U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Myrsine fosbergii

Common Name:

kolea

Lead region:

Region 1 (Pacific Region)

Information current as of:

05/15/2011

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

___ Taxon is more abundant or widespread than previously believed or not subject

___ Taxon not subject to the degree of threats sufficient to warrant issuance of

___ Range is no longer a U.S. territory

___ Insufficient information exists on biological vulnerability and threats to s

___ Taxon mistakenly included in past notice of review

___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct

___ Conservation efforts have removed or reduced threats

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Hawaii
- **US Counties**: Honolulu, HI, Kauai, HI
- **Countries**: United States

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Hawaii
- **US Counties**: Honolulu, HI, Kauai, HI
- **Countries**:Country information not available

Land Ownership:

On Kauai Myrsine fosbergii occurs primarily on privately owned land in the Lihue-Koloa and Halelea Forest Reserves (FR). A few individuals occur on State land in the Na Pali Kona, and Halelea Forest Reserves, and in the Na Pali Coast State Park. On Oahu, Myrsine fosbergii occurs about equally on private and State-owned lands, with a few individuals occurring on both Federal and county land.

Lead Region Contact:

ARD - Ecological Services, Marilet Zablan, 503-231-6158, marilet_zablan@fws.gov

Lead Field Office Contact:

Pacific Islands ESFO, Christa Russell, (808) 792-9451, christa_russell@fws.gov

Biological Information

Species Description:

Myrsine fosbergii is a branched shrub or small tree 6.7 to 13 feet (ft) (2 to 4 meters (m)) tall. Branches are dark reddish brown and glabrous. Leaves are dark green, dark purple at the base, clustered at the tips of the branches, narrowly elliptic, and glabrous. Flowers are perfect or possibly unisexual (dioecious), arising on short woody knobs among the leaves. Drupes are purplish black, globose and 0.2 to 3.5 inches (in) (6 to 9 millimeters (mm) in diameter (Wagner et al. 1999, p. 940).

Taxonomy:

Myrsine fosbergii was described by Hosaka (1940, pp. 46-47). This species is recognized as a distinct taxon in Wagner et al. (1999, p. 40) and Wagner and Herbst (2003, p. 940), the most recently accepted Hawaiian plant taxonomy.

Habitat/Life History:

Typical habitat on Kauai is Metrosideros-Diospyros (ohia-lama) lowland mesic forest and Metrosideros-Cheirodendron montane (ohia-olapa) wet forest, often on watercourses or stream banks, between 900 and 4,300 ft (274 to 1,311 m) elevation (Hawaii Biodiversity and Mapping Program (HBMP) 2008). Typical habitat on Oahu is Metrosideros-mixed native, wet shrubland between 2,200 and 2,800 ft (671 and 853 m) elevation (HBMP 2008).

Historical Range/Distribution:

Myrsine fosbergii was historically known from the Koolau mountains of Oahu at the Puu Lanihuli and Kuliouou summit ridges (HBMP 2008). It was never observed or collected on Kauai before 1987, but it is assumed to have been there historically.

Current Range Distribution:

Currently, Myrsine fosbergii is known from widely scattered populations along the Koolau summit ridge on Oahu from Schofield to Puu Kahuauli. On Kauai, this species is known from the Wahiawa Mountains and drainage, Kawaiula Valley, Limahuli Valley, Namolokama, Kalalau, Hanakapiai, and Mt. Haupu (HBMP 2008; K. Wood, National Tropical Botanical Garden, in litt, 2005,2007).

Population Estimates/Status:

This species is currently known from 14 populations, totaling a little more than 100 individuals. Nine populations totaling approximately 55 individuals are on Kauai at Wahiawa drainage (47 individuals), east Kalalau (1 individual), upper Limahuli Valley (1 individual), Namolokama (1 individual), Hanakapiai (1 individual), the Iole headwaters (1 individual), east of Sincock bogs (1 individual), Waialealu summit bogs (1 individual), and at Mt. Haupu (1 individual); and five populations totaling 48 individuals in the Koolau mountains of Oahu at the Moanalua summit (21 individuals), Halawa summit (4 individuals), along the summit crest between Eleao and Waimano trail (6 individuals), Punaluu summit (2 individuals), and the Kaipapau-Puu Kainapuaa summit (15 individuals) (U.S. Army 2006; HBMP 2008; Kawelo 2010, in litt.; Kawelo 2011, in litt.).

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Myrsine fosbergii is threatened by feral pigs (Sus scrofa) and goats (Capra hircus) that degrade and destroy habitat (HBMP 2008). On Kauai, evidence of the activities of feral pigs has been reported at the Wahiawa, Sincock Bogs, Mt. Haupu, and Iole headwaters populations (HBMP 2008; Wood 2005, in litt. and , 2007, in litt.), and evidence of the activities of feral goats has been reported at the Kalalau (east) and Iole headwaters populations (HBMP 2008). On Oahu,evidence of the activities of feral pigs has been reported at the Puu Kainapuaa and Eleao to Waimano Trail summit populations (HBMP 2008).

Pigs of Asian ancestry were introduced to Hawaii by the Polynesians, and the Eurasian type was introduced to Hawaii by Cook in 1778, with many other introductions thereafter (Tomich 1986, p. 121). Some pigs raised as food escaped into the forests of Hawaii, Kauai, Oahu, Molokai, Maui, and Niihau, and are now managed as a game animal by the State to optimize hunting opportunities (Tomich 1986, p. 125; State of Hawaii 2001). A study was conducted in the 1980s on feral pig populations in the Kipahulu Valley on Maui (Diong 1982, 408 pp.). This valley consists of a diverse composition of native ecosystems, from near sea level to alpine, and forest types ranging from mesic to wet, Acacia koa (koa) to Metrosideros polymorpha. Rooting by feral pigs was observed to be related to the search for earthworms, with rooting depths averaging 8 in (20 cm), greatly disrupting the leaf litter and topsoil layers, contributing to erosion and changes in ground topography. The feeding habits of pigs created seed beds, enabling the establishment and spread of weedy species such as Psidium cattleianum (strawberry guava). The study concluded that all aspects of the food habits of pigs are damaging to the structure and function of the Hawaiian forest ecosystem (Diong 1982, pp. 164-165). The effects on mesic and wet forest habitat by foraging of feral pigs have also been reported in fencing studies. In a fencing study conducted in the montane bogs of Haleakala, it was found that when feral pigs were fenced out of an area the cover of native plant species increased from 6 percent to 95 percent within six years of protection (Loope et al. 1991, p. 3).

The goat, a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. On Kauai, feral goats have been present in drier, more rugged areas since the 1820s. They still occur in Waimea Canyon and along the Na Pali Coast, as well as in the drier perimeter of Alakai Swamp and even in its wetter areas during periods with low rainfall (Street 1989, p. 21). Goats eat nearly all plants available, but their preference is for woody species (Spatz and Mueller-Dombois 1973, p. 870). A study of goat predation on the native woody species Acacia koa on the island of Hawaii has shown that grazing pressure by goats can cause its eventual extinction because it is unable to reproduce (Spatz and Mueller-Dombois 1973, p. 874). Feral goats are able to forage in extremely rugged terrain and have a high reproductive capacity (van Riper and van Riper 1982, pp. 34-35; Tomich 1986, pp. 150-156).

Hawaiian ecosystems, having evolved without hoofed mammals, are susceptible to large-scale disturbance by feral pigs, goats, and other introduced ungulates (Loope et al. 1991, p. 3). Because of demonstrated habitat modifications by feral pigs and goats, such as destruction of native plants, disruption of topsoil leading to erosion, and establishment and spread of nonnative plants, the Service believes they are a threat to Myrsine fosbergii.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

None known.

C. Disease or predation:

Predation by feral pigs and goats is a likely threat to Myrsine fosbergii (HBMP 2008; K. Wood 2005, in litt. and 2007, in litt.). In a study conducted in the 1980s, feral pigs were observed browsing on young shoots, leaves and fronds of a wide variety plants, of which over 85 percent were endemic species (Diong 1982, p. 138). A stomach content analysis in this study showed that the pigs' food sources consisted of native plants, 60 percent of which were Cibotium spp., (tree ferns) alternating with Psidium cattleianum when it was available. Pigs were observed to fell plants and remove the bark of Clermontia, Cibotium, Coprosma,

Psychotria, and Hedyotis species, with larger trees killed over a few months of repeated feeding (Diong 1982, pp. 138, 144).

Goats browse on introduced grasses and native plants, and are able to reach more remote and inaccessible areas than other ungulates. They thrive on a variety of food plants, and are instrumental in the decline of native vegetation in many areas (Cuddihy and Stone 1990, pp. 40, 61, 63-64).

Because Hawaii's native plants evolved without any browsing or grazing mammals present, many lost natural defenses to such impacts (Carlquist 1980, pp. 28-29). Browsing by ungulates has been observed on many other native species, including common and rare or endangered species (Cuddihy and Stone 1990, pp. 63-64; Loope et al. 1991, p. 3). Therefore, even though we have no direct evidence of browsing for this species, it is likely that feral pigs and goats impact this species directly as well as its habitat.

D. The inadequacy of existing regulatory mechanisms:

Mrysine fosbergii currently receives no protection under Hawaii's endangered species law (HRS, Sect. 195-D) or the Federal Endangered Species Act (16 U.S.C. §1531-1544).

Pigs and goats are managed as game animals in Hawaii. Pig and goat hunting is allowed on all islands either year-round or during certain months, depending on the area (Hawaii Department of Land and Natural Resources 1999, 2003); however, public hunting is not adequate to eliminate this threat to Myrsine fosbergii.

E. Other natural or manmade factors affecting its continued existence:

Myrsine fosbergii is threatened by alien weeds that compete with it and degrade habitat (HBMP 2008). The nonnative plants reported to be the greatest threats to the populations on Kauai are: Psidium cattleianum (strawberry guava), Rhodomyrtus tomentosa (downy or rose myrtle), and Clidemia hirta (Koster's curse) at Wahiawa drainage; Psidium guajava (common guava) at Hanakapiai; C. hirta, Rubus rosifolius (thimbleberry), Schyzachyrium condensatum (beardgrass) at upper Limahuli Valley; Melastoma septemnervium (Indian rhododendron), Schinus terebinthifolius (Christmas berry), P. cattleianum, Heliocarpus popayanensis (moho), R. tomentosa, Melinus minutiflora (molasses grass), and Paspalum conjugatum (Hilo grass) at Mt. Haupu; and M. septemnervium, P. cattleianum, R. rosifolius and Axonopus fissifolius (narrow-leaved carpetgrass) at Iole headwaters. On Oahu, the nonnative plants reported to be the greatest threats are: A. fissifolius, Erigeron karvinskianus (daisy fleabane), Pterolepis glomerata (false meadowbeauty), and C. hirta at the Eleao and Waimano Trail summit ridge; Sacciolepis indica (glenwood grass), C. hirta, E. karvinskianus, A. fissifolius, and P. conjugatum at Halawa summit; and C. hirta, P. cattleianum, and A. fissifolius at Puu Kainapuaa (HBMP 2006, 2008).

Axonopus fissifolius is native to subtropical North America and the Neotropics, where it is commonly used as a pasture grass, and is now widely naturalized in Hawaii in wet pastures and disturbed wet forest and bogs (O'Connor 1999, pp. 1,500-1,503). It is best adapted to the subtropics. This grass forms a dense mat with foliage up to 1 ft (30 cm) tall and flowering culms up to 2 ft (60 cm) tall. This species does well in soils with low nitrogen levels, can outcompete other grasses, is not subject to any major diseases or insect pests, and recovers quickly from fire. The seeds are readily spread by water, vehicles, and in the dung of grazing animals (Cook et al. 2005).

Clidemia hirta is a noxious shrub first cultivated on Oahu. This pest plant forms a dense understory, shading out native plants and hindering their regeneration, and is considered a major alien plant threat (Wagner et al. 1985, p. 41; Smith 1989, p. 189). The most promising biological control to date for Koster's curse is the Colleotrichum fungus, Gloesporioides f. sp. clidemiae, released in 1986. Although there is no quantitative data available, it has an observable negative impact. Other agents tested were a moth (Antiblemma

acclinalis), a leaf-feeding beetle (Lius poseidon), a fruit and flower-feeding insect (Mompha trithalama), and a terminal growth-feeding insect (Liothrips urichi), all with lesser control success than the fungus (Smith 1989, p. 189).

Erigeron karvinskianus is native to the Neotropics from Mexico to Venezuela, Chile, and the Antilles. It was cultivated in Hawaii as early as 1911 on Oahu, and is now also naturalized on all the main islands, in moderately wet areas from 984 to 4,265 ft (300 to 1,300 m) (Wagner et al. 1999, p. 315). Seeds are dispersed by wind and water, the layering of stems, and the regrowth of broken roots. Daisy fleabane reproduces and spreads rapidly to form dense mats, and can grow in almost any open habitat, including watercourses. This species crowds out and displaces ground level plants (Weeds of Blue Mountains Bushland 2006).

Heliocarpus popayaensis is a tree 20 to 98 ft (6 to 30 m) tall. It is native to Mexico and Argentina (Wagner et al. 1999, p. 1,292). It was introduced to Hawaii in 1941, was planted extensively by foresters, and has since escaped into wet forests at low to mid elevations. The seeds are dispersed by wind. It is becoming a dominant tree in some forest areas on Oahu, but has not yet been evaluated for biological control (Smith 2005).

Melastoma septemnervium is a shrub or small tree up to 16 ft (5 m) tall, native to Southeast Asia and southern Japan. It was first collected on Kauai in 1928, and is naturalized in Hawaii in mesic to wet areas, where it is abundant and invasive (Alameda 1999, pp. 910-911). This shrub forms tangled brush which crowds out all other species (Smith 1985, p. 194). The fruit are dispersed by frugivorous birds (Smith 1985, p. 194).

Melinis minutiflora is native to Africa, and now introduced to many parts of the tropics as a fodder plant. In Hawaii it is naturalized and common in dry to mesic disturbed open areas on all the main islands except Niihau. It is considered to be a serious pest, choking out and covering native vegetation and preventing seedling establishment (O'Connor 1999, p. 1,562). The mats it forms fuel more intense fires (Cuddihy and Stone 1990, p. 89).

Paspalum conjugatum is a grass native to the Neotropics, and was introduced for cattle fodder and quickly spread (Cuddihy and Stone 1990, pp. 82-83). It is naturalized in Hawaii in moist to wet disturbed sites along roadsides and in open fields (O'Connor 1999, p. 1,576). It forms a dense ground cover even on acidic, low-nutrient soils (Pacific Island Ecosystems at Risk (PIER) 2006a). Its small hairy seeds are easily transported on humans and animals or are carried by the wind through native forests. No biological control agents have been released for this species (University of Hawaii 2006).

Psidium cattleianum, a tree native to tropical America, has become widely naturalized on all the main islands of Hawaii. Found in mesic to wet forests, strawberry guava develops into dense stands in which few other plants can grow, displacing native vegetation. The fruit is eaten by pigs and birds, which then disperse the seeds throughout the forest (Smith 1985, p. 200; Wagner et al. 1985, p. 971). A biological control agent, Tectococus ovatus, has undergone 15 years of testing, and there is a proposal to release this insect at Olaa Forest Reserve on the island of Hawaii (ScienceDaily 2008).

Psidium guajava, a small shrub or tree native to the Neotropics, is naturalized in Hawaii and forms dense stands in disturbed forest. It is not as common as Psidium cattleianum. The seeds are spread by feral pigs and alien birds (Wagner et al. 1999, p. 972). Extensive stands of young trees must be controlled through burning, as cutting results in regrowth with multiple stems. Regeneration from underground parts by suckering limits the effectiveness of manual control. Trees grown from seed produce fruit in 2 to 4 years, with a life expectancy of 30 to 40 years (Global Invasive Species Database (GISD) 2006a).

Pterolepis glomerata is an herb or subshrub in the Melastomataceae family. It is native to tropical regions of eastern South America. In Hawaii it is naturalized in mesic to wet disturbed sites and trail margins on Kauai, Oahu, Molokai, and Hawaii (Almeda 1999, pp. 912-913). All members of this genus are declared noxious in the State of Hawaii (Hawaii Administrative Rules (HAR) Title 4, Subtitle 6, Chapter 68). The basis for this

genus being classed as invasive are the plants' adaptations such as high germination rates, rapid growth, early maturity, ability of fragments to root, possible asexual reproduction, and efficient seed dispersal, especially by birds that are attracted by copious production of berries (University of Florida Herbarium 2006).

Rhodomyrtus tomentosa is a small shrub or tree native to India to Southeast Asia. In Hawaii it is cultivated and naturalized in mesic to wet forest (Wagner et al. 1999, pp. 972-973). This noxious evergreen shrub rarely grows above 9 ft (3 m) tall, but forms dense thickets (Smith 1985, p. 201). It produces large amounts of seed that are dispersed by frugivorous birds and mammals. Downy myrtle also alters natural fire regimes and resprouts prolifically after fires (University of Florida 2006). Research is ongoing for biocontrol agents. Five species are undergoing testing for possible biocontrol of Rhodomyrtus, including two moths (Carea varipes and Agriothera sp.), an undescribed thrips, and two weevils (Sternuchopsis patruilis and Hypolixus truncatulus) (Winotai et al. 2005, pp. 104-105).

Rubus rosifolius is native to Asia and is common in Hawaii in disturbed mesic to wet forest on all of the main islands. It is a sparse shrub, covered with prickles, and has edible red fruit. It invades the understory, forming dense thickets and outcompetes native plant species. It easily reproduces from roots left in the ground, and seeds are spread by feral animals and birds. There is no specific management information for R. rosifolius, but techniques used for the control of R. fruticosus (blackberry), which is a related species, may be applicable (PIER 2006b; GISD 2006b).

Sacciolepis indica is an annual or perennial grass native to the Paleotropics, and naturalized in Hawaii in open, wet areas and along trails (O'Connor 1999, p. 1,589). This slender, annual grass invades disturbed and open areas in wet habitats. The seeds are dispersed by sticking to animal fur. Its response to fire is unknown. There is a large infestation moving into Wahiawa Bog, Kauai (University of Hawaii Botany Department 1998). A study conducted in a bog at Haleakala National Park showed that within six years of an area being rooted and denuded by pigs, the cover of Sacciolepis indica increased from 4 percent to 33 percent (Medeiros et al. 1991, p. 11). This species has not been evaluated for biological control.

Schinus terebinthifolius, a shrub native to Brazil, was introduced to Hawaii in 1911 and is now naturalized in mesic areas (Wagner et al. 1999, p. 198). It forms dense thickets and grows even on steep slopes, and the red berries are attractive to birds (Smith 1989, p. 63). Seedlings grow very slowly and can survive in dense shade, exhibiting vigorous growth if the canopy is cleared, leading to the creation of open habitat and further influencing and increasing its rate of spread (Brazilian Pepper Task Force 1997). Schinus terebinthifolius is also a relative of poison ivy and may cause allergic skin reactions on sensitive persons. There are no released biocontrol agents to date (Brazilian Pepper Task Force 1997). This species is on the Hawaii noxious weed list (HAR Title 4, Subtitle 6, Chapter 68).

Schizachyrium condensatum (Andropogon condensatus) is a perennial grass, native to tropical and subtropical America, and naturalized in Hawaii along roadsides and in open sites in mesic shrubland and grassland on the island of Hawaii (O'Connor 1999, p. 1590). This perennial bunchgrass sometimes forms continuous cover in boggy, open mesic and dry habitats. It releases highly persistent allelopathic substances (Rice 1972, p. 755). The dead material provides an excellent fuel for fires. It is fire-stimulated; its cover increases dramatically with each fire (Smith et al. 1980, p. 289). It is dormant during the rainy season, which Mueller-Dombois (1973, p. 2) has shown leads to increased erosion in some areas. The seeds are dispersed by wind. The potential for biological control has been discussed by Gardner and Davis (1982, pp. 20-21), but attempts to evaluate possible agents in Hawaii probably will be resisted by the sugar industry.

The original native flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the current total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent are introduced species, and nearly 100 species are pests (Smith 1985, p. 180; Wagner et al. 1999, p. 45). Several studies (Cuddihy and Stone 1990, p. 74; Wood and Perlman 1997, p. 18; Robichaux et al. 1998, p. 4) indicate nonnative plant species may outcompete native plants similar to Myrsine fosbergii. Competition may be for space, light, water, or nutrients, or there may be a chemical produced that inhibits growth of other plants

(Smith 1985, pp.227-230; Cuddihy and Stone 1990, p. 74). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smith 1985, pp. 240-241; Loope and Medeiros 1992, pp. 7-8; Medeiros et al. 1992, p. 30; Ellshoff et al. 1995, pp ii, 3-4; Meyer and Florence 1996, p. 778; Medeiros et al. 1997, pp.23-24, Loope et al. 2004, p. 1,472). In particular, alien pest plant species degrade habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985, pp. 227-230; Cuddihy and Stone 1990, p. 74; Vitousek et al. 1997, pp. 6-10). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to the wet forest habitat of M. fosbergii, the Service believes nonnative plant species are a threat to this species.

Conservation Measures Planned or Implemented :

The Service provided funding to the Koolau Mountain Watershed Partnership from 2005 through 2009 to fence and remove ungulates from the Helemano area of Oahu, which may benefit a portion of one population of Myrsine fosbergii (Koolau Mountains Watershed Partnership 2005-2009).

Myrsine fosbergii is represented in an ex situ collection at Lyon Arboretum (Sugii 2006, in litt.).

Summary of Threats :

Based on our evaluation of habitat degradation and loss by feral pigs, goats, and nonnative plants, we conclude there is sufficient information to develop a proposed rule for this species due to the present and threatened destruction, modification, or curtailment of its habitat and range, and the displacement of individuals of Myrsine fosbergii, due to competition with nonnative plants for space, nutrients, water, air, and light. Predation by feral pigs and goats is a likely threat to M. fosbergii. We find that this species is warranted for listing throughout all of its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

• Survey for populations of Myrsine fosbergii in areas of potentially suitable habitat
• Control feral pigs and goats
• Control alien plants
• Continue propagation efforts for maintenance of genetic stock
• Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species

Priority Table

Magnitude	Immediacy	Taxonmomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2**
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

This species is highly threatened by feral pigs and goats that degrade and/or destroy habitat, and nonnative plants that compete for light and nutrients. Threats to the wet forest habitat of Myrsine fosbergii, and to individuals of this species, occur throughout its range and are expected to continue or increase without control or eradication. This species is represented in an ex situ collection; however, no other known conservation measures have been initiated to date.

Imminence :

Threats to Myrsine fosbergii from feral pigs, goats, and nonnative plants are considered imminent because they are ongoing.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. This species is represented in an ex situ collection. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of Myrsine fosbergii as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

Description of Monitoring:

Much of the information on this form is based on the results of a meeting of 20 botanical experts held by the

Center for Plant Conservation in December of 1995. We incorporated additional information on this species from our files and the most recent supplement to the Manual of Flowering Plants of Hawaii (Wagner and Herbst 2003, p. 35). In 2004, the Pacific Islands Office contacted the following species experts: Robert Hobdy, retired from the Hawaii Division of Forestry and Wildlife; Joel Lau, Hawaii Biodiversity and Mapping Program; Arthur Medeiros, U.S. Geological Survey, Biological Resources Discipline; Hank Oppenheimer, resource manager for the Maui Land and Pineapple Company; and Steve Perlman and Ken Wood, National Tropical Botanical Garden (NTBG). No new information was provided. In 2005, we contacted species experts and confirmation of the status was provided by Kapua Kawelo, U.S. Army Environmental Division. In 2006, new status information was provided by Nellie Sugii, Lyon Arboretum. In 2008, new information was provided by Ken Wood of the NTBG. In 2009, we received no new information. In 2010, we received new information from Kapua Kawelo. In 2011, we contacted the species experts listed below and received new information from Kapua Kawelo, U.S. Army Environmental Division.

List all experts contacted:

Name Date Affiliation
Agorastos, Nick 02/16/11 Division of Forestry and Wildlife, Hawaii
Bakutis, Ane 02/16/11 Plant Extinction Prevention Program, Molokai
Ball, Donna 02/16/11 U.S. FWS, Partners Program, Hawaii
Bily, Pat 02/16/11 The Nature Conservancy, Maui
Bio, Kealii 02/16/11 Plant Extinction Prevention Program, Hawaii
Caraway, Vickie 02/22/11 Hawaii Division of Forestry and Wildlife, Oahu
Ching, Susan 02/16/11 Plant Extinction Prevention Program, Oahu
Clark, Michelle 02/16/11 U.S. FWS, Partners Program, Kauai
Duvall, Fern 02/16/11 Hawaii Division of Forestry and Wildlife, Maui
Fay, Kerri 02/16/11 The Nature Conservancy, Maui
Garnett, Bill 02/16/11 National Park Service, Kalaupapa, Molokai
Haus, Bill 02/16/11 National Park Service, Haleakala NP, Maui
Higashino, Jennifer 02/16/11 U.S. FWS, Partners Program, Maui
Imada, Clyde 02/16/11 Bishop Museum, Botany Department
Kawelo, Kapua 02/16/11 U.S. Army, Environmental Division
McDowell, Wendy 02/16/11 Plant Extinction Prevention Program, Kauai
Medeiros, Arthur 02/16/11 U.S. Geological Survey
Moses, Wailana 02/16/11 The Nature Conservancy, Molokai
Oppenheimer, Hank 02/16/11 Plant Extinction Prevention Program, Maui Nui
Perlman, Steve 02/16/11 National Tropical Botanical Garden
Perry, Lyman 02/16/11 Division of Forestry and Wildlife, Hawaii
Pratt, Linda 02/16/11 U.S.G.S., Biological Resources Division
Starr, Forest 02/16/11 U.S. Geological Survey
Stevens, Bryon 02/16/11 DLNR Natural Area Reserves, Maui
Ward, Joe 02/22/11 Puu Kukui Watershed Preserve
Welton, Patti 02/16/11 National Park Service, Haleakala NP, Maui
Wysong, Michael 02/16/11 DLNR Natural Area Reserves, Kauai

The Hawaii Biodiversity and Mapping Program identified this species as critically imperiled (HBMP 2006). Based on the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species, this species is recognized as Endangered (facing a very high risk of extinction in the wild) (Bruegmann and Caraway 2003). Myrsine fosbergii is not included in the list of species in Hawaii's 2005 Comprehensive Wildlife Conservation Strategy (Mitchell et al. 2005).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

none

Indicate which State(s) did not provide any information or comment:

Hawaii

State Coordination:

On January 13, 2011, we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. No additional information or comments were received.

Literature Cited:

Almeda, F. 1999. Melastomataceae, Melastoma family. In Manual of the Flowering Plants of Hawaii, Wagner, W.L., D.R. Herbst, and S.H. Sohmer (eds.), University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Museum Special Publication 97. Pp. 903-917.

Brazilian Pepper Task Force. 1997. Brazilian Pepper Management Plan for Florida, Amy Ferriter (ed.), The Florida Exotic Pest Plant Council. 26 pp.

Bruegmann, M.M. and V. Caraway. 2003. Myrsine fosbergii: In IUCN 2006 Red List of Threatened Species, http://www.iucn.redlist.org, accessed on December 18, 2006.

Carlquist, S. 1980. Hawaii: a natural history, second edition. Pacific Tropical Botanical Garden, Honolulu. 468 pp.

Cook, B.G., Pengelly, B.C., Brown, S.D., Donnelly, J.L., Eagles, D.A., Franco, M.A., Hanson, J., Mullen, B.F., Partridge, I.J., Peters, M. and Schultze-Kraft, R. 2005. Tropical forages: an interactive selection tool. [CD-ROM], CSIRO, DPI&F (Qld), CIAT and ILRI, Brisbane, Australia.

Cuddihy, L.W., and C.P. Stone. 1990. Alteration of native Hawaiian vegetation; effects of humans, their activities and introductions. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu. 138 pp.

Diong, C.H. 1982. Population biology and management of the feral pig (Sus scrofa L.) in Kipahulu Valley, Maui. Dissertation to the Zoology graduate division of the University of Hawaii. 408 pp.

Ellshoff, Z.E., D.E. Gardner, C. Wikler, and C.W. Smith. 1995. Annotated bibliography of the genus Psidium, with emphasis on P. cattleianum (strawberry guava) and P. guava (common guava), forest weeds in Hawaii. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, Technical Report 95. 105 pp.

Gardner, D.E., and C.J. Davis. 1982. The prospects for biological control of nonnative plants in Hawaiian national parks. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, Technical Report 45.

Global Invasive Species Database. 2006a. Psidium guajava. http://www.issg.org/database/species/ecology.asp?fr=1&si=211&sts=

Global Invasive Species Database. 2006b. Rubus rosifolius. http://www.issg.org/database/species/ecology.asp?si=500&fr=1&sts=

Hawaii Biodiversity and Mapping Program. 2008. Program database. Unpublished.

Hawaii Biodiversity and Mapping Program. 2006. Myrsine fosbergii. http://hbmp.hawaii.edu/printpage.asp?spp=PDMRS040N0, downloaded on February 2, 2007.

Hawaii, Department of Land and Natural Resources. 1999. Rules regulating game mammal hunting, updated 2003. 56 pp.

Hosaka, E.Y. 1940. A revision of the Hawaiian species of Myrsine (Suttonia, Rapanea), (Myrsinaceae). Occasional Papers of the Bernice P. Bishop Museum 16: 46.

Koolau Mountains Watershed Partnership. 2005-2009. Helemano watershed management project.

Loope, L.L., A.C. Medeiros, and B.H. Gagné. 1991. Recovery of vegetation of a montane bog following protection from feral pig rooting. Cooperative National. Park Resources Studies Unit, University of Hawaii, Honolulu, Technical Report 77. 23 pp.

Loope, L.L. and A.C. Medeiros. 1992. A new and invasive grass on Maui. Newsletter of the Hawaiian Botanical Society 31: 7-8.

Loope, L., F. Starr, and K. Starr. 2004. Protecting endangered Hawaiian plant species from displacement by invasive plants on Maui, Hawaii. Weed Technology 18: 1472-1474.

Medeiros, A.C., L.L. Loope, and B.H. Gagne. 1991. Degradation of vegetation in two montane bogs: 1982-1988. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, Technical Report 78. 31 pp.

Medeiros, A.C., L.L. Loope, T. Flynn, S.J. Anderson, L.W. Cuddihy, K.A. Wilson. 1992. Notes on the status of an invasive Australian tree fern (Cyathea cooperi) in Hawaiian rain forests. American Fern Journal 82: 27-33.

Medeiros, A.C., L.L. Loope, P. Conant, S. McElvaney. 1997. Status, ecology, and management of the invasive plant, Miconia calvescens DC (Melastomataceae) in the Hawaiian Islands. Records of the Hawaii Biological Survey for 1996, Bishop Museum Occasional Papers 48: 23-36.

Meyer, J.Y. and J. Florence. 1996. Tahiti's native flora endangered by the invasion of Miconia calvescens D.C. (Melastomataceae). Journal of Biogeography 23: 775-781.

Mitchell, C., C. Ogura, D.W. Meadows, A. Kane, L. Strommer, S. Fretz, D. Leonard, and A. McClung. 2005. Hawaii's comprehensive wildlife conservation strategy. Department of Land and Natural Resources, Honolulu, Hawaii. 722 pp.

Mueller-Dombois, D. 1972. A non-adapted vegetation interferes with water removal in a tropical rain forest area in Hawaii. Tropical Ecology 14: 1-18.

O'Connor, P.J. 1999. Poaceae, grass family. In Manual of the Flowering Plants of Hawaii, Wagner, W.L., D.R. Herbst, and S.H. Sohmer (eds.), University of Hawaii Press and Bishop Museum Press, Honolulu, Bishop Museum Special Publications 97. Pp. 1,481-1,604.

Pacific Island Ecosystems at Risk. 2006a. Paspalum conjugatum. http://www.hear.org/pier/species/paspalum_conjugatum.htm, accessed on February 22, 2007.

Pacific Island Ecosystems at Risk. 2006b. Rubus rosifolius.

http://www.hear.org/Pier/species/rubus_rosifolius.htm, accessed on February 20, 2007.

Rice, E.L. 1972. Allelopathic effect of Andropogon virginicus and its persistence in old fields. American Journal of Botany. 59: 752-755.

Robichaux, R., J. Canfield, F. Warshauer, L. Perry, M. Bruegmann, and G. Carr. 1998. "Radiating" plants-adaptive radiation. Endangered Species Bulletin November/December. Pp. 3-5.

ScienceDaily. 2008. Biological control: insect release proposed to control exotic strawberry guava. http://www.sciencedaily.com/releases/2008/05/080522093339.htm, accessed February 25, 2009.

Smith, C.W., T. Parman, and K. Wampler. 1980. Impact of fire in a tropical submontane seasonal forest. In Proceedings of the Second Conference in Natural Sciences, Hawaii Volcanoes National Park, Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu., Vol. 10, Fire ecology. Pp. 313-324.

Smith, C.W. 1985. Impact of alien plants on Hawaii's native biota. In Hawaii's Terrestrial Ecosystems: Preservation and Management, C.P. Stone and J.M. Scott (eds.), Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu. Pp. 191-192.

Smith, C.W. 1989. Non-native plants. In Conservation Biology in Hawaii, Stone, C.P. and D.B. Stone (eds.), Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu. Pp. 60-69.

Smith, C.W. 2005. Hawaiian alien plant studies, University of Hawaii Botany Department. http://www.botany.hawaii.edu/faculty/cw_smith/hel_pop.htm

Spatz, G. and D. Mueller-Dombois. 1973. The influence of feral goats on koa tree reproduction in Hawaii Volcanoes National Park. Ecology 54: 870-876.

State of Hawaii. 2001. Game mammal hunting guide. http://www.state.hi.us/dlnr/dcre/mammalguide.html, accessed February 13, 2007.

Street, J. 1989. Soils in Hawaii. In Conservation Biology in Hawaii, C.P. Stone and D.B. Stone (eds.), Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu. Pp. 17-23.

Tomich, P.Q. 1986. Mammals in Hawaii; a synopsis and notational bibliography. Bishop Museum Press, Honolulu. 375 pp.

University of Florida. 2006. Rhodomyrtus tomentosa. Center for Aquatic and Invasive Plants. http://plants.ifas.ufl.edu/rhotom.pdf

University of Florida Herbarium. 2006. Melastomataceae of the World: Pterolepis glomerata. http://www.flmnh.ufl.edu/herbarium/melastomes/melastome_invasives_table.htm.

University of Hawaii. 2006. Paspalum conjugatum Bergius, Hilo grass, Hawaiian Alien Plant Studies, Botany Department, Honolulu http://www.botany.hawaii.edu/faculty/cw_smith/pas_con.htm, accessed on February 20, 2007.

University of Hawaii Botany Department. 1988. Hawaiian Alien Plant Studies. Sacciolepis indica. http://www.botany.hawaii.edu/faculty/cw_smith/aliens.htm.

U.S. Army Environmental. 2006. Species database for Oahu. Unpublished.

van Riper, S.G. and C. van Riper III. 1982. A field guide to the mammals in Hawaii. The Oriental Publishing

Company, Honolulu. 68pp.

Vitousek, P.M., C.M. D'Antonio, L.L. Loope, M. Rejmanek, and R. Westerbrooks. 1997. Introduced species: a significant component of human-caused global change. New Zealand Journal of Ecology 21: 1-16.

Wagner, W.L., D.R. Herbst, and R.S.N. Yee. 1985. Status of the native flowering plants of the Hawaiian Islands. In Hawaii's Terrestrial Ecosystems: Preservation and Management, Stone, C.P., and J.M. Scott (eds.), Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu. Pp. 23-74.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawaii. University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Museum Special Publication 97. 1,918 pp.

Wagner, W.L. and D.R. Herbst. 2003. Electronic supplement to the manual of flowering plants of Hawaii, Version 3.1. December 12, 2003.
http://rathbun.si.edu/botany/pacificislandbiodiversity/hawaiianflora/supplement.htm

Weeds of Blue Mountains Bushland. 2006. Erigeron karvinskianus.
http://www.weedsbluemountains.org.au/show_weed_botanical.asp?id=11

Winotai, A., T. Wright, and J.A. Goolsby. 2005. Herbivores in Thailand on Rhodomyrtus tomentosa (Myrtaceae), an invasive weed in Florida. Florida Entomologist 88: 104-105.

Wood, K.R. and S. Perlman. 1997. Maui 14 plant survey final report. National Tropical Botanical Garden. 25 pp.

Personal Communications and In Litteris.

Kawelo, K. , U.S. Army Environmental, Electronic mail regarding status and locations of candidate plant species on Oahu, February 17, 2011.

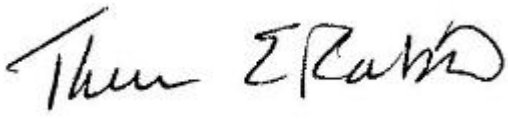
Kawelo, K. , U.S. Army Environmental, Electronic mail regarding status and locations of candidate plant species on Oahu, February 10, 2010.

Sugii N., Lyon Arboretum, Phone record regarding ex situ population status of Bidens micrantha ssp. ctenophylla, August 30, 2006.

Wood, K., National Tropical Botanical Garden, Phytogeographical data for Myrsine fosbergii on Kauai, 2005 and 2007.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: 

06/01/2011
Date

Concur: 10/07/2011
Date

Did not concur: _____ _____
Date

Director's Remarks: