

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

Scientific Name:

Joinvillea ascendens ascendens

Common Name:

`ohe

Lead region:

Region 1 (Pacific Region)

Information current as of:

06/01/2013

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

Continuing Candidate

Candidate Removal

Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status

Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species

Range is no longer a U.S. territory

Insufficient information exists on biological vulnerability and threats to support listing

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

___ More abundant than believed, diminished threats, or threats eliminated.

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:

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, emergency listings, and essential litigation-related, administrative, and program management functions.

Historical States/Territories/Countries of Occurrence:

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

Current States/Counties/Territories/Countries of Occurrence:

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

Land Ownership:

Populations of *Joinvillea ascendens* ssp. *ascendens* are found scattered on Federal land in Haleakala National Park, State, and private lands; with a few also on Federal, State, and private lands under the jurisdiction of the U.S. Army.

Lead Region Contact:

ARD-ECOL SVCS, Jesse D'Elia, 5032312349, jesse_delia@fws.gov

Lead Field Office Contact:

PACIFIC ISLANDS FISH AND WILDL OFC, Kristi Young, 503 231-6845, kristi_young@fws.gov

Biological Information

Species Description:

Joinvillea ascendens ssp. *ascendens* is an erect herb, 5 to 16 feet (ft) (1.5 to 5 meters (m)) tall. Leaf blades are narrowly elliptic, 18 to 32 inches (in) (45 to 80 centimeters (cm)) long, 2 to 6 in (4.5 to 16 cm) wide. Both leaf surfaces have scattered bristles, with the lower surface also sparsely to moderately pubescent. Tepals in this endemic subspecies usually split with age, the outer ones ovate to orbicular-ovate, 0.1 to 0.16 in (2.7 to 4 millimeters (mm)) long, with a sharp abrupt point to the apex, and inner tepals 0.1 to 0.14 in (2.6 to 3.5 mm) long. Fruit are 0.18 to 0.2 in (4.6 to 5.8 mm) in diameter and the styles are not evident on them (Wagner et al. 1999a).

Taxonomy:

Joinvillea ascendens ssp. *ascendens* was described by Brongniart and Gris (1861, pp. 264-269). This subspecies is recognized as a distinct taxon in the Manual of the Flowering Plants of Hawaii (Wagner et al. 1999a, pp. 1,450-1,451), the most recently accepted Hawaiian plant taxonomy.

Habitat/Life History:

Joinvillea ascendens ssp. *ascendens* is found in wet to mesic *Metrosideros polymorpha*-*Acacia koa* (ohia-koa) lowland and montane forest, and along intermittent streams, with diverse native species, at elevations between 1,000 and 4,260 ft (305 and 1,299 m) (Hawaii Biodiversity and Mapping Program (HBMP) 2008). This subspecies occurs as widely separated individuals. Seedlings have rarely been observed in the wild, although mature seeds germinate. In cultivation the seedlings rarely survive. It is uncertain if this rarity of reproduction is typical of this subspecies, or if it is related to habitat disturbance (Wagner et al. 1999a, p. 1,451).

Historical Range/Distribution:

Historically, *Joinvillea ascendens* ssp. *ascendens* was found in widely distributed populations on the islands of Hawaii, Maui, Molokai, Oahu, and Kauai (HBMP 2008). On Hawaii, this subspecies was known from the northeastern side of the island from the Kohala Mountains, south to Volcanoes National Park. On west Maui it occurred in the summit area, and on east Maui it ranged on the northeastern side from the Koolau Forest Reserve (FR) south to Kipahulu Valley. On Molokai, this subspecies was known from the eastern half of the island ranging from Pelekunu Preserve and east to Halawa Valley. On Oahu, this subspecies was known from the summit area of the Waianae Mountains, and ranged along the entire length of the Koolau Mountains. On Kauai, this subspecies was wide-ranging across the mountains and into coastal areas (HBMP 2008).

Current Range Distribution:

Currently, *Joinvillea ascendens* ssp. *ascendens* is still found on the same islands, although in fewer and scattered populations. On Hawaii, this subspecies still ranges from the Kohala Mountains and Laupahoehoe to Volcanoes National Park. On Maui, this subspecies is found on the eastern side of the summit of the west Maui Mountains, and on east Maui in the Koolau FR and Haleakala National Park. On Molokai, this subspecies is found only in Kamakou Preserve. On Oahu, this subspecies is found scattered along the summit of the Waianae Mountains, and is now restricted to the more northerly Koolau Mountains. On Kauai, this subspecies occurs in the northwest area of Kokee State Park, with a few populations scattered east to Waioli

and Limahuli valleys, with one population in the south in the Wahiawa drainage (HBMP 2008; Conry, in litt. 2012).

Population Estimates/Status:

Joinvillea ascendens ssp. *ascendens* is known from 45 populations totaling approximately 200 individuals on the islands of Hawaii, Maui, Molokai, Oahu and Kauai (HBMP 2008; Moses, in litt. 2006; Oppenheimer 2006, pers. comm.; Oppenheimer, in litt. 2008; Perry, in litt. 2006; Welton and Haus 2008, pp. 12, 13; Welton, in litt. 2008; Perlman, in litt. 2010; Agorastos, in litt. 2010; Kawelo, in litt. 2010; Welton, in litt. 2010). Plants are typically found as only one or two individuals, with miles between populations (HBMP 2008). *J. ascendens* ssp. *ascendens* occurs on the island of Hawaii in 8 populations totaling approximately 13 individuals; on west Maui in 3 populations totaling 13 individuals; on east Maui in 7 populations of approximately 70 individuals; on Molokai in 1 population of at least 24 individuals; on Oahu in 16 populations with a total of approximately 51 to 59 individuals; and on Kauai in 9 populations totaling between 32 and 35 individuals (Imada and LeGrande 2006, p. 9; Moses, in litt. 2006; Oppenheimer 2006, pers. comm.; HBMP 2008; Oppenheimer, in litt. 2008; Perry, in litt. 2006; Welton, in litt. 2008; Kam, in litt. 2008; Plant Extinction Prevention (PEP) Program 2008, p. 103; Bily, in litt. 2009; Moses, in litt. 2009; Welton, in litt. 2010; Kawelo, in litt. 2010; Agorastos, in litt. 2010; Perlman, in litt. 2010; Imada, in litt. 2011; Kawelo, in litt. 2011; Conry, in litt. 2012). According to the PEP Program (in litt. 2013), a new population comprised of one individual was discovered in 2012 in upper Waiakea Forest Reserve near Steinbeck Highway. Although threatened by feral pigs and nonnative plants, the population is somewhat protected by an enclosure fence. Additionally, the Hawaii Island Olaa Forest Reserve Transfer Station population of one individual has been extirpated and feral pigs and several nonnative plants remain as threats in the area (PEP, in litt. 2013).

Threats

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

This subspecies is threatened by feral ungulates that degrade and destroy habitat on all of the islands where it occurs (Oppenheimer 2006, pers. comm.; Moses, in litt. 2006; HBMP 2008; Welton and Haus 2008, p. 16; Perlman, in litt. 2010).

Evidence of the activities of feral pigs (*Sus scrofa*) has been reported at the populations of *Joinvillea ascendens* ssp. *ascendens* on Hawaii at Wailuku River, Olaa, and Puu o Umi (HBMP 2008; Perlman, in litt. 2010); on west Maui at Hononana drainage and Kekaalaa; on east Maui at Keanae, Kaipuena Gulch, and Kaapahu valleys (HBMP 2008; Welton and Haus 2008, p. 4; Perlman, in litt. 2010); on Molokai at Kamakou Preserve (Perlman, in litt. 2010); on Oahu in the Waianae mountains at Kaluaa gulch, Makaha-Waianae Kai ridge, Puu Hapapa, Palikea gulch, and Haleauau gulch (HBMP 2008); on Oahu in the Koolau mountains at Kawainui-Koloa divide, Kaipapau-Kawaiiki, Peahinaia, and Kawaiiki-Opaepala ridge (HBMP 2008); and on Kauai Waioli Valley, Nualolo Valley, Kawaiula Valley, Waiialae Trail, Wahiawa drainage, and Kuia Valley (HBMP 2008; Perlman, in litt. 2010).

Pigs of Asian ancestry were introduced to Hawaii by the Polynesians, and the Eurasian type was introduced to Hawaii by Captain James 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* (ohia), similar to the habitat of *J. ascendens* ssp. *ascendens*. 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 and 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).

Evidence of the activities of feral goats (*Capra hircus*) has been observed at the population of *J. ascendens* ssp. *ascendens* on Oahu in the Waianae Mountains at Palikea gulch (HBMP 2008). The goat, a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. Currently, populations exist on Kauai, Oahu, Maui, Molokai, and Hawaii. Goats browse on introduced grasses and native plants, trample roots and seedlings, cause erosion, and promote the invasion of alien plants. Goats are able to forage in extremely rugged terrain and have a high reproductive capacity (Clarke and Cuddihy 1980, p. C20; van Riper and van Riper 1982, pp. 34-35; Scott et al. 1986, pp. 352-358; Tomich 1986, pp. 150-156; Culliney 1988, pp. 336-337; Cuddihy and Stone 1990, p. 64). *A. koa* is a primary component of the habitat of *J. ascendens* ssp. *ascendens* in the Waianae Mountains. A study of goat predation on the native *A. koa* forest on the island of Hawaii has shown that grazing pressure by goats can cause the eventual extinction of *A. koa* because it is unable to reproduce (Spatz and Mueller-Dombois 1973, p. 874). An enclosure analysis demonstrated that release from goat pressure by fencing resulted in an immediate recovery in height growth and numbers of vegetative resprouts of *A. koa* (Spatz and Mueller-Dombois 1973, p. 876). Another study at Puuwaawaa on the island of Hawaii demonstrated that prior to management actions in 1985, regeneration of endemic shrubs and trees in the grazed area was almost totally lacking, contributing to the invasion of the forest understory by exotic grasses and weeds. After the removal of grazing animals in 1985, *A. koa* and *Metrosideros* seedlings were observed germinating by the thousands (Department of Land and Natural Resources 2002, p. 52).

Black-tailed deer (*Odocoileus hemionus columbianus*) have been observed to be a threat to this subspecies on Kauai at the Kuia Natural Area Reserve populations (HBMP 2008). Black-tailed deer were brought to Kauai in 1961 from Oregon by the State of Hawaii Fish and Game Division. Deer trample native vegetation and cause erosion by creating trails and removing vegetation (Tomich 1986, pp. 132-134; Cuddihy and Stone 1990, p. 67).

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

None known.

C. Disease or predation:

Predation by feral pigs is a likely threat to *Joinvillea ascendens* ssp. *ascendens*. 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 felling and removing the bark of *Clermontia*, *Cibotium*, *Coprosma*, *Psychotria*, and *Hedyotis* (herbaceous and woody plants), and causing enough damage to kill larger trees over a few months of repeated feeding (Diong 1982, pp. 138, 144).

Predation by feral goats is a likely threat to *J. ascendens* ssp. *ascendens*. 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).

Predation by deer is a likely threat to *J. ascendens* ssp. *ascendens* (HBMP 2008). According to current State records, they are feeding largely on the introduced species *P. cattleianum*, *Passiflora edulis* (passion fruit), *Rubus argutus* (prickly Florida blackberry), *Rubus rosifolius* (thimbleberry), and the native species *Acacia koa*, *Alixia oliviformis* (maile), *Dianella sandwicensis* (ukiuki), *Dodonaea viscosa* (aalii), and *Hedyotis* spp. (pilo) (Rare Hawaii 2006).

Rats may predate the fruit of *J. ascendens* ssp. *ascendens* at the Limahuli Valley population on Kauai (HBMP 2008). Of the four species of rodents that have been introduced to the Hawaiian Islands, the species with the greatest impact on native flora and fauna is probably the black or roof rat (*Rattus rattus*), which now occurs on all the main Hawaiian Islands. Black rats, and to a lesser extent the house mouse (*Mus musculus*), the Polynesian rat (*R. exulans*), and the Norway rat (*R. norvegicus*), eat the fruits of some native plants, while black rats are reported to strip the bark from some native plants (Tomich 1986, pp. 37-45; Cuddihy and Stone 1990, p. 67).

Because Hawaii's native plants evolved without any browsing or grazing mammals present, many lost or never developed 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 evidence of browsing for this species, it is likely that pigs, goats, deer, and rats impact this species directly as well as the surrounding habitat.

D. The inadequacy of existing regulatory mechanisms:

Joinvillea ascendens ssp. *ascendens* 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, goats, and deer are managed in Hawaii as game animals, but many herds populate inaccessible areas where hunting is difficult, if not impossible, and therefore has little effect on their numbers (Hawaii Heritage Program 1990, p. 3). 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 *J. ascendens* ssp. *ascendens*.

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

Many alien plant species are a threat to this subspecies (HBMP 2008). The nonnative plant species reported to be the greatest threats to *Joinvillea ascendens* ssp. *ascendens* on Hawaii are: *Psidium cattleianum*, *Clidemia hirta* (Kosters curse), *Hedychium gardnerianum* (kahili ginger), *Passiflora tarminiana* (banana poka), *Setaria palmifolia* (palmgrass), and *Rubus ellipticus* (yellow Himalayan raspberry) (Perry, in litt. 2006; HBMP 2008; PEP Program 2008, p. 103). On Maui, *Ageratina adenophora* (Maui pamakani), *C. hirta*, *Erechtites valerianifolia* (fireweed), *Hedychium gardnerianum*, *Psidium cattleianum*, *Sphaeropteris cooperi* (Austrian tree fern), and *Tibouchina herbacea* (glorybush) are the major threats to *J. ascendens* ssp. *ascendens* (Oppenheimer 2006, pers. comm.; HBMP 2008; Welton, in litt. 2008; Perlman, in litt. 2010). On Molokai, *Juncus effusus* (Japanese mat rush) and *P. cattleianum* are the greatest threats (Moses 2006, in litt.; HBMP 2008). On Oahu, *C. hirta*, *Lantana camara* (lantana), *Melinis minutiflora* (molasses grass), *P. cattleianum*, *Paspalum conjugatum* (Hilo grass), *Rubus argutus*, *Schinus terebinthifolius* (Christmas berry), and *Toona ciliata* (Australian red cedar) are the greatest threats (HBMP 2008). On Kauai, *C. hirta*, *Cecropia obtusifolia* (guaramo, trumpet tree), *H. gardnerianum*, *Kalanchoe pinnata* (air plant), *Melastoma candidum* (no common name), *P. cattleianum*, *P. tarminiana*, *Rubus argutus*, *R. rosifolius*, and *Schizachryium condensatum* (little bluestem) are reported to be the greatest nonnative plant threats (HBMP 2008; Perlman, in litt. 2010).

Ageratina adenophora is native to tropical America, and has naturalized in dry to wet forest on the islands of Oahu, Molokai, Lanai, and Maui (Wagner et al. 1999, pp. 254-255). *A. adenophora* is a shrub 3 to 5 ft (1 to 1.5 m) tall with trailing branches that root on contact with soil. It forms dense mats which prevent regeneration of native plants (Anderson et al. 1992, p. 315; University of California 2006). It is considered a serious weed in agriculture, especially in rangeland, because it often replaces more desirable vegetation or native species, and is fatally toxic to horses and most livestock. The eupatorium gall fly, *Procecidochares utilis*, was introduced to Hawaii in 1944 for control of *A. adenophora*, and has been successful in suppression of most of the infestations (Bess and Haramoto 1959, p. 248).

Cecropia obtusifolia is a tree native to Central America, 16 to 33 ft (5 to 10 m) tall, up to possibly 49 ft (15 m) in Hawaii. It is naturalized in Hawaii in low elevation wet forest on the islands of Kauai, Oahu and Hawaii. This tree grows rapidly into the canopy, forming dense stands which inhibit the growth of other plants (Smith 1985, p. 187). Seeds are dispersed by frugivorous birds. It has not been considered for biological control (Smith 2006).

Clidemia hirta is a noxious shrub first cultivated prior to 1941 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 *C. hirta* is the *Colletrichum* 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 terminal growth-feeding insects called thrips (*Liothrips urichi*), but with lesser control success than the fungus (Smith 1989, p. 189).

Erechtites valerianifolia, a tall (up to 8 ft (2.5 m)) annual herb, is native to South America and is naturalized in Hawaii in wet, disturbed areas from sea level to 4,600 ft (0 to 1,400 m). Thousands of seeds produced by a single plant are dispersed widely by wind (Wagner et al. 1999a, p. 314). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

Hedychium gardnerianum is native to India (Nagata 1999, p. 1,623). This showy ginger was introduced for ornamental purposes, and was first collected in 1954 at Hawaii Volcanoes National Park (Wester 1992, p. 124). *H. gardnerianum* grows over 3.3 ft (1 m) tall in open light environments, preferring a warm moist climate; however it will readily grow in full shade beneath a forest canopy (Global Invasive Species Database (GISD) 2005a). It forms vast, dense colonies, displacing other plant species, and reproduces by rhizomes where already established. The conspicuous, fleshy, red seeds are dispersed by fruit-eating birds as well as man. Aircraft-based analysis shows that *H. gardnerianum* reduces the amount of nitrogen in the *Metrosideros* forest canopy in Hawaii, a finding subsequently corroborated by ground based sampling (Asner and Vitousek 2005). It may also block stream edges, altering water flow (GISD 2005a). *H. gardnerianum* can be controlled by herbicides, but biological control is considered the only practical approach for the long-term management of large infestations in native forests. The ability of the bacterium *Ralstonia* (= *Pseudomonas*) *solanacearum* to cause bacterial wilt in *H. gardnerianum* in the field, together with its lack of virulence in other ginger species, contributes to its potential as a biological control agent (Anderson and Gardner 1999, p. 95; Anderson 2003).

Juncus effusus is a perennial herb widely distributed in temperate regions and naturalized in Hawaii in ponds, streams, and open boggy sites. It was brought to Hawaii as a source of matting material, but grew too slowly to be of commercial value (Coffey 1999, pp. 1,451-1,452). This plant spreads by seeds and rhizomes, and forms dense mats that crowd out native plants (Pojar and Mackinnon 1994). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

Kalanchoe pinnata is an herb which is widely established in many tropical and subtropical areas. In Hawaii it was naturalized prior to 1871, and is abundant in low elevation disturbed areas on all the main islands except Niihau and Kahoolawe (Wagner et al. 1999a, p. 568). *K. pinnata* can reproduce vegetatively at indents along

the leaf, usually after the leaf has broken off the plant and is lying on the ground, where a new plant can take root. *K. pinnata* can form dense stands that prevent reproduction of native species (Starr 2006). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

Lantana camara, brought to Hawaii as an ornamental plant, is an aggressive, thicket-forming shrub which is now found on all of the main islands in mesic forest, dry shrubland, and other dry, disturbed habitats (Wagner et al. 1999a, p. 1,320). The most effective control agents are the lace bug *Teleonemia scrupulosa* Stal. (Tingidae); the chrysomelid beetles, *Octotoma scabripennis* Guerin-Meneville and *Uroplata girardi* Pic; and the moths, *Hypena strigata* F., *Neogalea sunia* (Guenee) (Noctuidae), and *Salbia haemorrhoidalis* Guenee (Pyralidae). While biological control of *L. camara* by most of the established insects appeared to have reached equilibrium by 1969, the overall impact has been a steady and considerable reduction in abundance of lantana, particularly in drought-prone areas. Although *L. camara* is considered generally to be under partial to substantial control in drier areas, it still remains a pest in some other environments, such as national parks (Hawaii Department of Agriculture 2006).

Melastoma candidum (*M. septemnerium*) 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). The fruit are dispersed by frugivorous birds (Smith 1985, p. 194). All plants in this genus are declared noxious in the State of Hawaii (HAR Title 4, Subtitle 6, Chapter 68). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

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 (OConnor 1999, p. 1,562). The mats it forms fuel more intense fires (Cuddihy and Stone 1990, p. 89). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

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 moist to wet disturbed sites along roadsides and in open fields (OConnor 1999, p. 1,576). It forms a dense ground cover even on acidic, low-nutrient soils (Pacific Island Ecosystems at Risk 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) and we are unaware of any control methods for this species beyond herbicide application and selective grazing (University of Hawaii 2013).

Passiflora tarminiana, a vine native to South America, is widely cultivated for its fruit (Escobar 1999, p. 1,012). First introduced to Hawaii in the 1920s, it is now a serious pest in mesic forest, where it overgrows and smothers the forest canopy. Seeds are readily dispersed by humans, birds, and feral pigs (LaRosa 1992, pp. 271, 281-282). Fallen fruit encourage rooting and trampling by pigs (LaRosa 1992, p. 283). Field releases of biocontrol insects have not been successful. Testing of fungi as biocontrol of this vine is ongoing (Gardner 2005).

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, *P. cattleianum* 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* (Brazilian scale), has undergone 15 years of testing, and there is a proposal to release this insect at Olaa Forest Reserve (ScienceDaily 2008).

Rubus argutus is native to the central and eastern United States, and is a serious weed that naturalizes in a

variety of disturbed habitats (Tunison 1991). It reproduces both vegetatively and by seed (Tunison 1991, pp. 1-2). *Rubus argutus* was introduced to Hawaii in the late 1800s and was quickly spread by birds (Wagner et al. 1999a, p. 1,107; Tunison 1991, p. 2). This taxon grows via runners underground, and readily resprouts from them if above ground tissue is treated with herbicide (U.S. Army 2006, pp. 2-1-212-1-22). Biological controls were introduced (moths, sawfly, and beetle), but the damage to this nonnative species so far has been negligible (Nagata and Markin 1986, p. 53).

Rubus ellipticus is native to India and widely grown as an ornamental in warm regions. This species has naturalized locally in the Volcano and Laupahoehoe areas of the island of Hawaii. It is a climbing shrub, covered with prickles and edible yellow fruit, and is readily dispersed by birds. This extremely thorny plant forms impenetrable thickets, threatening native ecosystems and the native Hawaiian raspberry species, *R. hawaiensis* (Benton 2005; GISD 2005b). *R. ellipticus* is on the Hawaii State noxious weed list (HAR Title 4, Subtitle 6, Chapter 68).

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), a related species, may be applicable (PIER 2006b; GISD 2006).

Schinus terebinthifolius, a shrub native to Brazil, was introduced to Hawaii in 1911 and is now naturalized in mesic areas (Wagner et al. 1999a, 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 (OConnor 1999, p. 1,590). 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). It is dormant during the rainy season, which Mueller-Dombois (1972, p. 19) 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, p. 31), but attempts to evaluate possible agents in Hawaii probably will be resisted by the sugar industry, as sugarcane (*Saccharum officinarum* L.) is a related species. We are unaware of any control methods for this species beyond herbicide application and control by selective grazing (University of Hawaii 2013).

Setaria palmifolia is native to tropical Asia and was first collected on Hawaii Island in 1903 (OConnor 1999, pp. 1,592-1,593). A large-leaved perennial herb, this species attains about 6.5 ft (2 m) in height at maturity, shading out native vegetation. *S. palmifolia* is resistant to fire and recovers quickly after being burned. Feral animals provide new areas for establishment by disturbing and opening areas in native vegetation (Cuddihy and Stone 1990, pp. 82-83). Chemical control methods are used currently, and no known biocontrol research is being conducted for this species (Motooka et al. 2003). We are unaware of any control methods for this species beyond herbicide application and control by selective grazing (University of Hawaii 2013).

Sphaeropteris cooperi, a tree fern native to Australia, is used in landscaping in Hawaii because it is faster growing and more tolerant of warmer, drier conditions than the native Hawaiian tree ferns, and has escaped from cultivation (Medeiros et al. 1992, pp. 30-31). It can achieve high densities in native Hawaiian forest,

grows up to 1 ft (0.3 m) in height per year, with maximum known heights of 39 ft (12 m) (Jones and Clemesha 1981, pp. 56-57), and can displace native species. Understory disturbance by pigs facilitates the establishment of *S. cooperi* (Medeiros et al. 1992, pp. 30-32). This species has been known to spread over seven miles (12 kilometers) by windblown dispersal of spores from plant nurseries (Medeiros et al. 1992, pp. 28-31; Palmer 2003, p. 245). We are unaware of any control methods for this species beyond herbicide application and mechanical control (University of Hawaii 2013).

Tibouchina herbacea, a member of the Melastomataceae family, is native to southern Brazil, Uruguay, and Paraguay. In Hawaii, it is naturalized and abundant in disturbed mesic to wet forest on the islands of Hawaii, Maui, and Lanai (Wagner et al. 1999a, p. 915). All members of this genus are legally declared noxious in the state of Hawaii (HAR Title 4, Subtitle 6, Chapter 68). Research is ongoing for biological controls of this species (Smith 1998; The Nature Conservancy 2008, p. 12).

Toona ciliata is a fast-growing tree, 66 to 98 ft (20 to 30 m) tall. It is native to India, southeastern Asia, and Australia, and is cultivated as a timber tree (Koala Native Plants 2006). In Hawaii it was first collected on Oahu in 1929, and was extensively planted. *T. ciliata* is a well branched shade tree with an open spreading crown. It has wind-dispersed seeds and is naturalized in mesic to wet disturbed habitats on Maui, Hawaii, Kauai, Oahu and Lanai (Wagner et al. 1999a, p. 920). We are unaware of any control methods for this species beyond herbicide application (BioNET-EAFRINET 2013).

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 were introduced from other parts of the world, and nearly 100 species have become pests (Smith 1985, p. 180; Wagner et al. 1999a, p. 45). Several studies (Cuddihy and Stone 1990, p. 74; Robichaux et al. 1998, p. 4) indicate nonnative plant species may outcompete native plants similar to *J. ascendens* ssp. *ascendens*. 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 *J. ascendens* ssp. *ascendens*, the U.S. Fish and Wildlife Service (FWS) believes nonnative plant species are a threat to this subspecies.

Landslides are a likely threat to the populations of *J. ascendens* ssp. *ascendens* at Waioli Valley on Kauai and Waikolu drainage on Molokai (HBMP 2008).

Conservation Measures Planned or Implemented :

On west Maui, construction of an ungulate exclosure fence in the Kahakuloa Game Management Area, funded through a FWS grant to the State Division of Forestry and Wildlife, may help prevent feral pigs from gaining access to the area where the Hononana population of one individual occurs (USFWS 2005a). The West Maui Mountain Watershed Partnership, a non-governmental, non-profit partnership composed of West Maui landowners and managers, received funding from the FWS for ungulate exclosure fences, which have been completed, and for ungulate and nonnative plant control, which is ongoing (USFWS 2004, 2005a, 2006a). These actions may provide protection to one population of 10 individuals of *Joinvillea ascendens* ssp. *ascendens* in the Puu Kukui Preserve in the west Maui Mountains. The East Maui Mountain Watershed Partnership, a non-governmental, non-profit partnership composed of east Maui landowners and managers, received funding from the FWS between 2005 and 2006 to complete a border fence for a 100,000 acre area (for exclusion of feral ungulates and weed control) (USFWS 2006b). This fencing provides some protection

to three populations (three individuals) of *J. ascendens* ssp. *ascendens* in the Koolau FR. On the island of Hawaii, the Olaa-Kilauea Partnership received FWS funds from 2004 to 2005 (through the Hawaiian Silversword Foundation) for restoration of native forest in areas previously grazed by cattle within the Kulani Correctional Facility. Restoration included ungulate enclosure fencing, weed control, and propagation and outplanting of native plants, and provides some protection to one individual of *J. ascendens* ssp. *ascendens* (Olaa-Kilauea Partnership 2005). Hawaii Volcanoes National Park has conducted outplanting of *J. ascendens* ssp. *ascendens*, but is having little success (Pratt, in litt. 2005). On Oahu, the Koolau Mountains Watershed Partnership was provided funding from the FWS from 2005 through 2009 for fencing and ungulate removal for the Helemano area, which benefits one population of three individuals (Koolau Mountains Watershed Partnership 2005-2009). Another Oahu population of three individuals occurs within fencing constructed by the U.S. Army Environmental Division, in cooperation with The Nature Conservancy (Honouliuli Preserve) for management of species included in the FWSs Biological Opinion routine training at the Makua Military Reservation (USFWS 1999). On Molokai, the one population of at least 24 individuals in Kamakou Preserve is protected by management actions taken by The Nature Conservancy (The Nature Conservancy 1998).

J. ascendens ssp. *ascendens* is represented in ex situ collections at Haleakala National Park, the Lyon Arboretum (approximately 281 individuals and 1,492 seeds in storage), the National Tropical Botanical Garden (NTBG), and at the Volcano Rare Plant Facility (1 individual from Puu Makaala) (USFWS 2005b; NTBG 2006; Sugii, in litt. 2006; PEP Program 2008, p. 103; Conry, in litt. 2012; Imoto, in litt. 2013). This species is difficult to propagate as seedlings are susceptible to fungal diseases (Moriyasu, in litt. 2009). According to State of Hawaii botanists, 103 individuals were out-planted on the island of Hawaii in 2012 (Imoto, in litt. 2013).

Summary of Threats :

Based on our evaluation of habitat degradation and loss by feral pigs, goats, deer, 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 *Joinvillea ascendens* ssp. *ascendens*, due to competition with nonnative plants for space, nutrients, water, and light. Predation by feral pigs, goats, deer, and rats is a likely threat to this species. Randomly occurring natural events, such as landslides, are a likely threat. 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 *Joinvillea ascendens* ssp. *ascendens* in areas of potentially suitable habitat.
- Control feral pigs, goats, and wild deer by removing these species from areas where *J. ascendens* ssp. *ascendens* populations exist and preventing reinvasion through the use of enclosures.
- Control alien plants through physical, mechanical, and biological control methods, as well as herbicides when necessary. Continue to conduct research into potential biocontrol species.
- 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	Taxonomy	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 subspecies is threatened by feral pigs, goats, and deer that degrade and destroy habitat, and by nonnative plants that outcompete and displace it. It is likely threatened by predation by feral pigs, goats, deer, and rats; and by randomly occurring natural events such as landslides. Only 9 of the 38 populations benefit from conservation measures. Threats to the wet to mesic *Metrosideros polymorpha-Acacia koa* lowland/montane forest habitat of *Joinvillea ascendens* ssp. *ascendens*, and to individuals of this species, occur throughout its range and are expected to continue or increase without control or eradication.

Imminence :

Threats to *Joinvillea ascendens* ssp. *ascendens* from feral pigs, goats, deer, rats, 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 subspecies 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. In addition, the FWS has provided funding for conservation actions that benefit *Joinvillea ascendens* ssp. *ascendens*, including construction of ungulate exclosures and for weed control on west Maui. On the island of Hawaii, the OIaa-Kilauea Partnership and Hawaii Volcanoes National Park have fenced and are out-planting this species. On Oahu, the Koolau Mountains Watershed Partnership has fenced an area that will provide some protection to this species. This species is represented in ex situ collections. 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 *J. ascendens* ssp. *ascendens* 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 in this form is based on the results of two meetings of 20 botanical experts held by the Center for Plant Conservation in December of 1995, and November 1996, and was updated by personal communication with Jack Jeffrey, FWS, in 1995. We incorporated additional new information on this species from information in our files and the Manual of Flowering Plants of Hawaii (Wagner et al. 1999a). In 2004, the Pacific Islands Office contacted the following species experts: Robert Hobdy, retired from DOFAW-Maui; Joel Lau, Hawaii Natural Heritage 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, NTBG. No new status or range information was provided. In 2005, we contacted species experts and confirmation of the status of *Joinvillea ascendens* ssp. *ascendens* was provided by Linda Pratt, U.S. Geological Survey Biological Resources Discipline, and Ken Wood, NTBG. In 2006, new status and range information was provided by Nellie Sugii, Lyon Arboretum; Wailana Moses, The Nature Conservancy of Hawaii; Hank Oppenheimer, Plant Extinction Prevention Program; and Lyman Perry, Hawaii Division of Forestry and Wildlife, and was incorporated into this assessment. In 2008, new status and range information was provided by Hank Oppenheimer, NTBG; Roy Kam, HBMP database manager; and Patti Welton, Haleakala National Park. In 2009, new information was provided by Pat Bily and Wailana Moses of The Nature Conservancy and Patrice Moriyasu of the Volcano Rare Plant Facility. In 2010, we received new information from Steve Perlman, NTBG; Nick Agorastos, Hawaii Division of Forestry and Wildlife; Kapua Kawelo, U.S. Army, Environmental Division; and Patti Welton, Haleakala National Park. In 2011, we contacted the species experts listed below and received new information from Clyde Imada, Bishop Museum, Botany Department; Kapua Kawelo, U.S. Army, Environmental Division; and Linda Pratt, U.S. Geological Survey Biological Resources Discipline. In 2012 we received information from the State and incorporated it into this form.

List all experts contacted in 2011:

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 USFWS, 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. Geological Survey, 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 subspecies 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 Rare (could be considered at risk) by Wagner et al. (1999b). *J. ascendens* ssp. *ascendens* is 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:

Hawaii

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

none

State Coordination:

On February 20, 2013, we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. We received information from the State on March 23 and April 12, 2013, and incorporated it into this report.

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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:



06/13/2013

Date

Concur:



10/28/2013

Date

Did not concur:

Date

Director's Remarks: