated native species including *Antidesma*
**platyphyllum** (hame), **Bidens forbesii** (kookoolau), **Bobea sp.** (ahakea), **Boehmeria grandis** (akolea), **Cibotium sp.** (hapuu), **Cyanea coriacea** (haha), **Eugenia sp.** (nioi), **Freylinetta arborea** (ie ie), **Gardenia remyi** (nanu), **Hibiscus waimeae** subsp. **hannerae** (kokio ula), **Ilex anomala** (kawau), **Kadua affinis** (manono), **Machaerina angustifolia** (uki), **Perrottetia sandwicensis** (olomea), **Pipturus albidus** (mamake), **Pisonia sp.** (papala), **Pittosporum kauaiense** (hoawa), **Pritchardia sp.** (loulu), **Rauvolfia sandwicensis** (hao), and **Syzygium sandwicensis** (ohia ha), with numerous fern species (Hawaii Biodiversity and Mapping Program, 2009; Perlman 2009; Wood 2009b).

In Upper Limahuli on Kauai, the habitat is **Dicranopteris linearis** (uluhe) – **Clidemia hirta** (Koster’s curse) vegetation on stream banks with **Metrosideros polymorpha** – **Dicranopteris linearis** wet forest in gulch bottoms with **Antidesma sp.** (hame), **Bidens sp.**, **Bobea sp.**, **Cibotium sp.**, **Gardenia remyi**, **Hibiscus waimeae** subsp. **hannerae**, **Pisonia sp.**, **Pritchardia limahuliensis** (loulu), and **Psychotria mariniana** (kopiko) (National Tropical Botanical Garden 2010b).

The habitat in Hanakapiai on Kauai is lowland mesic forest **Metrosideros polymorpha** wet shrubland and **Metrosideros polymorpha** – **Dicranopteris linearis** wet forest in gulch bottoms with **Aleurites moluccana** (kukui), **Antidesma sp.**, **Athyrium microphyllum** (akolea), **Bidens sp.**, **Bobea sp.**, **Boehmeria grandis**, **Charpentiera densiflora** (olapa), **Christella cyatheoides** (kikawaio), **Cibotium sp.**, **Christella cyatheoides** (kikawaio), **Cyrtandra sp.** (haiwale), **Diospyros sp.**, **Gardenia remyi**, **Hibiscus waimeae** subsp. **hannerae**, **Isachne pallens** (no common name [NCN]), **Kadua fluviatilis** (kamapuaa), **Machaerina sp.**, **Melicope sp.** (alani), **Peperomia sp.** (ala ala wai nui), **Piper methysticum** (awa), **Pipturus albidus**, **Pisonia sp.**, **Pleomele sp.** (hala pepe), **Pritchardia limahuliensis**, **Psydrax odorata** (alahee), **Psychotria mariniana**, **Selaginella sp.** (lepelepe a moa), **Streblus pendulinus** (aiai), and **Wikstroemia oahuensis** (akia) (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2010b; Perlman 2009; Wood 2009b).

In Kalalau, the habitat is diverse mesic forest with **Alectryon macrococcus** (mahoe), **Aleurites moluccana**, **Charpentiera densiflora**, **Cyanea hardyi** (haha), **Diospyros sandwicensis**,
Freycinetia arborea, Hibiscus kokio ssp. saintjohnianus, Kadua sp., Myrsine petiolata (kolea), Pipturus albidus, Pouteria sandwicensis (alaa), Psychotria mariniana, Pteralyxia kauaiensis (kaulu), Rauvolfia sandwicensis, and Syzygium sandwicensis (Perlman 2009).

Pohakuao on Kauai has relict diverse mesic forest habitat dominated by Aleurites moluccana (kukui) and with associated species including Alectryon macrococcus, Antidesma platyphyllum, Bidens sandwicensis subsp. sandwicensis (kookoolau), Boehmeria grandis, Chamaesyce celastroides var. hanaepensis (akoko), Charpentiera densiflora, Diospyros sandwicensis, Flueggea neowawraea (mehamehame), Freycinetia arborea, Hibiscus kokio subsp. saintjohnianus, Kokia kauaiensis (kokio), Lipochaeta connata var. acris (nehe), Metrosideros polymorpha var. glaberrima, Musa x paradisiaca (maia), Myrsine lanaiensis (kolea), Myrsine lessertiana (kolea lau nui), Myrsine petiolata (kolea), Nesoloma polynesicum (keahi), Nototrichium sandwicense (kului), Pipturus albidus, Pleomele aurea, Pleomele sandwicensis, Pouteria sandwicensis, Pritchardia napaliensis (loulu), Psychotria mariniana, Psydrax odoratum, Pteralyxia kauaiensis, Rauvolfia sandwicensis, Santalum freycinetianum var. pyrularium (iliahi), Syzygium sandwicensis, Wilkesia gymnoxiphium, and Zanthoxylum dipetalum (kawau kua) (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2010a; Perlman 2009).

In the Wahiawa drainage on Kauai, between Hulua and Puu Auuka, the habitat is closed Metrosideros polymorpha – Dicranopteris linearis lowland mesic to wet forest with Athyrium microphyllum (akolea), Boheia sp., Cheirodendron sp., Diospyros sp., Freycinetia arborea, Kadua sp., Labordia spp. (kamakahala), Pleomele sp., Pouteria sp., Psychotria sp., and Syzygium sp. (National Tropical Botanical Garden 2010a; Wood 2009b).

In Kawaiula on Kauai, the habitat is Acacia koa – Metrosideros polymorpha lowland mesic forest with associated native species including Alphitonia ponderosa (kauila), Antidesma platyphyllum, Athyrium sp., Bobea brevipes, Bonamia menziesii (NCN), Carex meyenii (NCN), Charpentiera elliptica (papala), Cheirodendron trigynum (olapa), Dodonaea viscosa, Diospyros
sandwicensis, Diplazium sandwichtianum (hoio), Elaeocarpus
bifidus (kalia), Euphorbia haeleleleana (NCN), Freycinetia
arborea, Kadua affinis, K. knudsenii (NCN), Leptecophylla
tameameiae (pukiawe), Lysimachia kalalauensis (NCN),
Nestegis sandwicensis (olopua), Peperomia cookiana (ala ala
wai nui), P. kokeana (ala ala wai nui), Pipturus kauaiensis
(mamake), Pleomele aurea (hala pepe), Polypodium pellucidum
var. acuminatum (ae lau nui), Smilax melastomifolia (pi oi),
Syzygium sandwicensis, Tetraplasandra kavaiensis (ohe ohe),
and Wilkesia gymnoxiphium (Hawaii Biodiversity and Mapping
Program 2009; Wood 2009b).

In Honopu on Kauai the habitat is Acacia koa – Metrosideros
polymorpha – Dicranopteris montane mesic forest with
Alphitonia ponderosa, Bobea brevipes, Cheirodendron fauriei
(olapa), Claoxylon sandwicensis (laukea), Coprosma kauensis
(koi), Cyrtandra kauaiensis (haiwale), Dianella sandwicensis
(uki uki), Diplazium sp., Dodonaea viscosa, Doodia sp.
(okupukupu), Hillebrandia sandwicensis (aka aka awa), Ilex
anomala, Kadua affinis, Labordia degeneri (kamakahala),
Lysimachia kalalauensis (NCN), Melicope anisata (mokihana),
M. barbigera (uaialele), Microlepia strigosa (palapalai),
Myrsine lessertiana, Perrottetia sp., Platycladus spathulata (pilo
kea), Pleomele aurea, Pouteria sandwicensis, Psychotria
greenwelliae (kopiko), P. hexandra (kopiko), P. mariniana,
Ranunculus mawiensis (makou), Tetraplasandra sp., Xylosma
crenatum (NCN), Xylosma hawaiiense (maua), and Zanthoxylum
dipetala (Hawaii Biodiversity and Mapping Program 2009;
National Tropical Botanical Garden 2010b; Wood 2009b).

Mount Kahili on Kauai has Metrosideros – Dicranopteris
linearis wet forest habitat with Alyxia stellata (maile),
Antidesma platyphylla, Bidens forbesii, Boehmeria grandis,
Broussaisia arguta (kanawao), Cheirodendron trigynum,
Coprosma sp. (pilo), Cyanea coriacea, Cyanea remyi, Cyanea
sylvestris, Diospyros sandwicensis, Dubautia knudsenii
(naenae), Elaphoglossum crassifolium (hoe a Maui), Freycinetia
arborea (ie ie), Gardenia remyi, Ilex anomala, Kadua affinis,
Machaerina sp., Pipturus albidus, Pittosporum kauaiense,
Pritchardia flynnii, Psychotria mariniana, Rauvolfia
sandwicensis, Scaevola procera (naupaka kuahiwi), Syzygium
sandwicensis, and Tetraplasandra sp. (Perlman 2009).

In Iliiliula Valley on Kauai, on the northern slope below the dividing ridge and flats of Iole Valley, the habitat is *Metrosideros polymorpha – Dicranopteris linearis* wet forest with *Antidesma platyphyllum, Bidens forbesii, Boehmeria grandis, Broussaia arguta, Carex wahuensis* (NCN), *Cheirodendron trigynum, Cyanea coriacea, Cyanea spp., Cyrtandra paludosa* (moa), *Diospyros sandwicensis, Diplazium sp., Dubautia knudsenii, Freycinetia arborea, Gardenia remyi, Ilex anomala, Kadua affinis, Labordia sp. (kamakahala), *Melicope clusiifolia* (kukaemoa), *M. wawraeana* (alani), *Perrotettia sp., Pipturus albidus, Pisonia sp., Pittosporum kauaiense* (hoawa lau nui), *Pritchardia sp., Psychotria mariniana, P. wawrae* (kopiko), *Rauvolfia sandwicensis, Sadleria cyatheoides, Sphenomeris chinensis, Syzygium sandwicensis*, and *Tetraplasandra* sp. (National Tropical Botanical Garden 2010a; Wood 2009b).
In Nualolo on Kauai in the Kuia Natural Area Reserve the habitat is *Metrosideros polymorpha – Dicranopteris linearis* montane mesic forest in a drainage below relic *Acacia koa – Metrosideros polymorpha* lowland mesic forest with *Antidesma* sp., *Claxoylon* sp., *Diospyros sandwicensis*, *Dodonaea viscosa*, *Dubautia* sp., *Elaeocarpus* sp., *Eragrostis grandis*, *Labordia hirtella* (kamakahala), *Melicope* sp., *Pittosporum glabrum*, *Pleomele* sp., *Psychotria* sp., *Scaevola* sp., *Xylosma* sp., and *Zanthoxylum* sp. (Wood 2009b).


In the Waianae Mountains on Oahu *Isodendrion longifolium* grows in mesic or lowland wet *Metrosideros polymorpha – Acacia koa – Dicranopteris linearis* forest with *Alectryon macrococcus*, *Alyxia stellata*, *Antidesma platyphyllum*, *Bobea brevipes* (ahakea lau lii), *B. elatior*, *Broussaisia arguta*, *Carex* sp., *Charpentiera* sp., *Cibotium* sp., *Clermontia persicifolia* (oha
wai), Coprosma foliosa (pilo), Cyanea angustifolia (haha), Cyrtandra sp., Diospyros sandwicensis, Diplazium sandwicchianum, Dodonaea viscosa, Doodia kunthiana, Eugenia reinwardtiana (nii), Flueggea neowawraea, Hibiscus arnottianus subsp. arnottianus (koking keokeo), Ilex anomala, Isachne pallens (NCN), Kadua affinis, Labordia tinifolia (kamakahala), Leptecophylla tameiameiae, Melicope peduncularis (alani), Morinda trimera (noni kuahiwi), Myrsine lessertiana, Neraudia melastomifolia, Nestegis sp., Ochrosia sp. (holei), Peperomia sp., Perrottetia sandwicensis, Pittosporum sp., Pouteria sandwicensis, Psychotria sp., P. hathewayi (kopiko), Psydrax odorata, Pteralyxia macrocarpa (kaulu), Rauvolvia sandwicensis, Scaevola sp., Selaginella arbuscula, Syzygium sandwicensis, and Wikstroemia oahuensis (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2010a, 2010b; Perlman 2009; USFWS 2003).

In the Koolau Mountains on Oahu, Isodendrion longifolium grows on wet Metrosideros polymorpha – Dicranopteris linearis lowland forest stream banks in dark shade with native species Acacia koa, Cordyline fruticosa (ti), Charpentiera tomentosa (papala), Coprosma foliosa, Cyanea acuminata (haha), C. crispa (haha), Cyrtandra hawaiiensis (haiwale), C. propinqua (haiwale), Dodonaea viscosa, Isachne pallens, Leptecophylla tameiameiae, Myrsine lessertiana, Nothocestrum longifolium (aiea), Ochrosia compta (holei), Selaginella arbuscula, Christella parasitica (NCN), Touchardia latifolia (olona), and Urera glabra (opuhe) under heavy canopy of the invasive species Clidemia hirta (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2010a; Perlman 2009).

2.3.1.7 Other:

No new information.

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

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

On Kauai the threats to Isodendrion longifolium are habitat

On Oahu, the major threats to *Isodendrion longifolium* are habitat degradation or destruction by feral goats and pigs and invasive introduced plant species including *Ageratina riparia*, *Clidemia hirta*, *Oplismenus hirtellus*, *Paspalum conjugatum*, *Psidium cattleianum*, and *Christella parasitica* (USFWS 2003b).

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

Not a threat.

2.3.2.3 Disease or predation:

Goats, pigs, and rats (*Rattus* spp.) eat the fruit, and slugs (unidentified species) presumably also eat the foliage of
Isodendrion longifolium (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2010b; Wood 2009b).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Not a threat.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Fire is considered a threat to Isodendrion longifolium on Kauai (Hawaii Biodiversity and Mapping Program 2009; Perlman 2009; Wood 2009b). On Oahu, the Palikea Gulch occurrence is also potentially threatened by fire (USFWS 2003b). On Oahu, there is also the risk of extinction from naturally occurring events due to the small number of occurrences and individuals (USFWS 2003b).

Threats from introduced invasive plant species previously described in Section 2.3.2.1, in addition to degrading habitat, directly compete with Isodendrion longifolium for water, light, and nutrients.

Climate change may also pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

The National Tropical Botanical Garden has received funding to construct a 400 hectares (1,000 acres) fence which is currently in progress. The National Tropical Botanical Garden on Kauai is also controlling invasive plants and reintroducing rare and endangered plants in the area (National Tropical Botanical Garden 2006, 2008). This site will benefit towards the recovery of Isodendrion longifolium.

There are four seeds collected from the Iiiliula population in storage at the National Tropical Botanical Garden (National Tropical Botanical Garden 2009). The Pahole Rare Plant
Facility reported having six rooted cuttings of *Isodendrion longifolium* from one wild individual (Pahole Rare Plant Facility 2009). The Center for Conservation Research and Training Seed Storage Laboratory (2010) on Oahu has 32 seeds in long-term storage.

### 2.4  Synthesis

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the 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. *Isodendrion longifolium* is a short-lived perennial that was listed as threatened, and to be considered for delisting, which is the first step in recovering the species, a minimum of 8 to 10 populations should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing, stable and 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.

The delisting goals for this species have not been met. Although there are seven reported populations since 2003 and an additional six known historical populations may still be extant, no current or historic populations have ever been reported to contain 300 mature individuals (Table 1), and all threats are not being managed (Table 2). Therefore, *Isodendrion longifolium* meets the definition of threatened as it remains likely to become endangered in the foreseeable future throughout all or a significant portion of its range.
Table 1. Status of *Isodendron longifolium* from listing through 5-year review.

<table>
<thead>
<tr>
<th>Date</th>
<th>No. wild indivs</th>
<th>No. outplanted</th>
<th>Delisting Criteria identified in Recovery Plan</th>
<th>Delisting Criteria Completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996 (listing)</td>
<td>&lt;1,000</td>
<td>0</td>
<td>All threats managed in all 8-10 populations</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Naturally reproducing, stable or increasing in number</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-10 populations with 300 mature individuals each</td>
<td>No</td>
</tr>
<tr>
<td>1999 (recovery plan)</td>
<td>&lt;1,000</td>
<td>0</td>
<td>All threats managed in all 8-10 populations</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Naturally reproducing, stable or increasing in number</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-10 populations with 300 mature individuals each</td>
<td>No</td>
</tr>
<tr>
<td>2003 (critical habitat)</td>
<td>834-884</td>
<td>0</td>
<td>All threats managed in all 8-10 populations</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Naturally reproducing, stable or increasing in number</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-10 populations with 300 mature individuals each</td>
<td>No</td>
</tr>
<tr>
<td>2010 (5-year review)</td>
<td>103</td>
<td>0</td>
<td>All threats managed in all 8-10 populations</td>
<td>Partially (Table 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Naturally reproducing, stable or increasing in number</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-10 populations with 300 mature individuals each</td>
<td>No: none of the 7 populations has 300 mature</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>individuals</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Threats to *Isodendrion longifolium*.

<table>
<thead>
<tr>
<th>Threat</th>
<th>Listing factor</th>
<th>Current Status</th>
<th>Conservation/ Management Efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ungulates – habitat modification and herbivory</td>
<td>A, C, D</td>
<td>Ongoing</td>
<td>Partially: one population in Limahuli is fenced</td>
</tr>
<tr>
<td>Rats – herbivory</td>
<td>C</td>
<td>Ongoing</td>
<td>No</td>
</tr>
<tr>
<td>Slugs – herbivory</td>
<td>C</td>
<td>Ongoing</td>
<td>No</td>
</tr>
<tr>
<td>Fire</td>
<td>E</td>
<td>Ongoing</td>
<td>No</td>
</tr>
<tr>
<td>Small population size on Oahu</td>
<td>E</td>
<td>Ongoing</td>
<td>Partially: seeds collected and propagules growing in nursery</td>
</tr>
<tr>
<td>Invasive introduced plants</td>
<td>A, E</td>
<td>Ongoing</td>
<td>Partially: weed control in Limahuli</td>
</tr>
<tr>
<td>Climate change</td>
<td>A, E</td>
<td>Increasing</td>
<td>No</td>
</tr>
</tbody>
</table>

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

- Construct large-scale fences around all naturally occurring and reintroduced individuals to control feral ungulates.
- Control invasive introduced plant species around known populations.
- Collect material for genetic storage and propagation for reintroduction.
- Coordinate fire protection on State Natural Area Reserves, such as Mt. Kaala, where one of three Oahu populations occurs.
- Control rats in the vicinity of these populations.
- Develop and implement methods to control slugs.
- Assess the current status of historic populations, reproductive trends, and threats to the species to determine if downlisting is warranted.
- 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.
- Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

5.0 REFERENCES


**Personal Communications:**

Pre-1996 DPS listing still considered a listable entity? N/A

Recommendation resulting from the 5-year review:

- Delisting
- Reclassify from Endangered to Threatened status
- Reclassify from Threatened to Endangered status
- X No Change in listing status

Appropriate Listing/Reclassification Priority Number, if applicable:

Review Conducted By:
Chelsie Javar, Fish and Wildlife Biologist
Marie Bruegmann, Plant Recovery Coordinator
Jess Newton, Recovery Program Lead
Assistant Field Supervisor for Endangered Species

Field Supervisor, Pacific Islands Fish and Wildlife Office

Date