

Myrsine linearifolia
(kolea)

**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: *Myrsine linearifolia* (kolea)

TABLE OF CONTENTS

1.0	GENERAL INFORMATION	1
1.1	Reviewers.....	1
1.2	Methodology used to complete the review:.....	1
1.3	Background:.....	1
2.0	REVIEW ANALYSIS	3
2.1	Application of the 1996 Distinct Population Segment (DPS) policy.....	3
2.2	Recovery Criteria.....	3
2.3	Updated Information and Current Species Status	5
2.4	Synthesis.....	6
3.0	RESULTS	12
3.3	Recommended Classification:.....	12
3.2	New Recovery Priority Number:.....	12
3.3	Listing and Reclassification Priority Number:	12
4.0	RECOMMENDATIONS FOR FUTURE ACTIONS	12
5.0	REFERENCES	13
	Signature Page.....	15

5-YEAR REVIEW
***Myrsine linearifolia* / kolea**

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 April 29, 2008. The review was based on the final critical habitat designation for *Myrsine linearifolia* and other species from the island of Kauai (USFWS 2003), 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.

1.3 Background:

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

USFWS. 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.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1996. Endangered and threatened wildlife and plants; determination of endangered or threatened status for 19 plants from the island of Kauai, Hawaii; final rule. Federal Register 61(198):53070-53089.

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:

USFWS. 2003. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, Hawaii; final rule. Federal Register 68(39):9116-9479.

Critical habitat was designated for *Myrsine linearifolia* in 6 units totaling 1,952 hectares (4,824 acres) on the island of Kauai (USFWS 2003). These designations includes habitat on State and private lands (USFWS 2003).

1.3.4 Review History:

Species status review [FY 2009 Recovery Data Call (August 2009)]:

Declining

Recovery achieved:

1 (0-25%) (FY 2007 Recovery Data Call – this was the last year this was reported)

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

2

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Kauai II: Addendum to the recovery plan for the Kauai plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 140 pages.

Date issued: August 23, 1998.

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

Yes
 No

2.1.2 Is the species under review listed as a DPS?

Yes
 No

2.1.3 Was the DPS listed prior to 1996?

Yes
 No

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

Yes
 No

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

Yes
 No

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

Yes
 No

2.2 Recovery Criteria

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

Yes
 No

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

Yes
 No

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery 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, C, D, and E) affecting this species is presented in section 2.4. Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the addendum to the recovery plan for the Kauai plant cluster (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Myrsine linearifolia* is a long-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced, weeding, etc.) and be represented in an *ex situ* (at other than its original site, *e.g.*, a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Myrsine linearifolia* 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 100 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Myrsine linearifolia* 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 100 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section 1.3.3 ("Associated Rulemakings") and in section 2.4 ("Synthesis") below, which also includes any new information about the status and threats of the species.

Table 1. Status of *Myrsine linearifolia* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (listing)	1000-1500	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Yes
1998 (recovery plan)	1000-1500	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Yes
2003 (critical habitat)	490-564	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Yes
2008 (5-year review)	164-197	17	All threats managed	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	Partially

2.3.1 Biology and Habitat

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

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

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

2.3.1.4 Taxonomic classification or changes in nomenclature:

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

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

2.3.1.7 Other:

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

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

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

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

Myrsine linearifolia is a tree, and one of 14 species of the genus *Myrsine* known on Kauai. It is also one of the 10 *Myrsine* species which are single-island endemics (Wagner 1999; Wood 2000; Wood 2008).

Historically, *Myrsine linearifolia* was known from 11 scattered locations on Kauai: Kaala (last seen in 1917), Olokele Valley (last seen in 1912), Kalualea (last seen in 1939), Kalalau Valley and Kahuamaa Flat, Limahuli-Hanakapiai Ridge, Koaie Stream, Pohakua, the Namolokama summit plateau, Haupu (last seen in 1992), Lihue-Koloa Forest Reserve, along a ridge east-southeast of Puu Kolo to the summit (last seen in

1987), and Kokee State Park along Highway 550 near mile marker 19 (Hawaii Biodiversity and Mapping Program 2008; National Tropical Botanical Garden 2008a). In 1995, six populations were noted: Kalalau Valley including Kahuamaa Flat above Kalalau, Limahuli-Hanakapiai Ridge, Wahiawa Drainage, Koaie Stream, Pohakuao, back of Iiiliula Valley below Kawaikini, and the Namolokama summit plateau (Hawaii Biodiversity and Mapping Program 2008; National Tropical Botanical Garden 2008a; USFWS 1995).

Forty-seven individuals of *Myrsine linearifolia* were observed in Wahiawa Drainage along water courses in 1991 at 630 to 800 meters (2,067 to 2,625 feet) elevation (Lorence and Flynn 1991). Observations were made in the same area from 1991 to 1995 at 689 to 719 meters (2,260 to 2,360 feet) elevation of as many as 22 individuals (Perlman 2008). In 2000, 50 mature individuals were seen there on a major ridge southwest of Kapalaoa at 732 to 884 meters (2,402 to 2,900 feet) elevation (National Tropical Botanical Garden 2008a, b). In 2002, individuals were noted near Kapalaoa Summit, in an east-facing subgulch off the ridge crest between Hanapepe Valley and the Wahiawa drainage. In 2006, five individuals were seen in the upper Wahiawa drainage (National Tropical Botanical Garden 2008a). Approximately 50 individuals are believed to remain in this area (Wood 2009).

In 1995, when the species was listed, there were estimated to be hundreds of individuals in Kalalau Valley (USFWS 1995). In 2000, 30 individuals were reported in the back of Kalalau Valley below Pihea, on the descent into the valley at 607 to 1,036 meters (1,991 to 3,399 feet) elevation (National Tropical Botanical Garden 2008a, b). In 2004, an observation was recorded from the very back of lower Kalalau Valley, on forested slopes below and east of Pihea (National Tropical Botanical Garden 2008a). In 2007, a single mature individual was recorded in Kalalau Valley, on the northern side, east of Keanapuka Falls (National Tropical Botanical Garden 2008a). In 2000, about 100 individuals were noted near Puu-o-Kila, on Kahuamaa Flat, about 18 meters (60 feet) north of the road at 1,173 meters (3,848 feet) elevation (National Tropical Botanical Garden 2008b). In 2001, 30 individuals were reported between the two Kalalau lookouts at 1,219 meters (3,999 feet) elevation. In 2003, about 20 individuals were noted between the lookouts. In 2004, one individual was observed on the north face just below the valley rim, between the first and second Kalalau lookouts (National Tropical Botanical Garden 2008a). At Alealau, on the east side of Kalalau Valley over Pohakuao, on Kaalahina Ridge, two groups of plants totaling 18 individuals were seen between 945 and 1,180 meters (3,100 and 3,871 feet) elevation in 1993 (Hawaii Biodiversity and Mapping Program 2008; Perlman 2008). These three occurrences included in the Kalalau population are estimated to total about 70 to 80 individuals (Wood 2009).

In 1996, Ken Wood of the National Tropical Botanical Garden saw 20 mature individuals in upper Limahuli Valley between Pali Eleele and Hono O Na Pali. From 1991 to 2001, Steve Perlman of National Tropical Botanical Garden saw various individuals at 597 to 823 meters (1,960 to 2,700 feet) elevation (Perlman 2008). In 2006, he saw only 1 mature individual there and 2 individuals on the Hanakapiai side of upper Limahuli's

southwestern headwaters (National Tropical Botanical Garden 2008a). Currently these areas have an estimated 20 to 25 individuals in the general region (Wood 2009).

Ten individual trees of *Myrsine linearifolia* were seen in Koaie Canyon in 1994 (Perlman 2008), and in 2006 several individuals were noted in Koaie Canyon (National Tropical Botanical Garden 2008a). There are estimated to be between 7 and 10 individuals in this area (Wood 2009).

Ten individuals were seen on Mt. Kahili in 1992 (Perlman 2008). In 1999, two individuals, with considerable dieback, were seen on the ridge trail from the water tank at Kahili Mountain Park, and in 2005 one individual *Myrsine linearifolia* was seen again at Mt. Kahili near the tower, on the right side of the ridge (National Tropical Botanical Garden 2008b). Between 8 and 10 individuals are currently estimated in this area (Wood 2009).

One individual was sighted with binoculars from a distance, on a ridge in Honopu Valley in November 2008 (N. Tangalin, National Tropical Botanical Garden, pers. comm. 2008).

Anther *Myrsine linearifolia* population in upper Hanakoa Valley, below Pihea, had one individual in 1995 at 988 meters (3,240 feet) elevation on a stream bank (Perlman 2008). Upper Hanakoa is now estimated to have between one and five individuals (Wood 2009).

At the Lihue and Kawaihau Districts boundary, below Blue Hole in the headwaters of the Wailua River, just north of Mt. Kawaikini, and southeast of Mt. Waialeale, a single individual was seen in 1992. It is estimated that between one and five individuals still exist here (National Tropical Botanical Garden 2008a; Wood 2009).

Scattered individuals were noted in the back of Iiiliu Valley below Kawaikini in 1994 (National Tropical Botanical Garden 2008a; Perlman 2008). Currently this area is estimated to have between five and ten individuals (Wood 2009).

On Mt. Haupu at 580 to 680 meters (1,903 to 2,231 feet) elevation, one individual was seen in 1992 (National Tropical Botanical Garden 2008a), and this number is thought to be current (Wood 2009).

Currently there are estimated to be between 164 and 197 individuals on Kauai in 12 populations (Wood 2009).

Myrsine linearifolia grows in the Wahiawa Mountains, near Kapalaoa summit, south of a peak off the ridge between Hanapepe valley and Wahiawa drainage, in an east-facing subgulch off the ridge crest in *Metrosideros polymorpha* (ohia) - *Dicranopteris linearis* (uluhe) low wet forest with wind swept ridge and riparian vegetation, including *Antidesma platyphyllum* (hame), *Bobea* sp. (ahakea), *Broussaisia arguta* (kanawao), *Chamaesyce remyi* (akoko), *Cheirodendron fauriei* (olapa), *C. platyphyllum* (olapa), *Cyanea fissa* (haha), *C. sylvestris* (haha), *Cyrtandra pickeringii* (haiwale), *Dubautia laxa* (naenae pua melemele), *Embelia pacifica* (kilioe), *Freycinetia arborea* (ie ie), *Gahnia*

beecheyi (no common name [NCN]), *Kadua affinis* (manono), *Lobelia kauaiensis* (pue), *Machaerina angustifolia* (uki), *Melicope feddei* (alani), *M. waialealae* (alani wai), *Perrottetia sandwicensis* (olomea), *Pritchardia* sp. (loulu), *Psychotria hexandra* (kopiko), *P. mariniana* (kopiko), *P. wawrae* (kopiko), *Sphenomeris chinensis* (palaa), and *Syzygium sandwicensis* (ohia ha). Matting ferns include *Dicranopteris linearis* and *Diplopterygium pinnatum* (uluhe lau nui), along with scattered tree ferns *Sadleria pallida* (amau ii) and *Cibotium nealiae* (hapuu) (National Tropical Botanical Garden 2008a, b).

On Kahili, *Myrsine linearifolia* grows in degraded mixed mesophytic forest with *Metrosideros polymorpha*, *Dicranopteris linearis*, *Myrsine* spp. (kolea), *Sadleria pallida*, and *Bidens* spp. (kookoolau) (National Tropical Botanical Garden 2008a).

On the Hanakapiai side of Limahuli, in the upper headwaters of the preserve, *Myrsine linearifolia* occurs in *Metrosideros polymorpha* open forest with *Broussaisia arguta*, *Kadua affinis*, *Psychotria mariniana*, *Melicope clusiifolia* (kukaemoa), *M. wawraeana* (alani), *M. feddei*, *Scaevola procera* (naupaka kuahiwi), *Syzygium sandwicensis*, and matting ferns *Diplopterygium pinnatum*, and *Dicranopteris linearis* (National Tropical Botanical Garden 2008a).

In the back of lower Kalalau Valley below and east of Pihea on forested slopes, *Myrsine linearifolia* grows in a habitat of *Metrosideros polymorpha* - *Cheirodendron* sp. montane wet forest with ground covering ferns of *Dicranopteris linearis* and *Sticherus owhyhensis* (unuhe) and patches of windswept shrubland. Associated species include *Broussaisia arguta*, *Carex meyenii* (NCN), *Chamaesyce remyi*, *Diospyros sandwicensis* (lama), *Diplazium sandwichianum* (hoio), *Eurya sandwicensis* (anini), *Freycinetia arborea*, *Gunnera* sp. (apa ape), *Melicope peduncularis* (alani), *Psychotria greenwelliae* (kopiko), *P. mariniana*, *Pipturus kauaiensis* (mamake), *Santalum freycinetianum* var. *pyrularium* (iliau), *Syzygium sandwicensis*, and *Touchardia latifolia* (olona) (National Tropical Botanical Garden 2008a).

Around the rim of Kalalau Valley near Puu o Kila, *Myrsine linearifolia* grows between the two lookouts in *Metrosideros polymorpha* - *Dicranopteris linearis* wet forest with *Alyxia stellata* (maile), *Bobea* sp., *Cheirodendron* sp., *Coprosma* sp., *Cryptocarya mannii* (holio), *Dodonaea viscosa* (aalii), *Dubautia laevigata* (naenae), *D. microcephala* (naenae), *Elaeocarpus bifidus* (kalia), *Ilex anomala* (kawau), *Melicope clusiifolia*, *M. puberula* (alani), *Myrsine* spp. (kolea), *Pleomele aurea* (hala pepe), *Psychotria greenwelliae*, *Sadleria pallida*, *Scaevola procera*, *Syzygium sandwicense*, and *Tetraplasandra* sp. (ohe) (National Tropical Botanical Garden 2008a).

In Kalalau Valley on the northern face between the first and second Kalalau lookout, north of the fenced Hawaii Division of Forestry and Wildlife plant sanctuary, *Myrsine linearifolia* grows in *Metrosideros polymorpha* montane mesic forest with *Carex meyenii*, *Diplazium sandwichianum*, *Exocarpos luteolus* (heau), *Pouteria sandwicensis* (alaa), *Pritchardia minor* (loulu), *Psychotria greenwelliae*, *Xylosma hawaiiense* (maua), and *Zanthoxylum dipetalum* (kawau) (National Tropical Botanical Garden 2008a).

Above Hanakoa, it occurs on the north side of the drainage and east of Keanapuka Falls on a *Dicranopteris linearis* – *Diplopterygium pinnatum* matting fern ridge with occasional *Santalum freycinetianum* (iliahi), and associated species including *Bobea elatior* (ahakea lau nui), *Coprosma waimeae* (olena), *Dodonaea viscosa*, *Dianella sandwicensis* (uki uki), *Ilex anomala*, *Kadua affinis*, *Metrosideros polymorpha*, *Pouteria sandwicensis*, *Pteridium aquilinum* var. *decompositum* kilau), *Psychotria mariniana*, *Scaevola procera*, *Syzygium sandwicensis*, and *Xylosma hawaiiense*, with a rich fern understory of *Cibotium nealiae*, *Nephrolepis exaltata* var. *hawaiiense* (nianiau), *Diplazium sandwicense*, *Sphenomeris chinensis* (palaa), and *Doodia kunthiana* (okupukupu) (National Tropical Botanical Garden 2008a).

Myrsine linearifolia grows in Koaie Canyon's upper drainage in closed to open *Metrosideros polymorpha* – *Diospyros sandwicensis* mixed mesic forest with riparian vegetation, with associated species including *Alphitonia ponderosa* (kauila), *Antidesma platyphylla*, *Artemisia australis* (hinahina), *Cheirodendron fauriei*, *Cryptocarya mannii*, *Dodonaea viscosa*, *Pouteria sandwicensis*, *Pleomele aurea*, *Pritchardia minor*, *Ilex anomala*, *Melicope anisata* (mokihana), *M. clusiifolia*, *Perrottetia sandwicensis*, *Myrsine lessertiana* (kolea lau nui), *Psychotria mariniana*, *Psychotria greenwelliae*, *Streblus pendulinus* (ai ai), *Syzygium sandwicensis*, *Tetraplasandra kavaiensis* (oheohe), *Xylosma hawaiiense*, and understory ferns of *Microlepia strigosa* (palapalai), *Diplazium sandwichianum*, and *Dryopteris fusco-atra* (ii) (National Tropical Botanical Garden 2008a).

In the Limahuli Valley's upper eastern drainage, between Pali Eleele and Hono O Na Pali and the upper southwestern headwaters of the preserve, *Myrsine linearifolia* grows in *Metrosideros polymorpha* – *Dicranopteris linearis* montane wet forest with windswept shrubland, along ridges above a forested drainage. This rich forest with an intact understory of matting ferns *Diplopterygium pinnatum* and *Dicranopteris linearis* has other native associated species including *Broussaisia arguta*, *Chamaesyce remyi*, *Cheirodendron fauriei*, *Cyanea remyi*, *Cyrtandra* spp., *Eurya sandwicensis*, *Hesperomannia lydgatei* (NCN), *Joinvillea ascendens* (ohe), *Kadua affinis*, *Labordia lydgatei* (kamakahala), *Lobelia hypoleuca* (kuhiaikamo owahie), *Machaerina angustifolia* (uki), *M. mariscoides* (ahaniu), *Melicope clusiifolia*, *M. feddei*, *M. waialealae*, *M. wawraeana*, *Metrosideros waialealae* (NCN), *Psychotria mariniana*, *Scaevola procera*, and *Syzygium sandwicensis* (National Tropical Botanical Garden 2008a, b).

Below the Blue Hole in the headwaters of the Wailua River (National Tropical Botanical Garden 2008a) *Myrsine linearifolia* grows in a deep, narrow valley surrounded by vertical cliffs laced with waterfalls. This is a low undisturbed wet forest of small, stunted trees and shrubs including *Metrosideros polymorpha*, *Bobea* sp., and *Perrottetia sandwicensis*, with a ground cover of ferns, *Gunnera* sp., *Cyrtandra* spp., and *Cyanea* spp., growing over saturated, rocky ground (National Tropical Botanical Garden 2008a).

On Mt. Haupu, *Myrsine linearifolia* grows in *Metrosideros polymorpha* lowland mixed mesic forest with north-facing cliffs. Associated native species include *Artemisia* sp.,

Bidens valida (kookoolau), *Bonamia menziesii*, *Carex wahuensis* (NCN), *Eragrostis variabilis* (kawelu), *Hibiscus kokio* ssp. *kokio* (kokio), *Isodendrion* (aupaka), *Kadua acuminata* (au), *K. fluviatilis* (kamapuaa), *Lepidium bidentatum* (anaunau), *Lobelia niihauensis* (NCN), *Machaerina*, *Cyperus* sp. (ahu awa), *Melicope anisata*, *Pipturus*, *Sida fallax* (ilima), and *Zanthoxylum* sp. (National Tropical Botanical Garden 2008a).

Threats which alter the habitat for *Myrsine linearifolia* include pigs (*Sus scrofa*), goats (*Capra hircus*), and mule deer (*Odocoileus hemionus*) (Factors A and D). Invasive introduced plant species which impact the habitat and compete with *Myrsine linearifolia* are *Erigeron karvinskianus* (daisy fleabane), *Bryophyllum pinnatum* (airplant), *Axonopus fissifolius* (narrow-leaved carpetgrass), *Cyperus meyenianus* (NCN), *Holcus lanatus* (common velvet grass), *Melastoma septemnerium* (NCN), *Rhodomyrtus tomentosa* (rose myrtle), *Psidium cattleianum* (strawberry guava), *Pterolepis glomerata* (NCN), *Rubus argutus* (blackberry), *Rubus rosifolius* (thimbleberry), and *Stachytarpheta cayennensis* (Brazilian tea) (Factor E) (Hawaii Biodiversity and Mapping Program 2008; National Tropical Botanical Garden 2008a, b; Perlman 2008; N. Tangalin, pers. comm. 2008; USFWS 1995).

Goats, rats (*Rattus rattus*), and mule deer are believed to eat *Myrsine linearifolia* (Factor C) (Hawaii Biodiversity and Mapping Program 2008; National Tropical Botanical Garden 2008a, b; Perlman 2008; N. Tangalin, pers. comm. 2008; USFWS 1995).

Climate change may also pose a threat to *Myrsine linearifolia* (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.

Five plants were grown, 13 plants were reintroduced, and 122 seeds are in storage in the Department of Land and Natural Resources Kokee Rare Plant Facility (State of Hawaii Department of Land and Natural Resources 2008). Four plants were grown and reintroduced at the National Tropical Botanical Garden's Limahuli Garden (National Tropical Botanical Garden 2008c). The seed bank at the National Tropical Botanical has 210 seeds and 25 propagated plants from five accessions of seeds: four collected from Kalalau and one from Namolokama (National Tropical Botanical Garden 2009).

Stabilizing, downlisting, and delisting objectives are provided in the addendum for the recovery plan for plants from the island of Kauai (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Myrsine linearifolia* is a long-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 25 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 25 mature individuals and all threats are not being

managed. The numbers of populations and individuals have declined since the species was listed as threatened, but an accurate current status is not available. Therefore, *Myrsine linearifolia* may meet the definition of endangered and should be surveyed to determine if changing its status from threatened to endangered is warranted.

3.0 RESULTS

3.3 Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist

Extinction

Recovery

Original data for classification in error

No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: _____

Reclassification (from Endangered to Threatened) Priority Number: _____

Delisting (regardless of current classification) Priority Number: _____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Continue to collect seeds for adequate genetic storage.
- Protect all populations against trampling, browsing and disturbances from feral ungulates.
- Develop and implement methods of rat control for all populations.
- Reintroduce to augment existing populations and create new populations in suitable protected habitat.
- Work with Hawaii Division of Forestry and Wildlife and other landowners to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Survey to determine the current status of the species and whether change in status from threatened to endangered is warranted.

5.0 REFERENCES

- Hawaii Biodiversity and Mapping Program. 2008. Program database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.
- Lorence, D.H., and T. Flynn. 1991. Botanical survey of the Wahiawa Mountains. Department of Land and Natural Resources, Division of Forestry and Wildlife, Lihue, Hawaii. Unpublished.
- National Tropical Botanical Garden. 2008a. Herbarium database. National Tropical Botanical Garden, Kalaheo, Hawaii. Unpublished.
- National Tropical Botanical Garden. 2008b. Living collections database. National Tropical Botanical Garden, Kalaheo, Hawaii. Unpublished.
- National Tropical Botanical Garden. 2008c. Plant out records from living collections database. National Tropical Botanical Garden, Kalaheo, Hawaii. Unpublished.
- National Tropical Botanical Garden. 2009. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. National Tropical Botanical Garden, Kalaheo, Hawaii. Unpublished.
- Perlman, S. 2008. *Myrsine linearifolia*. National Tropical Botanical Garden, Kalaheo, Hawaii. 5 pages. Unpublished.
- State of Hawaii Department of Land and Natural Resources, Department of Forestry and Wildlife. 2008b. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. State of Hawaii, Lihue, Hawaii. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 1995. Endangered and threatened wildlife and plants; proposed endangered or threatened status for nineteen plant species from the Island of Kauai, Hawaii. Federal Register 60(185):49359-49377.
- [USFWS] U.S. Fish and Wildlife Service. 1996. Endangered and threatened wildlife and plants; determination of endangered or threatened status for 19 plants from the island of Kauai, Hawaii; final rule. Federal Register 61(198):53070-53089.
- [USFWS] U.S. Fish and Wildlife Service. 1998. Kauai II: addendum to the recovery plan for the Kauai plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 140 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, Hawaii; final rule. Federal Register 68(39):9116-9479.

Wagner, W.L., D.R. Herbst and S.H. Sohmer. 1999. Manual of the flowering plants of Hawaii, revised edition. University of Hawaii Press, Bishop Museum Press, Special Publication. 97:1-1918.

Wood, K.R. 2000. Lumahai, Namolokama, and Laau Ridge Kauai, Hawaii. Personal observations and checklist of vascular plants with topographical mapping. Prepared for Kamehameha Schools and the U. S. Fish and Wildlife Service. National Tropical Botanical Garden, Kalaheo, Hawaii. 56 pages Unpublished.

Wood, K.R. 2008. Checklist of vascular plant taxa of Wahiawa, Kauai, Hawaii (610-1010 meters). National Tropical Botanical Garden, Kalaheo, Hawaii. 23 pages. Unpublished.

Wood, K.R. 2009. *Myrsine linearifolia* numbers revised. National Tropical Botanical Garden, Kalaheo, Hawaii. 4 pages. Unpublished.

Personal Communications

Tangalin, Natalia. 2008. Field botanist, National Tropical Botanical Garden, Kalaheo, Hawaii. E-mail to Margaret Clark, National Tropical Botanical Garden, dated December 3, 2008. Subject: *Myrsine linearifolia*.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Myrsine linearifolia* (kolea)

Current Classification: _____ T _____

Recommendation resulting from the 5-Year Review:

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

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

Marie Bruegmann, Plant Recovery Coordinator
Marilet A. Zablan, Assistant Field Supervisor for Endangered Species
Jeff Newman, Acting Deputy Field Supervisor

Approved _____

Acting

Field Supervisor, Pacific Islands Fish and Wildlife Office

Date

AUG 27 2010