

Species		Historic range	Family	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
<i>Cyrtandra viridiflora</i>	Ha'iwale	U.S.A. (HI)	Gesneriaceae—African violet.	E	591	NA	NA
<i>Delissea subcordata</i>	'Oha	U.S.A. (HI)	Campanulaceae—Bell-flower.	E	591	NA	NA
<i>Eragrostis fosbergii</i>	None	U.S.A. (HI)	Poaceae—Grass	E	591	NA	NA
<i>Gardenia mannii</i>	Nanu	U.S.A. (HI)	Rubiaceae—Coffee	E	591	NA	NA
<i>Labordia cyrtandrae</i>	Kamakahala	U.S.A. (HI)	Loganiaceae—Logania	E	591	NA	NA
<i>Lepidium arbuscula</i>	'Anaunau	U.S.A. (HI)	Brassicaceae—Mustard	E	591	NA	NA
<i>Lobelia gaudichaudii</i>	None	U.S.A. (HI)	Campanulaceae—Bell-flower.	E	591	NA	NA
<i>Lobelia monostachya</i>	None	U.S.A. (HI)	Campanulaceae—Bell-flower.	E	591	NA	NA
<i>Melicope saint-johnii</i>	Alani	U.S.A. (HI)	Rutaceae—Rue	E	591	NA	NA
<i>Myrsine juddii</i>	Kolea	U.S.A. (HI)	Myrsinaceae—Myrsine	E	591	NA	NA
<i>Phyllostegia hirsuta</i>	None	U.S.A. (HI)	Lamiaceae—Mint	E	591	NA	NA
<i>Phyllostegia kaalaensis</i>	None	U.S.A. (HI)	Lamiaceae—Mint	E	591	NA	NA
<i>Pritchardia kaalae</i>	Loulu	U.S.A. (HI)	Arecaceae—Palm	E	591	NA	NA
<i>Schiedea kealiae</i>	None	U.S.A. (HI)	Caryophyllaceae—Pink	E	591	NA	NA
<i>Trematolobelia singularis</i>	None	U.S.A. (HI)	Campanulaceae—Bell-flower.	E	591	NA	NA
<i>Viola oahuensis</i>	None	U.S.A. (HI)	Violaceae—Violet	E	591	NA	NA

Dated: September 24, 1996.  
 John G. Rogers,  
 Acting Director, Fish and Wildlife Service.  
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 BILLING CODE 4310-55-P

**50 CFR Part 17**  
**RIN 1018-AD58**  
**Endangered and Threatened Wildlife and Plants; Determination of Endangered or Threatened Status for Fourteen Plant Taxa From the Hawaiian Islands**  
**AGENCY:** Fish and Wildlife Service, Interior.  
**ACTION:** Final rule.

**SUMMARY:** The U.S. Fish and Wildlife Service (Service) determines endangered status pursuant to the Endangered Species Act of 1973, as amended (Act), for 13 plant taxa—*Achyranthes mutica* (No common name (NCN)), *Cenchrus agrimonioides* (kamanomano), *Cyanea grimesiana* ssp. *grimesiana* (haha), *Cyperus trachysanthos* (pu'uka'a), *Euphorbia haeleleana* (NCN), *Isodendron laurifolium* (aupaka), *Panicum niihauense* (lau 'ehu), *Phyllostegia*

*parviflora* (NCN), *Platanthera holochila* (NCN), *Sanicula purpurea* (NCN), *Schiedea hookeri* (NCN), *Schiedea kauaiensis* (NCN), and *Schiedea nuttallii* (NCN). The Service also determines threatened status for *Isodendron longifolium* (aupaka). The 14 taxa are endemic to the Hawaiian Islands and are now known from one or more of the following Hawaiian Islands—Niihau, Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii. The 14 plant taxa and their habitats have been variously affected or are currently threatened by one or more of the following—competition, predation or habitat degradation from alien species, human impacts, fire, and natural disasters. This final rule implements the

Federal protection provisions provided by the Act.

**EFFECTIVE DATE:** This rule takes effect November 12, 1996.

**ADDRESSES:** The complete file for this rule is available for inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Pacific Islands Office, 300 Ala Moana Boulevard, Room 3108, P.O. Box 5088, Honolulu, Hawaii 96850.

**FOR FURTHER INFORMATION CONTACT:** Brooks Harper, Field Supervisor, Ecological Services, Pacific Islands Ecoregion (see **ADDRESSES** section) (telephone: 808/541-3441; facsimile: 808/541-3470).

**SUPPLEMENTARY INFORMATION:**

Background

*Achyranthes mutica*, *Cenchrus agrimonoides*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyperus trachysanthos*, *Euphorbia haelealeana*, *Isodendron laurifolium*, *Isodendron longifolium*, *Panicum niihauense*, *Phyllostegia parviflora*, *Platanthera holochila*, *Sanicula purpurea*, *Schiedea hookeri*, *Schiedea kauaiensis*, and *Schiedea nuttallii* are, or were, known from 10 Hawaiian Islands—Laysan, Midway, Kure, Niihau, Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii. The current and historical distribution by island is presented in Table 1 for each of the 14 taxa.

TABLE 1. SUMMARY OF ISLAND DISTRIBUTION OF THE TAXA

Species	Hawaiian Island									
	Kure	Maui	Laysan	Niihau	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
<i>Achyranthes mutica</i> .....					H					C
<i>Cenchrus agrimonoides</i> .....	H	H	H			C		H	C	H?
<i>Cyanea grimesiana</i> ssp. <i>grimesiana</i> .....						C	C	C	C	
<i>Cyperus trachysanthos</i> .....				C	C	C	H	H		
<i>Euphorbia haelealeana</i> .....					C	C				
<i>Isodendron laurifolium</i> .....					C	C				
<i>Isodendron longifolium</i> .....					C	C				
<i>Panicum niihauense</i> .....				H	C					
<i>Phyllostegia parviflora</i> .....						C			H	H
<i>Platanthera holochila</i> .....					C	H	C		C	
<i>Sanicula purpurea</i> .....						C			C	
<i>Schiedea hookeri</i> .....						C			H	
<i>Schiedea kauaiensis</i> .....					C					
<i>Schiedea nuttallii</i> .....					C	C				

Key:

- C—current; population last observed within the past 20 years.
- H—historical; population not seen for over 20 years.
- ?—questionable locality or inconsistent information in sources.

The Hawaiian archipelago includes eight large volcanic islands (Niihau, Kauai, Oahu, Molokai, Lanai, Kahoolawe, Maui, and Hawaii), as well as offshore islets, shoals, and atolls set on submerged volcanic remnants at the northwestern end of the chain (the Northwestern Hawaiian Islands, including Laysan, Midway, and Kure). The archipelago covers a land area of about 16,600 square kilometers (sq km) (6,400 sq miles (mi)), extending roughly between latitude 18°50' and 28°15' N and longitude 154°40' and 178°70' W, and ranging in elevation from sea level to 4,200 meters (m) (13,800 feet (ft)) (Department of Geography 1983). The regional geological setting is a mid-oceanic volcanic island archipelago set in a roughly northwest to southeast line, with younger islands to the southeast. The youngest island, Hawaii, is volcanically active. The older islands are increasingly eroded, so that the

basaltic portions of many of the north westernmost islands (such as Laysan, Midway, and Kure) are entirely submerged, and coralline atolls and shoals are often all that remain above sea level (Macdonald *et al.* 1986). The topography of the Hawaiian Islands is extremely diverse. On the youngest islands, Hawaii and Maui, gently sloping unweathered shield volcanoes with very poor soil development are juxtaposed with older, heavily weathered valleys with steep walls, well-developed streams, and gently sloped flood plains. The older islands to the northwest (Niihau, Kauai, Oahu, and Molokai) are generally more weathered. On a typical older island, sea cliffs and large amphitheater-headed valleys on the windward (northeast) side contrast with erosionally younger, dissected slopes on the leeward (southwest) side (Department of Geography 1983).

The climate of the Hawaiian Islands reflects the tropical setting buffered by the surrounding ocean (Department of Geography 1983). The prevailing winds are northeast trade winds with some seasonal fluctuation in strength. The islands also experience winter storm systems and occasional hurricanes. Annual rainfall varies greatly by location, with marked windward to leeward gradients over short distances. Minimum average annual rainfall is less than 250 millimeters (mm) (10 inches (in.)); the maximum average precipitation is well in excess of 11,000 mm (450 in.) per year. Precipitation is greatest during the months of October through April. A dry season is apparent in leeward settings, while windward settings generally receive trade wind-driven rainfall throughout the year (Department of Geography 1983).

The native-dominated vegetation of the Hawaiian Islands varies greatly

according to elevation, moisture regime, and substrate. Within the nearly 100 recognized native vegetation types are numerous island-specific or region-specific associations, comprising an extremely rich array of vegetation types over a very limited geographic area. Major vegetation formations include forests, woodlands, shrublands, grasslands, herblands, and pioneer associations on lava and cinder substrates (Gagné and Cuddihy 1990).

In Hawaii, lowland, montane, and subalpine forest types extend from sea level to above 3,000 m (9,800 ft) in elevation. Coastal and lowland forests are generally dry or mesic and may be open- or closed-canopied. The stature of lowland forests is generally under 10 m (30 ft). Ten of the taxa in this final rule (*Achyranthes mutica*, *Cenchrus agrimonoides* var. *agrimonioides*, *Cyanea grimesiana* ssp. *grimesiana*, *Euphorbia haeleleana*, *Isodendron laurifolium*, *I. longifolium*, *Panicum niuhauense*, *Schiedea hookeri*, *S. nuttallii*, and *S. kauaiensis*) have been reported from lowland dry or mesic forest habitat. *C. agrimonoides* var. *laysanensis* has been reported from dry coastal strand vegetation. Four taxa (*I. laurifolium*, *I. longifolium*, *Phyllostegia parviflora*, and *Sanicula purpurea*) have been reported from lowland wet forest habitat. One taxon, *Cyperus trachysanthos*, has been reported from wet sites on coastal cliffs or talus slopes. Montane wet forests, occupying elevations between 915 and 1,830 m (3,000 and 6,000 ft), occur on the windward slopes and summits of the islands of Kauai, Oahu, Molokai, Maui, and Hawaii. The forests may be open- to closed-canopied, and may exceed 20 m (65 ft) in height. Montane wet forests are usually dominated by several species of native trees and tree ferns. *Platanthera holochila*, has been reported from montane wet forest habitat. Montane bogs, found on Kauai, Molokai, Maui, and Hawaii, occur primarily on flat or gently sloping terrain with impervious substrates between 915 and 1,830 m (3,000 and 6,000 ft) in elevation. The vegetation of most of these bogs consists of an irregular, hummocky cushion of sedges, with *Metrosideros polymorpha* ('ohi'a) usually a codominant. Two taxa, *P. holochila* and *S. purpurea*, have been reported from montane bog habitats. Hawaiian shrublands are also found from coastal to alpine elevations. The majority of Hawaiian shrubland types are in dry and mesic settings, or on cliffs and slopes too steep to support trees. Only one of the taxa, *P. niuhauense*, has been reported from coastal dry shrubland habitat, on Kauai.

The land that supports these 14 plant taxa is owned by various private parties, the City and County of Honolulu, the State of Hawaii (including State parks, forest reserves, natural area reserves, and Hawaiian Home Lands), and the Federal government (Department of Defense (DOD)).

#### Discussion of the 14 Plant Taxa

*Achyranthes mutica* was first described by Asa Gray in 1867 based on a specimen collected on Kauai between 1851 and 1855 by Ezechiel Jules Remy, a French naturalist and ethnologist (St. John 1979, Wagner *et al.* 1990).

*Achyranthes nelsonii* (St. John 1979) is considered to be synonymous with *A. mutica* by the authors of the current treatment of Hawaiian members of the family (Wagner *et al.* 1990).

*Achyranthes mutica*, a member of the amaranth family (Amaranthaceae), is a many-branched shrub with stems ranging from 30 to 60 centimeters (cm) (12 to 24 in.) long. The opposite leaves, usually 3.2 to 4 cm (1.3 to 1.6 in.) long and 1.5 to 2 cm (0.6 to 0.8 in.) wide, are inversely egg-shaped to elliptic or inversely lance-shaped. The stalkless flowers are arranged in spikes (flowers directly attached to the main flower axis) that are 0.4 to 1.5 cm (0.2 to 0.6 in.) long. The apetalous (lacking petals) flowers are perfect (containing both female and male parts). The sepals are of unequal length, 3 to 4.2 mm (0.1 to 0.2 in.) long, and have sharply pointed tips. This species is distinguished from others in the genus by the shape and size of the sepals and by characteristics of the spike, which is short and congested (Wagner *et al.* 1990).

Historically *Achyranthes mutica* was known from three collections from opposite ends of the main archipelago, Kauai and Hawaii (Hawaii Heritage Program (HHP) 1994c1, 1994c2; Hawaii Plant Conservation Center (HPCC) 1992a). Currently this species is known only from the Keawewai Stream area in the Kohala Mountains of Hawaii on private land. Between 20 and 50 plants are growing at an elevation of about 920 m (3,030 ft) in an *Acacia koaia* (koa'i'a) lowland dry forest with *Dodonaea viscosa* ('a'ali'i), *Myoporum sandwicense* (naio), *Nestegis sandwicensis* (olopua), *Osteomeles anthyllidifolia* ('ulei), and *Sophora chrysophylla* (mamane) (HPCC 1992a).

The primary threats to the single remaining population of *Achyranthes mutica* are habitat degradation and/or destruction by ungulates such as cattle (*Bos taurus*) and feral goats (*Capra hircus*), competition with alien plant taxa, and a risk of extinction from naturally occurring events (such as

landslides or hurricanes) and/or reduced reproductive vigor, due to the small number of existing individuals in a single remaining population (HPCC 1992a; Christa Russell, The Nature Conservancy of Hawaii (TNCH), pers. comm. 1994).

Louis C.A. von Chamisso, a botanist on the Russian vessel *Rurik*, first collected *Cenchrus agrimonoides* on Oahu during a world exploring expedition between 1816 and 1817. Carl Bernhard von Trinius described the species several years later (Degener and Whitney 1937). Other published names considered synonymous with *C. agrimonoides* include *C. calyculatus* var. *uniflorus*, *C. laysanensis*, and *C. pedunculatus* (O'Connor 1990). Currently, two varieties are recognized—the nominate variety and variety *laysanensis*, which was described by F.B. Brown (1931).

*Cenchrus agrimonoides*, a member of the grass family (Poaceae), is a perennial grass with stems 0.3 to 2 m (1 to 6.7 ft) tall. The leaf blades, 20 to 40 cm (8 to 16 in.) long and 5 to 25 mm (0.2 to 1 in.) wide, are flat or folded and have a prominent midrib. The inflorescence (flower cluster) is a raceme (an unbranched, indeterminate inflorescence with flowers arranged along the axis) 5 to 10 cm (2 to 4 in.) long, bearing cylindrical to lance-shaped burs 8 to 18 mm (0.3 to 0.7 in.) long. The burs are densely hairy with an outer series of numerous, somewhat spreading bristles. Each bur partially envelops one spikelet (ultimate flower cluster). This species is distinguished from others in the genus by the cylindrical to lance-shaped bur and the arrangement and position of the bristles. *C. a.* var. *agrimonioides* differs from var. *laysanensis* in generally having smaller burs, shorter stems, and narrower leaves (O'Connor 1990).

Historically *Cenchrus agrimonoides* var. *agrimonioides* was known from the following general areas—the Waianae Mountains of Oahu, Kaaukuu on Lanai, and the south slope of Haleakala and Ulupalakua on Maui. It may possibly have occurred on the island of Hawaii; undocumented observations of this taxon have been reported from unspecified locations on this island (HHP 1994d1 to 1994d14, Hillebrand 1888). Currently *C. a.* var. *agrimonioides* is known from Oahu and Maui. In the Waianae Mountains on Oahu, approximately 25 individuals are found in the following populations—Pahole Gulch in the State's Pahole Natural Area Reserve (NAR), Makaha-Waianae Kai Ridge on City and County of Honolulu land, Kahanahaiki Valley on State land leased by the DOD for the Makua

Military Reservation, east Makaleha on State land, and Puulii drainage on private land in TNCH's Honouliuli Preserve (HHP 1994d1, 1994d8, 1994d11, 1994d12, 1994d14). On Maui, a patch of *C. a.* var. *agrimonioides* plants, 0.9 sq m (10 sq ft) in size, is known from State land within Kanaio NAR (Robert Hobdy, Division of Forestry and Wildlife (DOFAW), pers. comm. 1994). The number of individuals statewide totals fewer than 100. *Cenchrus agrimonioides* var. *agrimonioides* is usually found on dry rocky ridges or slopes, or ridges in mesic 'ohi'a-koa forest between 560 and 820 m (1,830 and 2,700 ft) in elevation. Associated plant taxa include *Alyxia oliviformis* (maile), *Psydrax odoratum* (alahe'e), *Carex* sp., *Diospyros* sp. (lama), and *Eragrostis variabilis* (kawelu) (HHP 1994d8, 1994d11, 1994d12, 1994d14; R. Hobdy, pers. comm. 1994).

The other variety of this species, *Cenchrus agrimonioides* var. *laysanensis*, was known historically from the northwestern Hawaiian islands of Laysan, Kure, and Midway, all within the Northwestern Hawaiian Islands National Wildlife Refuge. This variety has not been seen since 1973. These islands are infrequently surveyed for plants, the last comprehensive survey being completed in the 1980s, so it is possible that the variety still exists and will be found with further survey efforts (Corn 1980; HHP 1991a1, 1991a2).

The major threats to *Cenchrus agrimonioides* var. *agrimonioides* are habitat degradation and/or destruction by feral pigs (*Sus scrofa*) (Oahu only), competition with alien plant taxa, and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of existing individuals. The Pahole Gulch population on Oahu is potentially threatened by trampling and fire from military activities and the Maui population is potentially threatened by goats and cattle (HHP 1994d1, 1994d8, 1994d11, 1994d12, 1994d14; R. Hobdy and C. Russell, pers. comm. 1994). Listing of *Cenchrus agrimonioides* protects both varieties.

*Cyanea grimesiana* ssp. *grimesiana* was collected by Charles Gaudichaud-Beaupré in 1819 on Oahu while he was pharmaceutical botanist on the vessel *Uranie* (HHP 1989a, Rock 1919, Wagner *et al.* 1990). Gaudichaud later described this taxon and named it for the French Navy's head pharmacist (Thomas G. Lammers, Field Museum, pers. comm. 1994). Other published names considered synonymous with *Cyanea grimesiana* ssp. *grimesiana* include *C. grimesiana* var. *lydgatei*, *C. grimesiana*

var. *mauiensis*, *C. grimesiana* var. *munroi*, and *C. lobata* var. *hamakuae* (Lammers 1990). Currently, three subspecies are recognized—the extinct ssp. *cylindrocalyx* (Rock 1917); ssp. *grimesiana*; and the federally endangered ssp. *obatae* (St. John 1978a).

*Cyanea grimesiana* ssp. *grimesiana*, a member of the bellflower family (Campanulaceae), is a shrub 1 to 3.2 m (3.3 to 10.5 ft) tall. The leaves are pinnately divided, with 9 to 12 segments per side. The leaf blades are 27 to 58 cm (10.6 to 22.9 in.) long and 14 to 32 cm (5.5 to 12.6 in.) wide (across the segments). The inflorescence comprises 6 to 12 flowers. The calyx lobes, 10 to 44 mm (0.4 to 2 in.) long and 4 to 14 mm (0.2 to 0.55 in.) wide, are egg-shaped to lance-shaped and overlap at the base. The petals are purplish or greenish to yellowish white, often suffused or striped with magenta, and 55 to 80 mm (2 to 3 in.) long. The orange berries are 18 to 30 mm (0.7 to 1.2 in.) long. This species is distinguished from others in this endemic Hawaiian genus by the pinnately lobed leaf margins and the width of the leaf blades. This subspecies is distinguished from the other two subspecies by the shape and size of the calyx lobes, which overlap at the base (Lammers 1990).

Historically *Cyanea grimesiana* ssp. *grimesiana* was known from at least 40 populations located in the Waianae and Koolau mountains on Oahu, Wailau Valley and Puu Kahea on Molokai, central and northern Lanai, and scattered locations on Maui (HHP 1994e1 to 1994e39; Heidi Bornhorst, TNCH, and Steven Perlman, National Tropical Botanical Garden, *in litt.* 1992). Currently *C. g.* ssp. *grimesiana* is known from 14 populations on those 4 islands (HHP 1994e1, 1994e4, 1994e6 to 1994e8, 1994e14, 1994e15, 1994e26, 1994e27, 1994e34, 1994e36 to 1994e38; H. Bornhorst and S. Perlman, *in litt.* 1992). On Oahu, the following populations are known from the Waianae Mountains—one population from Mt. Kaala NAR and three populations from Pahole NAR on State land, one population each from North Haleauau Gulch on the federally owned Schofield Barracks Military Reservation and North Kaluaa Gulch on private land. Two populations are known from Oahu's Koolau Mountains on State and private land (HHP 1994e1, 1994e4, 1994e8, 1994e14, 1994e15, 1994e34, 1994e38; H. Bornhorst and S. Perlman, *in litt.* 1992). On Molokai, one population is known from Kukuinui Ridge on State land and the other is within the State's Olokui NAR (HHP 1994e7, 1994e36). On Lanai, two

populations are known from Kaiholena Gulch and an unnamed gulch south of Puhielelu Ridge, in the central portion of the island, both on private land (HHP 1994e27, 1994e37). On Maui, two populations are known from Iao Valley on private land. A population previously reported in lower Kipahulu Valley within Haleakala National Park has been determined to be *C. asplenifolia*, based on recently available flowering material (HHP 1994e6, 1994e26; Lloyd Loope, National Biological Service (NBS), *in litt.* 1995; Art Medeiros, NBS, pers. comm. 1995). The total current populations statewide consist of fewer than 50 individuals (HHP 1994e1, 1994e4, 1994e8, 1994e14, 1994e15, 1994e34, 1994e38; H. Bornhorst and S. Perlman, *in litt.* 1992). *C. g.* ssp. *grimesiana* is typically found in mesic forest often dominated by 'ohi'a or o'hi'a and koa, or on rocky or steep slopes of stream banks, and between 350 and 945 m (1,150 and 3,100 ft) elevation. Associated plant taxa include *Antidesma* sp. (hame), *Bobea* sp. ('ahakea), *Psychotria* sp. (kopiko), *Xylosma* sp. (maua), and various native and alien ferns (HHP 1994e1, 1994e7, 1994e8, 1994e14, 1994e34, 1994e37; H. Bornhorst and S. Perlman, *in litt.* 1992).

The major threats to *Cyanea grimesiana* ssp. *grimesiana* are habitat degradation and/or destruction caused by wild and feral ungulates (axis deer (*Axis axis*), goats, and pigs) and competition with various alien plants. Potential overcollection, trampling by hikers and/or military activities, and fire threaten the Palikea population on Oahu. The Oahu populations are also threatened by landslides (HHP 1994e1, 1994e7, 1994e34, 1994e37; H. Bornhorst and S. Perlman, *in litt.* 1992; Loyal Mehrhoff, U.S. Fish and Wildlife Service, pers. comm. 1995). Rats (*Rattus* spp.) are also a potential threat, since they are known to eat the fruits and girdle the stems of species in the bellflower family (Joel Lau, TNCH, pers. comm. 1994).

First collected by Chamisso between 1816 and 1817 in the "Sandwich Islands," *Cyperus trachysanthos* was described by William J. Hooker and G.A.W. Arnott in 1832 (Hillebrand 1888, Mill *et al.* 1988). This species has been maintained in the most recent treatment of Hawaiian members of the genus (Koyama 1990). The specific epithet refers to the rough or papery flowers.

*Cyperus trachysanthos*, a member of the sedge family (Cyperaceae), is a perennial grass-like plant with a short rhizome (underground stem). The culms (aerial stems) are densely tufted, obtusely triangular, 20 to 45 cm (8 to 18 in.) tall, sticky, and leafy at the base.

The linear leaf blades are green, covered with a waxy coating, and somewhat leathery. The leaf sheath is yellowish brown and partitioned with nodes. The flower clusters are 5 to 9 cm (2 to 3.5 in.) long and 6 to 12 cm (2 to 5 in.) wide. Each flower head contains 10 to 30 pale yellowish brown spikelets, each of which contains 8 to 20 flowers. The glumes (small pair of bracts at the base of each spikelet) are broadly egg-shaped. The fruit is a dark brown, egg-shaped achene. This species is distinguished from others in the genus by the short rhizome, the leaf sheath with partitions at the nodes, the shape of the glumes, and the length of the culms (Koyama 1990).

Historically *Cyperus trachysanthos* was known from Niihau, Kauai, scattered locations on Oahu, Mauna Loa on Molokai, and Kaena on Lanai (HHP 1994f1 to 1994f15, HPCC 1993a). Currently this species is known from 3 populations on Niihau, Kauai, and Oahu with an estimated total of less than 350 individuals (HHP 1994f1, 1994f5; HPCC 1993a). On privately owned Niihau, an unknown number of individuals is known from an area west of Mokouia Valley (HHP 1994f5). On Kauai, more than 300 individuals are known from State land in Nualolo Valley, while on Oahu an unspecified number of individuals is known from State land at Kaena Point (HHP 1994f1, HPCC 1993a). *C. trachysanthos* is usually found in wet sites (mud flats, wet clay soil, or wet cliff seeps) on coastal cliffs or talus slopes between 3 and 160 m (10 and 525 ft) elevation (HHP 1994f1, 1994f5; HPCC 1993a; Koyama 1990). On Kauai, associates include *Hibiscus tiliaceus* (hau), *Plantago lanceolata* (narrow-leaved plantain), and *Pteris vittata* (HPCC 1993a).

*Cyperus trachysanthos* is threatened by a risk of extinction from naturally occurring events due to the small number of populations, goats on Kauai (Kenneth Wood, National Tropical Botanical Garden, pers. comm. 1996) and competition with alien plant species on Oahu and Kauai (HHP 1994f1; J. Lau and C. Russell, pers. comms. 1994).

In 1970, Steven Montgomery and the late Wayne Gagné collected a specimen of an unidentified tree in Mahanaloa Valley on Kauai. The following year, Derral Herbst (1971) described it as *Euphorbia haeleleana*, naming it for another valley where the plant grows. This species has been maintained in the most recent treatment of Hawaiian members of the genus (Wagner *et al.* 1990).

*Euphorbia haeleleana*, a member of the spurge family (Euphorbiaceae), is a

dioecious (female and male flowers on separate plants) tree 3 to 14 m (10 to 46 ft) tall. The alternate leaves are papery in texture, elliptic, and usually 10 to 15 cm (4 to 6 in.) long and 4 to 6 cm (2 in.) wide. Male trees bear many small male flowers within a cyathium (a compact inflorescence with small individual flowers). The female trees have cyathia with a single female flower surrounded by numerous abortive male flowers. The capsules (dry fruit that open at maturity) are round. This species is distinguished from others in the genus in that it is a tree, whereas most of the other species are herbs or shrubs, as well as by the large leaves with prominent veins (Wagner *et al.* 1990).

*Euphorbia haeleleana* is known historically and currently from 15 populations and between 450 and 625 individuals from northwestern Kauai and the Waianae Mountains of Oahu (HHP 1994g1 to 1994g14, HPCC 1993b). On Kauai, 11 populations are known from valley slopes and cliffs along Kauai's northwestern coast from Pohakuao to Haelele Valley and Hipalau Valley within Waimea Canyon. All of the Kauai populations occur on State land, including Kuia NAR and the Na Pali Coast State Park (HHP 1994g1 to 1994g4, 1994g7 to 1994g9, 1994g11, 1994g12, 1994g14; HPCC 1993b). On Oahu, four populations are known from the northern Waianae Mountains. Three of these populations occur on State land leased by the DOD for the Makua Military Reservation, and the fourth population occurs on privately owned land (HHP 1994g5, 1994g6, 1994g10, 1994g13). *Euphorbia haeleleana* is usually found in lowland mixed mesic or dry forest that is often dominated by 'ohi'a, 'ohi'a and koa, lama, or *Aleurites moluccana* (kukui). Typically found between 205 and 670 m (680 and 2,200 ft) elevation, a few populations have been found at elevations up to 870 m (2,860 ft). Associated plant taxa include 'a'ali'i, *Erythrina sandwicensis* (wiliwili), *Pleomele* sp. (hala pepe), *Reynoldsia sandwicensis* ('ohe), and *Sapindus oahuensis* (aulu) (HHP 1994g1 to 1994g14, HPCC 1993b).

Habitat degradation and/or destruction by wild and feral ungulates including black-tailed deer (*Odocoileus hemionus*), goats, and pigs; predation by rats; fire; potential military activities; and competition with alien plant taxa seriously threaten *Euphorbia haeleleana* (HHP 1994g1, 1994g3 to 1994g7, 1994g10, 1994g12 to 1994g14; HPCC 1993b).

*Isodendrion laurifolium* was first described by Gray in 1852 based on a collection made on Oahu by members of

the U.S. Exploring Expedition in 1840 (St. John 1952). Other published names considered synonymous with *I. laurifolium* are *I. forbesii*, *I. lydgatei*, *I. subsessilifolium*, and *I. waianaense* (Wagner *et al.* 1990). The specific epithet refers to the resemblance in the leaves to those of the laurel tree (*Laurus* sp.).

*Isodendrion laurifolium*, a member of the violet family (Violaceae), is a slender, straight shrub, generally 1 to 2 m (3 to 6 ft) tall, with few branches. The leaves, 4 to 16 cm (2 to 6 in.) long and 1.5 to 5 cm (0.6 to 2 in.) wide, are somewhat leathery, oblong-elliptic, narrowly elliptic lance-shaped, or rarely elliptic. The fragrant flowers are perfect and borne singly along the stems. The five petals, which are clawed and somewhat unequal, are purple with greenish white edges externally, and dusty purple on the inner face of the lobe. The fruit is a green, lance-shaped capsule. This species is distinguished from others in this endemic Hawaiian genus by the shape of its leaves (Wagner *et al.* 1990).

Historically *Isodendrion laurifolium* was known from scattered locations on Kauai and both the Waianae and Koolau mountains of Oahu (HHP 1994h1 to 1994h21). A total of 14 populations on 2 islands comprising approximately 190 to 210 individuals is currently known statewide. On Kauai, approximately 130 to 140 individuals are known from 8 populations in the following locations—Paaiki, Kawaiula, Haelele, Makaha, Poopooiki, and Kuia valleys, and the Koaie branch of Waimea Canyon. All Kauai populations occur on State-owned land, with several in Kuia NAR (HHP 1994h6, 1994h9 to 1994h13, 1994h15, 1994h21). On Oahu, approximately 60 to 70 individuals of this species are known from 6 populations—Makaha in the Waianae Mountains, on City and County of Honolulu land; East Makaleha Valley, Waianae Kai, Kaawa Gulch, and Kaumokunui Gulch in the Waianae Mountains, on State land, including Mt. Kaala NAR; and south Kaukonahua Gulch within the federally owned Schofield Barracks Military Reservation in the Koolau Mountains (HHP 1994h1, 1994h2, 1994h16, 1994h17, 1994h18, 1994h20). *Isodendrion laurifolium* is usually found between 490 and 820 m (1,620 and 2,700 ft) elevation in diverse mesic forest, or rarely wet forest, dominated by 'ohia' or koa-'ohia', or 'ohia'-lama with hame, maua, *Hedyotis terminalis* (manono), *Pisonia* sp. (papala kepau), and *Pouteria* sp. ('a'ali'i) (HHP 1994h1, 1994h2, 1994h6, 1994h9 to 1994h13, 1994h15 to 1994h18, 1994h20).

The primary threats to *Isodendron laurifolium* are habitat degradation by ungulates (black-tailed deer, goats, and pigs), competition with alien plant taxa, and a potential threat from military activities (HHP 1994h2, 1994h6, 1994h9, 1994h11, 1994h15 to 1994h18, 1994h20, 1994h21).

*Isodendron longifolium* was first collected in 1840 in the "Kaala" [Waianae] Mountains of Oahu by members of the U.S. Exploring Expedition. Gray later named this species for its long leaves (St. John 1952). *Isodendron christensenii* and *I. maculatum* (St. John 1952, 1978b) are considered synonymous with *I. longifolium* (Wagner *et al.* 1990).

*Isodendron longifolium*, a member of the violet family, is a slender, straight shrub generally 0.6 to 2 m (2 to 7 ft) tall. The hairless, somewhat leathery leaves are lance-shaped, 10 to 30 cm (4 to 12 in.) long, and 3.4 to 6.5 cm (1 to 3 in.) wide. The fragrant flowers are perfect and are borne singly along the branches. The five petals are purple, clawed, and somewhat unequal. The purple capsular fruit is 10 mm (0.4 in.) long. This species is distinguished from others in this endemic Hawaiian genus by the shape of its leaves (Wagner *et al.* 1990).

Historically *Isodendron longifolium* was known from scattered locations on Kauai and the Waianae Mountains on Oahu (HHP 1994i1 to 1994i18; HPCC 1990a; Lorence and Flynn 1991, 1993). Currently *I. longifolium* is known from 18 populations on Kauai and Oahu. On Kauai, 15 populations totalling 500 to 800 individuals are scattered over ridges and valley slopes of northwestern Kauai. Eight populations occur on private land and seven are found on State land, which includes Hono O Na Pali NAR and the Na Pali Coast State Park (HHP 1994i3 to 1994i5, 1994i7 to 1994i13, 1994i15 to 1994i17; HPCC 1990a; Lorence and Flynn 1991, 1993). Three populations totalling 30 to 40 individuals are known from Oahu. Two populations are found within Mt. Kaala NAR on State-owned land in the Waianae Mountains, and the third population is found in Makaua Gulch on private land in the Koolau Mountains (HHP 1994i2, 1994i14, 1994i18). The total current populations throughout the State consist of fewer than 1,000 individuals, with most of the populations and individuals occurring on Kauai. *Isodendron longifolium* is found on steep slopes, gulches, and stream banks in mixed mesic or wet òhia forest, usually between 410 and 760 m (1,345 and 2,500 ft) elevation. Associated plant taxa include 'ahakea, hame, *Cyanea* sp. (haha), *Hedyotis* sp., *Perrottetia sandwicensis* (olomea), and

*Pittosporum* sp. (ho'awa) (HHP 1994i2 to 1994i8, 1994i10 to 1994i18; HPCC 1990a; Lorence and Flynn 1991, 1993).

The major threats to *Isodendron longifolium* are habitat degradation and/or destruction by feral goats and pigs and competition with various alien plant taxa. On Oahu, the Palikea Gulch population is potentially threatened by overcollection and fire (HHP 1994i2, 1994i13, 1994i15 to 1994i17; HPCC 1990a; Lorence and Flynn 1993).

In 1912, J.F. Stokes collected a grass on Niihau that St. John later named *Panicum niihauense* (St. John 1931). This species has been maintained in the most recent treatment of Hawaiian members of the genus (Davidse 1990).

*Panicum niihauense*, a member of the grass family, is a perennial bunchgrass with unbranched culms 50 to 125 cm (20 to 49 in.) long. The leaf blades are flat, 15 to 35 cm (6 to 14 in.) long and 0.7 to 1.9 cm (0.3 to 0.7 in.) wide. The panicles (loosely branched inflorescences) are 13 to 35 cm (5 to 14 in.) long. The panicle branches lie close to the main stem of the inflorescence (not spreading outward), and the spikelets are borne densely along the inflorescence branches. The spikelets, which contain two flowers, are 2.6 to 3.2 mm (0.1 in.) long. This species is distinguished from others in the genus by the shape of the inflorescence branches, which are erect and appressed, and the arrangement of the spikelets, which are densely clustered (Davidse 1990).

*Panicum niihauense* was known historically from Niihau and one location on Kauai (HHP 1994j1 to 1994j3). Currently this species is only known from State-owned land at Polihale State Park on Kauai. This single population of 23 individuals is found scattered in sand dunes in a coastal shrubland at between 9 and 15 m (30 and 50 ft) elevation. Associated plant taxa include 'a'ali'i, *Cassylia filiformis* (kaunàoa pehu), *Prosopis pallida* (kiawe), *Scaevola sericea* (naupaka), *Sida fallax* ('ilima), and *Vitex* sp. (kolokolo kahakai) (HHP 1993, 1994j3).

The primary threats to the single known population of *Panicum niihauense* are off-road vehicles, competition with alien plant taxa, and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of individuals in one remaining population (HHP 1993; HPCC 1992b; J. Lau and C. Russell, pers. comms. 1994).

*Phyllostegia parviflora* was first described by Gaudichaud-Beaupré as *Prasium parviflorum* based on a specimen collected on Oahu (Hillebrand 1888). Later, Bentham transferred the

species to *Phyllostegia* and this is the name accepted in the current treatment of Hawaiian members of the genus (Wagner *et al.* 1990). Currently two varieties are recognized—var. *parviflora* and var. *glabriuscula*, described by Gray in 1862 (Wagner *et al.* 1990). There is also a newly discovered variety that has not yet been formally named (Wagner *et al.* 1990). These recent collections of *P. parviflora* from the Waianae Mountains differ from the other varieties by several characters and represent a new variety previously considered to be *P. mollis* var. *lydgatei* (Wagner *et al.* 1990; Warren Wagner, Smithsonian Institution, *in litt.*, 1994; W. Wagner, pers. comm. 1994). Published names that Wagner *et al.* (1990) consider to be synonymous with *P. parviflora* var. *parviflora* include *P. leptostachys*, *P. parviflora* var. *canescens*, *P. parviflora* var. *gaudichaudii*, and *P. parviflora* var. *major* (Wagner *et al.* 1990).

*Phyllostegia parviflora*, a member of the mint family (Lamiaceae), is a perennial herb. The egg-shaped to broadly egg-shaped, wrinkled leaves are usually 19 to 33 cm (7.5 to 13 in.) long and 7.5 to 15.3 cm (3 to 6 in.) wide. The leaf stalks are typically 6 to 13.5 cm (2.4 to 5.3 in.) long. Usually six flowers are arranged along a flowering stalk. The corolla is white, sometimes tinged with purple, and about 9 to 13 mm (0.4 to 0.5 in.) long. The upper corolla lip is about 3 mm (0.1 in.) long while the lower lip is about 6 to 9 mm (0.2 to 0.4 in.) long. The fruits are nutlets. The species is distinguished from others of the genus by the leaf shape and length of the leaf stalk and lower corolla lip. *P. p.* var. *glabriuscula* has fewer glandular hairs in the inflorescence, less pubescent leaves, and usually unbranched inflorescences, as compared to *P. p.* var. *parviflora*. The newly discovered variety of *P. parviflora* has shorter leaf stalks, spreading hairs on the leaf stalks, and fewer gland-tipped hairs in the inflorescence (Wagner *et al.* 1990).

Historically *Phyllostegia parviflora* was known from three islands—Oahu, Hawaii, and Maui (HHP 1994x1 to 1994x3, 1994y1 to 1994y9, 1994z1, 1994z2; Sherff 1935; Wagner *et al.* 1990). This species is now known only from two populations on Oahu. *Phyllostegia parviflora* var. *glabriuscula* was only known from the island of Hawaii on private land and has not been observed since the 1800s (HHP 1994x1 to 1994x3). *Phyllostegia parviflora* var. *parviflora* was known from Oahu and Maui, but is now known from only four plants in North Kaukonahua Stream in the Koolau Mountains on Oahu, on State land leased by the DOD for the Kawailoa Training Area (HHP 1994y9).

The new variety of *P. parviflora* is known from only 19 plants in North Palawai Gulch within TNCH's Honouliuli Preserve (HHP 1994z1). *Phyllostegia parviflora* is typically found on moderate to steep slopes in diverse wet forest from 500 to 830 m (1,640 to 2,700 ft) elevation. Native taxa associated with *Phyllostegia parviflora* include 'ohi'a, *Broussaisia arguta* (kanawao), *Mysine* sp. (kolea), *Pipturus albidus* (mamaki), and *Cyrtandra* sp. (hāiwale) (HHP 1994y9, 1994z1; Wagner *et al.* 1990).

The major threats to *Phyllostegia parviflora* are habitat degradation and/or destruction by feral pigs, competition with several alien plant taxa, and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of remaining individuals and populations (HHP 1994y9, 1994z1; C. Russell, pers. comm. 1994).

Hillebrand (1888) described and named *Habenaria holochila* based on his collections and on material sent to him by J.M. Lydgate and V. Knudsen. Subsequently, F.W. Kraenzlin transferred the species to the genus *Platanthera*, resulting in the new combination *Platanthera holochila*; this name is accepted in the current treatment of Hawaiian members of the family (Kores 1979, Wagner *et al.* 1990). C.A. Luer (1975) published the combination *P. hyperborea* var. *viridiflora*, now considered synonymous with *P. holochila* (Wagner *et al.* 1990). The specific epithet refers to the undivided lip of the flower.

*Platanthera holochila*, a member of the orchid family (Orchidaceae), is an erect, deciduous herb. The stems arise from underground tubers and are 15 to 60 cm (6 to 24 in.) long. The pale-green leaves, generally 4 to 12 cm (2 to 5 in.) long and 1 to 3 cm (0.4 to 1 in.) wide, are lance to egg-shaped. The greenish-yellow flowers occur in open spikes. The back sepal is inversely egg-shaped and hooded and the lateral sepals are erect and elliptic. The lateral petals, 2 to 2.5 cm (1 in.) long, are irregularly egg-shaped and enclosed by the sepals. The lowest petal is strap-like, about 3 mm (0.1 in.) long, with a 3 to 5 mm (0.1 to 0.2 in.) long spur at the base. The fruit is an ellipsoid capsule with six ribs. This is the only species of this genus that occurs in the Hawaiian Islands (Wagner *et al.* 1990).

Historically *Platanthera holochila* was known from the Alakai Swamp and Kahoulamano area and the Wahiawa Mountains on Kauai, the Koolau Mountains on Oahu, scattered locations on Molokai, and various locations on Maui (HHP 1994k1 to 1994k17).

Currently *P. holochila* is known from five locations on Kauai, Molokai, and Maui. Before the devastation of Hurricane 'Iniki, on Kauai in September 1992, two populations were known from the Alakai Swamp within the Alakai Wilderness Preserve on State land (HHP 1994k4, 1994k8). One population, last seen in 1977, was not seen when the location was revisited in 1989. The other population comprised 100 plantlets representing 3 clones before Hurricane 'Iniki, but was reduced to only 10 immature plantlets representing 1 clone over a year after the hurricane (Perlman 1995). On Molokai, a single population of fewer than ten plants occurs on private land in TNCH's Kamakou Preserve (HHP 1994k3). On Maui, three populations are known—Hanaula, on State and private land, and TNCH's Waikamoi and Kapunakea Preserves (HHP 1994k9, 1994k12, 1994k17). The 5 current populations comprise fewer than 35 individuals—1 individual on Kauai; fewer than 10 on Molokai; and between 15 and 20 on Maui (HHP 1994k3, 1994k4, 1994k8, 1994k9, 1994k12, 1994k17). *Platanthera holochila* is found in 'ohi'a-*Dicranopteris linearis* (uluhe) montane wet forest or 'ohi'a mixed montane bog between 1,050 and 1,870 m (3,450 and 6,120 ft) elevation. Associated plant taxa include *Cibotium* sp. (hapu'u), *Coprosma ernodeoides* (kukaenene), *Oreobolus* sp., *Styphelia* sp. (pukiawe), and *Vaccinium* spp. ('ohelo) (HHP 1994k3, 1994k4, 1994k8, 1994k9, 1994k12, 1994k17).

The primary threats to *Platanthera holochila* are habitat degradation and/or destruction by ungulates such as cattle and feral pigs, competition with alien plant taxa, overcollection, and a risk of extinction from naturally occurring events due to the small number of remaining populations and individuals (HHP 1994k4, 1994k9, 1994k12, 1994k17; C. Russell, pers. comm. 1994).

While hiking the Schofield-Waikane Trail on Oahu, St. John collected a plant that he and Edward Hosaka described in 1935 as *Sanicula purpurea*. Other published names considered synonymous with this species include *S. lobata* and *S. sandwicensis* (Constance and Affolter 1990). The specific epithet refers to the purple petals.

*Sanicula purpurea*, a member of the parsley family (Apiaceae), is a stout perennial herb, 8 to 36 cm (3 to 14 in.) tall, arising from a massive stem. The basal leaves are numerous and leathery in texture. Two to 8 cm (0.8 to 3 in.) wide, the leaves are kidney-shaped or circular to egg-heart-shaped, with three to seven lobes. The small flowers are

purple or cream-colored with a purple tinge and occur in branched terminal clusters, each of which contains six to ten flowers. Each flower cluster contains one to three perfect flowers and five to seven staminate flowers. The nearly spherical fruits are covered with prickles. This species is distinguished from others in the genus by the number of flowers per cluster and by the color of the petals (Constance and Affolter 1990).

Historically *Sanicula purpurea* was known from six scattered locations along the Koolau Mountains of Oahu and from four locations on West Maui (HHP 1994L1 to 1994L10). This species is currently known from one population in Oahu's Koolau Mountains on the boundary of State land and the federally owned Schofield Barracks Military Reservation; another population, last seen on the summit between Aiea and Waimano in 1985, was not seen during a 1987 survey and may no longer be extant. On West Maui, three populations are currently known on State land, including West Maui NAR, and one population is known from private land (HHP 1994L1 to 1994L10). The number of plants of this species totals an estimated 130 to 210 individuals. This species typically grows in open 'ohi'a mixed montane bogs between 700 and 1,625 m (2,300 and 5,330 ft) elevation. Associated plant taxa include pukiawe, *Argyroxiphium grayanum* (greensword), *Lagenifera* sp., *Machaerina* sp. ('uki), and *Oreobolus furcatus* (HHP 1994L1, 1994L6 to 1994L9).

Habitat degradation by feral pigs and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of existing populations are the major threats to *Sanicula purpurea*. On Oahu, the Kaukonahua-Kahana Divide population is additionally threatened by competition with an alien grass, *Axonopus fissifolius* (narrow-leaved carpetgrass), and potentially by military activities (HHP 1994L1, 1994L9).

*Schiedea hookeri* was first described by Gray in 1854 based on a specimen collected on Oahu by Archibald Menzies of the U.S. Exploring Expedition (Wagner *et al.* 1990). Later, Earl Sherff described *S. hookeri* var. *acrisepala* and *S. hookeri* var. *intercedens*, which are now considered synonyms of *S. hookeri* (Sherff 1944, 1945; Wagner *et al.* 1990).

*Schiedea hookeri*, a member of the pink family (Caryophyllaceae), is a sprawling or clumped perennial herb. The stems, 0.3 to 0.5 m (1 to 1.6 ft) long, curve slightly upward or lie close to the ground and often produce matted clumps. The thin, opposite leaves, 3 to

8 cm (1.2 to 3.2 in.) long and 0.4 to 1.5 cm (0.2 to 0.6 in.) wide, are narrowly lance-shaped to narrowly elliptic. The apetalous, perfect flowers are borne in open branched inflorescences, which are hairy, somewhat sticky, and 5 to 22 cm (2 to 9 in.) long. The lance-shaped sepals are green to purple and 3 to 4.5 mm (1.2 to 1.8 in.) long. The fruit is a capsule about 3 mm (0.1 in.) long. This species is distinguished from others in this endemic Hawaiian genus by its open, hairy, and sometimes sticky inflorescence, and by the size of the capsules (Wagner *et al.* 1990).

Historically *Schiedea hookeri* was known from the Waianae Mountains of Oahu and Haleakala on Maui (HHP 1994m1 to 1994m17). Currently this species is known from 11 populations in Oahu's Waianae Mountains. Between 220 and 330 individuals are scattered on slopes and ridges from Kaluakauila Gulch to Lualualei Valley—1 population on private land in TNCH's Honouliuli Preserve; 3 populations on City and County of Honolulu land; 3 populations on State land, 1 of which is on land leased by the DOD for Makua Military Reservation; and 4 populations on Federal land (3 on Lualualei Naval Magazine and 1 on Schofield Barracks Military Reservation) (HHP 1994m1, 1994m5, 1994m8, 1994m9, 1994m11 to 1994m17). *Schiedea hookeri* is usually found in diverse mesic or dry lowland forest, often with 'ohi'a or lama dominant, between 365 and 790 m (1,200 and 2,600 ft) elevation. One population is reported at an elevation of 850 to 900 m (2,800 to 2,950 ft). Associated plant taxa include 'a'ali'i, *Artemisia australis* ('ahinahina), *Bidens* sp. (ko'oko'olau), *Carex meyenii*, and *Eragrostis grandis* (kawelu) (HHP 1994m5, 1994m6, 1994m9, 1994m11 to 1994m17).

The primary threats to *Schiedea hookeri* are habitat degradation and/or destruction by feral goats and pigs and competition with alien plant taxa. The Kaluakauila Gulch population is also potentially threatened by fire and military activities (HHP 1994m5, 1994m8, 1994m11 to 1994m13, 1994m15 to 1994m17).

*Schiedea kauaiensis* was first collected by Otto Degener and Amy Greenwell in 1952. Degener and Sherff considered this collection from Kauai to be a new variety of *S. nuttallii*, previously known only from Oahu, and named it *S. nuttallii* var. *pauciflora* (Sherff 1952). In 1988, St. John elevated this variety to species level, naming it *S. kauaiensis*. Wagner *et al.* (1990) recombined this species with *S. nuttallii*, without recognizing any varieties. The authorities on this

endemic Hawaiian genus, Stephen Weller, Ann Sakai, and Warren Wagner, now accept *S. kauaiensis* as a distinct species (Stephen Weller, University of California, Irvine, *in litt.* 1994). Weller, Sakai, and Wagner consider *S. wichmanii* St. John to be synonymous with *S. kauaiensis* (S. Weller, *in litt.* 1994).

*Schiedea kauaiensis*, a member of the pink family, is a generally hairless, erect subshrub, with stems normally 0.3 to 1.5 m (1 to 5 ft) long. The green, sometimes purple-tinged leaves are opposite, narrowly egg-shaped or lance-shaped to narrowly or broadly elliptic, up to 13 cm (5 in.) long, and 3.5 cm (1.4 in.) wide. The apetalous, perfect flowers are borne in open branched inflorescences, moderately covered with fine, short, curly, white hairs. The lance-shaped sepals, 2 to 3.8 mm (0.08 to 1.5 in.) long, are green or sometimes purple-tinged. The fruit is a capsule. The round to kidney-shaped seeds are about 2 mm (0.08 in.) long. This species is distinguished from others in this endemic Hawaiian genus by its habit, larger leaves, the hairiness of the inflorescence, the number of flowers in each inflorescence, larger flowers, and larger seeds (Wagner *et al.* 1990; S. Weller, *in litt.* 1994).

Historically *Schiedea kauaiensis* was known from the northwestern side of Kauai, from Papa'a to Mahanaloa. It was thought to be extinct until the 2 currently known populations were found, which total about 15 plants. Both populations occur on State land—the Mahanaloa Valley population within Kuia NAR and the Kalalau Valley population within Na Pali Coast State Park. *Schiedea kauaiensis* typically grows in diverse mesic forest on steep slopes. Associated plant taxa include *Psychotria hexandra* (kopiko), *Exocarpus luteolus* (heau), lama, the federally threatened *Peucedanum sandwicense* (makou), and *Euphorbia haeleleana* ('akoko) (HHP 1994n18; HPCC 1992c2; S. Weller, *in litt.* 1994).

Threats to *Schiedea kauaiensis* include habitat degradation and/or destruction by feral pigs, goats, and deer; competition from several alien plant taxa; landslides; and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the low number of individuals in only two known populations (HHP 1994n18, HPCC 1992c2).

In 1834, Thomas Nuttall collected a specimen of *Schiedea nuttallii* in the Koolau Mountains of Oahu. Ten years later, William Hooker described this species (Mill *et al.* 1988, Nagata 1980). Other published names considered

synonymous with *S. nuttallii* include *S. nuttallii* var. *lihuensis* and *S. oahuensis* (Wagner *et al.* 1990; S. Weller, *in litt.* 1994).

*Schiedea nuttallii*, a member of the pink family, is a generally hairless, erect subshrub, with stems normally 0.3 to 1.5 m (1 to 5 ft) long, and internodes usually 0.8 to 4 cm (0.3 to 1.6 in.) long. The green, sometimes purple-tinged leaves are opposite, narrowly egg-shaped or lance-shaped to narrowly or broadly elliptic, 5 to 10 cm (2 to 4 in.) long, and 1.5 to 2 cm (0.6 to 0.8 in.) wide. The apetalous, perfect flowers are borne in open branched inflorescences, normally 20 to 25 cm (8 to 10 in.) long. The lance-shaped sepals, 2 to 3.8 mm (0.08 to 1.5 in.) long, are green or sometimes purple-tinged. The fruit is a capsule. The round to kidney-shaped seeds are about 1 mm (0.04 in.) long. This species is distinguished from others in this endemic Hawaiian genus by its habit, length of the stem internodes, length of the inflorescence, number of flowers per inflorescence, smaller leaves, smaller flowers, and smaller seeds (Wagner *et al.* 1990; S. Weller, *in litt.* 1994).

Historically *Schiedea nuttallii* was known from scattered locations on southeastern Kauai, Oahu, Molokai, and Maui (HHP 1994n1 to 1994n17; HPCC 1992c1; S. Weller, *in litt.* 1994). One population of *S. nuttallii* is found on Kauai east of Haupu Peak on private land (HHP 1994n10, HPCC 1992c1). Five populations are found on Oahu—Kahanahaiki Valley, on State land leased by the DOD for Makua Military Reservation; two populations within the State owned Pahole NAR; and Ekahanui Gulch, on private land in TNCH's Honouliuli Preserve (HHP 1994n2 to 1994n4, 1994n14, 1994n17). The statewide total of 6 populations harbors fewer than 75 individuals of this species, with between 10 and 50 individuals on Kauai and about 25 on Oahu (HHP 1994n2 to 1994n4, 1994n10, 1994n14, 1994n17; HPCC 1992c1; S. Weller, *in litt.* 1994). *Schiedea nuttallii* typically grows in diverse lowland mesic forest, often with 'ohi'a dominant, between 415 and 730 m (1,360 and 2,400 ft) elevation. The population on Kauai is found at 790 m (2,590 ft) elevation. Associated plant taxa include hame, kopiko, olomea, papala kepau, and *Hedyotis acuminata* (au) (HHP 1994n2 to 1994n4, 1994n10, 1994n14, 1994n17, 1994n18; HPCC 1992c1).

Habitat degradation and/or destruction by feral ungulates such as pigs and goats, competition with several alien plant taxa, landslides, potential fire, potential military activities, and a risk of extinction from naturally



occurring events and/or reduced reproductive vigor, due to the small number of populations and individuals, seriously threaten *Schiedea nuttallii* (HHP 1994n2, 1994n17; HPCC 1992c1; C. Russell, pers. comm. 1994).

Previous Federal Action

Federal action on these plants began as a result of section 12 of the Endangered Species Act of 1973, which directed the Secretary of the Smithsonian Institution to prepare a report on those plants considered to be endangered, threatened, or extinct in the United States. This report, designated as House Document No. 94-51, was presented to Congress on January 9, 1975. Seven of the 14 taxa were considered to be endangered in that document and 2 were considered to be threatened. On July 1, 1975, the Service published a notice in the Federal Register (40 FR 27823) of its acceptance of the Smithsonian report as a petition within the context of section 4(c)(2) (now section 4(b)(3)) of the Act, and giving notice of its intent to review the status of the plant taxa named therein. The Service published an updated notice of review for plants on December 15, 1980 (45 FR 82479), September 27, 1985 (50 FR 39525), February 21, 1990 (55 FR 6183), and September 30, 1993 (58 FR 51144). *Cyanea grimesiana* ssp. *grimesiana* (as *C. grimesiana* var. *mauiensis* and var. *munroi*), *Euphorbia haelealeana*, *Isodendron laurifolium*, *I. longifolium*, and *Platanthera holochila* were considered Category 1 species in the 1980 and 1985 notices of review. Category 1 species, now referred to as candidate species (61 FR 7597), are those for which the Service has on file substantial information on biological vulnerability and threats to support issuance of a proposed rule to list as threatened or endangered but for which listing proposals have not yet been published because they are precluded by other listing activities. Since the 1993 notice, new information suggests that the nine taxa not previously considered Category 1 species are sufficiently restricted in numbers and

distribution and imminently threatened and therefore warrant listing.

On October 2, 1995, the Service published in the Federal Register (60 FR 51417) a proposal to list 13 plant taxa from the Hawaiian Islands as endangered and one taxon, *Isodendron longifolium*, as threatened. This proposal was based primarily on information supplied by the Hawaii Heritage Program, the National Tropical Botanical Garden, and observations by botanists and naturalists. Based on comments received in response to the proposal (See Comments and Recommendations below) the Service now determines 13 taxa from the Hawaiian Islands to be endangered and 1 taxon to be threatened.

The processing of this final rule follows the Service's listing priority guidance published in the Federal Register on May 16, 1996 (61 FR 24722). The guidance clarifies the order in which the Service will process rulemakings following two related events: (1) the lifting, on April 26, 1996, of the moratorium on final listings imposed on April 10, 1995 (Public Law 104-6), and (2) the restoration of funding for listing through passage of the omnibus budget reconciliation law on April 26, 1996, following severe funding constraints imposed by a number of continuing resolutions between November 1995 and April 1996. The guidance calls for prompt processing of final rules containing species facing threats of high magnitude. The 14 species in this rule face high magnitude threats.

Summary of Comments and Recommendations

In the October 2, 1995, proposed rule and associated notifications, all interested parties were requested to submit factual reports or information that might contribute to the development of a final listing decision. The public comment period ended on December 1, 1995. Appropriate State agencies, county governments, Federal agencies, scientific organizations, and other interested parties were contacted

and requested to comment. Newspaper notices inviting public comment were published in the Hawaii Tribune-Herald and the Kauai Times on October 18, 1995, the Garden Island on October 19, 1995, and the Honolulu Advertiser and the Maui News on October 20, 1995. Four letters of comment were received supporting the listing of these taxa from the Hawaiian Islands. One letter requested further information on the locations of these species and one letter provided additional information which has been incorporated into this final rule. No requests for public hearings were received.

Pursuant to the Service's policy on peer review (59 FR 34270), the expert opinions of three appropriate and independent specialists were also solicited regarding pertinent scientific or commercial data and assumptions relating to the taxonomy, population models, and supportive biological and ecological information for these 14 taxa. No responses from peer reviewers were received.

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that *Achyranthes mutica*, *Cenchrus agrimonioides*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyperus trachysanthos*, *Euphorbia haelealeana*, *Isodendron laurifolium*, *Panicum niuhauense*, *Phyllostegia parviflora*, *Platanthera holochila*, *Sanicula purpurea*, *Schiedea hookeri*, *Schiedea kauaiensis*, and *Schiedea nuttallii* should be classified as endangered species and *Isodendron longifolium* should be classified as a threatened species. Procedures found at section 4 of the Act and regulations implementing the listing provisions of the Act (50 CFR part 424) were followed. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). The threats facing the 14 taxa in this final rule are summarized in Table 2.

TABLE 2.—SUMMARY OF THREATS

Species	Alien mammals					Alien plants	Substrate loss	Fire	Human impact	Limited numbers
	Cattle	Deer	Goats	Pigs	Rats					
<i>Achyranthes mutica</i> .....	X	.....	X	.....	.....	X	.....	.....	.....	X1,3*
<i>Cenchrus agrimonioides</i> .....	P	.....	P	X	.....	X	X	P	P	X2,3
<i>Cyanea grimesiana</i> ssp. <i>grimesiana</i> .....	.....	X	X	X	P	X	X	P	P	X3
<i>Cyperus trachysanthos</i> .....	.....	.....	X	.....	.....	X	.....	.....	.....	X1
<i>Euphorbia haelealeana</i> .....	.....	X	X	X	X	X	.....	P	P	
<i>Isodendron laurifolium</i> .....	.....	X	X	X	.....	X	.....	.....	P	
<i>Isodendron longifolium</i> .....	.....	.....	X	X	.....	X	.....	P	P	
<i>Panicum niuhauense</i> .....	.....	.....	.....	.....	.....	X	.....	.....	X	X1,3

TABLE 2.—SUMMARY OF THREATS—Continued

Species	Alien mammals					Alien plants	Substrate loss	Fire	Human impact	Limited numbers
	Cattle	Deer	Goats	Pigs	Rats					
<i>Phyllostegia parviflora</i> .....	.....	.....	.....	X	.....	X	.....	.....	.....	X1,3
<i>Platanthera holochila</i> .....	X	.....	.....	X	.....	X	.....	.....	X	X1,3
<i>Sanicula purpurea</i> .....	.....	.....	.....	X	.....	X	.....	.....	P	X1
<i>Schiedea hookeri</i> .....	.....	.....	X	X	.....	X	.....	P	P	
<i>Schiedea kauaiensis</i> .....	.....	X	X	X	.....	X	X	.....	.....	X1,3
<i>Schiedea nuttallii</i> .....	.....	.....	X	X	.....	X	X	P	P	X2,3

Key

- X—Immediate and significant threat.
- P—Potential threat.
- \*—No more than 100 individuals and/or no more than 5 populations.
- 1—No more than 5 populations.
- 2—No more than 10 populations.
- 3—No more than 100 individuals.

These factors and their application to *Achyranthes mutica* A. Gray (No common name (NCN)), *Cenchrus agrimonoides* Trin. (kamanomano), *Cyanea grimesiana* Gaud. ssp. *grimesiana* (haha), *Cyperus trachysanthos* Hook. & Arnott (pu'uka'a), *Euphorbia haelealeana* Herbst (NCN), *Isodendron laurifolium* A. Gray (aupaka), *Isodendron longifolium* A. Gray (aupaka), *Panicum niihauense* St. John (lau 'ehu), *Phyllostegia parviflora* (Gaud.) Benth. (NCN), *Platanthera holochila* (Hillebr.) Kraenzl. (NCN), *Sanicula purpurea* St. John & Hosaka (NCN), *Schiedea hookeri* A. Gray (NCN), *Schiedea kauaiensis* St. John (NCN), and *Schiedea nuttallii* Hook. (NCN) are as follows:

A. *The present or threatened destruction, modification, or curtailment of its habitat or range.* Native vegetation on all of the main Hawaiian Islands has undergone extreme alteration because of past and present land management practices including ranching, deliberate alien animal and plant introductions, and agricultural development (Cuddihy and Stone 1990, Wagner *et al.* 1985). The Northwestern Hawaiian Islands have undergone similar alteration, but to a lesser degree. The primary threats facing the 14 plant taxa included in this rule are destruction and modification of habitat by feral animals and competition with alien plants (see Factor E).

Thirteen of the 14 taxa in this rule are threatened by feral animals. Animals such as pigs, goats, axis deer, black-tailed deer, and cattle were introduced either by the early Hawaiians (pigs) or more recently by European settlers (all ungulate species) for food and/or commercial ranching activities. Over the 200 years following their introduction, their numbers increased and the adverse impacts of feral ungulates on native vegetation have become increasingly

apparent. Beyond the direct effect of trampling and grazing on native plants, feral ungulates have contributed significantly to the heavy erosion taking place on most of the main Hawaiian islands (Cuddihy and Stone 1990).

Pigs, originally native to Europe, Africa, and Asia, were introduced to Hawaii by the Polynesian ancestors of Hawaiians, and later by western immigrants. The pigs escaped domestication and invaded primarily wet and mesic forests of Kauai, Oahu, Molokai, Maui, and Hawaii. Pigs pose an immediate threat to one or more populations of 11 of the taxa in wet and mesic habitats. While foraging, pigs root and trample the forest floor, encouraging the establishment of alien plants in the newly disturbed soil. Pigs also disseminate alien plant seeds through their feces and on their bodies, accelerating the spread of alien plants through native forests (Cuddihy and Stone 1990, Stone 1985). Pigs are vectors of *Psidium cattleianum* (strawberry guava) and *Schinus terebinthifolius* (Christmas berry), which threaten several of the taxa in this final rule (Cuddihy and Stone 1990, Smith 1985, Stone 1985). Pigs have also invaded open bogs where they uproot native plants and create conditions that allow alien plant species to invade (Gagné and Cuddihy 1990). *Sanicula purpurea* and the Alakai Swamp population of *Platanthera holochila* are currently threatened by pigs in bogs (HHP 1994k4, 1994k8, 1994L9). On Kauai, one population of *Isodendron laurifolium* and two populations of *I. longifolium* have sustained loss of individual plants and/or habitat as a result of feral pig activities (HHP 1994h21, 1994i13, 1994i15; Lorence and Flynn 1993). The following plant taxa on Oahu are threatened by pigs—three populations of *Cenchrus agrimonoides*, two of *Cyanea grimesiana* ssp.

*grimesiana*, two of *Euphorbia haelealeana*, three of *I. laurifolium*, one of *I. longifolium*, the two remaining populations of *Phyllostegia parviflora*, one population of *Sanicula purpurea*, three of *Schiedea hookeri*, both populations of *Schiedea kauaiensis*, and one of *Schiedea nuttallii* (HHP 1994d8, 1994d11, 1994d12, 1994e1, 1994e34, 1994g10, 1994g13, 1994h16, 1994h18, 1994h20, 1994i2, 1994L1, 1994m5, 1994m12, 1994m13, 1994n2, 1994n18, 1994y1, 1994z1; HPCC 1992c2). On Maui, feral pigs are a threat to the Waikamoi and Kapunakea Preserves populations of *Platanthera holochila*, and the Eke Crater population of *Sanicula purpurea* (HHP 1994k12, 1994k17, 1994l9).

Goats, native to the Middle East and India, were first successfully introduced to the Hawaiian Islands in 1792. Feral goats now occupy a wide variety of habitats from lowland dry forests to montane grasslands on Kauai, Oahu, Molokai, Maui, and Hawaii, where they consume native vegetation, trample roots and seedlings, accelerate erosion, and promote the invasion of alien plants (Scott *et al.* 1986, Stone 1985, van Riper and van Riper 1982). One or more populations of nine of the taxa are currently threatened by direct damage from feral goats. On Kauai, goats are contributing to the decline of one population each of *Cyperus trachysanthos*, *Isodendron laurifolium* and *I. longifolium* and four populations of *Euphorbia haelealeana*. Goats threaten the two known populations of *Schiedea kauaiensis* and the one population of *S. nuttallii* on Kauai (HHP 1989b, 1994g1, 1994g4, 1994g12, 1994g14, 1994h21, 1994i5; HPCC 1992c2). On Oahu, encroaching urbanization and hunting pressure tend to concentrate the goat populations in the dry upper slopes of the Waianae Mountains, where one population of

*Euphorbia haeleeleana*, three populations of *I. laurifolium*, and two populations of *S. hookeri* exist (HHP 1994g13, 1994h16, 1994h18, 1994h20, 1994m13, 1994m15). The goat population in the Waianae area is apparently increasing in State game management areas and extending into adjacent areas, becoming an even greater threat to the rare plants that grow there. On Kukuinui Ridge, Molokai, goats threaten one of that island's two known populations of *Cyanea grimesiana* ssp. *grimesiana* (HHP 1994e7). On Maui, goats pose a potential threat to that island's only known population of *Cenchrus agrimonioides* (R. Hobdy, pers. comm. 1994). On Hawaii, the only known population of *Achyranthes mutica* is presently threatened by goats (HPCC 1992a).

In 1920, a group of 12 axis deer was introduced to the island of Lanai; about 60 years later, the population was estimated at 2,800 (Tomich 1986). The axis deer population is presently actively managed for recreational hunting by the State Department of Land and Natural Resources (DLNR). Axis deer degrade habitat by trampling and overgrazing vegetation, which removes ground cover and exposes the soil to erosion (J. Lau, pers. comm. 1994). Extensive red erosional scars caused by decades of deer activity are evident on Lanai. Activity of axis deer threatens one of the two populations of *Cyanea grimesiana* ssp. *grimesiana* on Lanai (HHP 1994e37).

Black-tailed deer were first introduced to Kauai in 1961 for the purpose of sport hunting and today probably number well over 500 animals. The deer are presently confined to the western side of the island, where they feed on a variety of native and alien plants (van Riper and van Riper 1982). Black-tailed deer threaten two populations of *Euphorbia haeleeleana*, including almost half of the known individuals on Kauai, and half of the known populations of *Isodendron laurifolium* on Kauai. Black-tailed deer also threaten other rare plants within Kuia NAR, potentially threatening one population of *Schiedea kauaiensis* (HHP 1994g1, 1994g7, 1994h6, 1994h9, 1994h11, 1994n18).

Large-scale ranching of cattle in the Hawaiian Islands began in the middle of the 19th century on the islands of Kauai, Oahu, Maui, and Hawaii. Large ranches, tens of thousands of acres in size, developed on East Maui and Hawaii (Cuddihy and Stone 1990) where most of the State's large ranches still exist today. Degradation of native forests used for ranching activities became evident soon after full-scale ranching began. The

negative impact of cattle on Hawaii's ecosystems is similar to that described for goats and deer (Cuddihy and Stone 1990, Stone 1985). On Maui, cattle ranching is the primary agricultural activity on the west and southwest slopes of East Maui and in lowland regions of West Maui. On West Maui, the Hanaula population of *Platanthera holochila* is threatened by grazing cattle (HHP 1994k9). Cattle pose a potential threat to that island's only known population of *Cenchrus agrimonioides* (R. Hobdy, pers. comm. 1994). The only known population of *Achyranthes mutica*, in the Keawewai Stream area on the island of Hawaii, is also threatened by cattle ranching activities (HPCC 1992a).

On Oahu, habitat disturbance caused by human activities may pose a threat to rare plant populations that grow on lands on which military training exercises and ground maneuvers are occasionally conducted. However, because most of the taxa grow on moderate to steep slopes, ridges, and gulches, habitat disturbance is probably restricted to foot and helicopter traffic. Trampling by ground troops associated with training activities, and construction, maintenance, and utilization of helicopter landing and drop-off sites could affect populations of seven of the taxa (*Cenchrus agrimonioides*, *Cyanea grimesiana* ssp. *grimesiana*, *Euphorbia haeleeleana*, *Isodendron laurifolium*, *Sanicula purpurea*, *Schiedea hookeri*, and *Schiedea nuttallii*) that occur on land leased or owned by the Army (HHP 1994d11, 1994e34, 1994g5, 1994g6, 1994g10, 1994h17, 1994L1, 1994m8, 1994m12, 1994n14; Wagner *et al.* 1985).

B. *Overutilization for commercial, recreational, scientific, or educational purposes.* Increased interest in collecting for scientific or horticultural purposes or visits by individuals interested in seeing rare plants could result from publicity following the publication of this final rule. This interest potentially threatens all of the taxa, but would seriously impact the ten taxa whose low numbers and/or few populations make them especially vulnerable to disturbance (*Achyranthes mutica*, *Cenchrus agrimonioides*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyperus trachysanthos*, *Panicum niihauense*, *Phyllostegia parviflora*, *Platanthera holochila*, *Sanicula purpurea*, *Schiedea kauaiensis*, and *Schiedea nuttallii*). Such disturbances could also promote erosion and greater ingress of alien plant species. Some taxa, such as *Cenchrus agrimonioides*, *Cyanea grimesiana* ssp. *grimesiana*, *Isodendron longifolium*, *Panicum*

*niihauense*, and *Platanthera holochila*, have well-known populations, or populations close to trails or roads, that are possibly threatened by trampling or by overcollection (HHP 1994d1, 1994e1, 1994i2, 1994k9). One individual of *P. holochila* died in the late 1980s after a portion of the plant was collected for scientific purposes (Marie Brueggemann, U.S. Fish and Wildlife Service, *in litt.* 1995).

C. *Disease and predation.* Disease is not known to be a significant threat to any of the taxa. Evidence of predation on *Isodendron laurifolium* by deer is documented on Kauai (HHP 1994h6, 1994h11). While there is no evidence of predation on the other 13 taxa, none of them are known to be unpalatable to cattle, deer, or goats. Predation is therefore a possible threat to taxa growing at sites where those animals have been reported (*Achyranthes mutica*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyperus trachysanthos*, *Euphorbia haeleeleana*, *Isodendron laurifolium*, *I. longifolium*, *Platanthera holochila*, *Schiedea hookeri*, and *S. kauaiensis*) (see Factor A). Feral pigs not only destroy native vegetation through their rooting activities and dispersal of alien plant seeds, but they also feed on plants, preferring the pithy interior of large tree ferns and fleshy-stemmed plants from the bellflower family (Stone 1985, Stone and Loope 1987). Although there is no conclusive evidence of predation on *Cyanea grimesiana* ssp. *grimesiana*, a member of the bellflower family, it is not known to be unpalatable to pigs. Predation is therefore a possible threat to this taxon in areas where pigs have been reported (HHP 1994e1, 1994e34).

Two rat species, the black rat (*Rattus rattus*) and the Polynesian rat (*R. exulans*), and to a lesser extent other introduced rodents, eat large, fleshy fruits and strip the bark of some native plants, including plants in the bellflower family (Cuddihy and Stone 1990, Tomich 1986, Wagner *et al.* 1985; J. Lau, pers. comm. 1994). The largest population of *Euphorbia haeleeleana* on Oahu is seriously threatened by rat predation (HHP 1994g5). It is possible that rats eat the fruits of *Cyanea grimesiana* ssp. *grimesiana*, which produces fleshy fruit and stems and grows in areas where rats occur (J. Lau, pers. comm. 1994).

D. *The inadequacy of existing regulatory mechanisms.* Of the 14 taxa in this final rule, 10 have populations located on private land, 12 on State land, 3 on City and County of Honolulu land, and 9 on land under Federal jurisdiction. Of those under Federal jurisdiction, four taxa have populations

that occur on land owned by the Federal government and six on land leased to the Federal government by the State. While 12 of the taxa occur in more than 1 of those 4 ownership categories, *Achyranthes mutica* is known only on private land and *Panicum niuhauense* is found only on State land.

Eight of the taxa have one or more populations in State NARs, where rules and regulations for the protection of resources apply (Hawaii Revised Statutes (HRS), sect. 195-5). The majority of the populations of the 14 taxa are located on land classified within conservation districts and owned by the State of Hawaii or private companies or individuals. Regardless of the owner, lands in these districts are regarded as necessary for the protection of endemic biological resources, and maintenance or enhancement of the conservation of natural resources. Activities permitted in conservation districts are chosen by considering how best to make multiple use of the land (HRS, sect. 205-2). Some uses, such as maintaining animals for hunting, are based on policy decisions, while others, such as preservation of endangered species, are mandated by both Federal and State laws. Requests for amendments to district boundaries or variances within existing classifications can be made by government agencies and private landowners (HRS, sect. 205-4). Before decisions about these requests are made, the impact of the proposed reclassification on "preservation or maintenance of important natural systems or habitat" (HRS, sects. 205-4, 205-17) as well as the maintenance of natural resources is required to be taken into account (HRS, sects. 205-2, 205-4). Before any proposed land use that will occur on State land, is funded in part or whole by county or State funds, or will occur within land classified as a conservation district, an environmental assessment is required to determine whether the environment will be significantly affected (HRS, chapt. 343). If it is found that an action will have a significant effect, preparation of a full Environmental Impact Statement is required. Hawaii environmental policy, and thus approval of land use, is required by law to safeguard " \* \* \* the State's unique natural environmental characteristics \* \* \* " (HRS, sect. 344-3(1)). The Hawaii DLNR is mandated to initiate changes in conservation district boundaries to include "the habitat of rare native species of flora and fauna within the conservation district" (HRS, sect. 195D-5.1). Six of the taxa in this final rule are threatened by four plants considered by the State of Hawaii to be

noxious weeds. The State has provisions and funding available for eradication and control of noxious weeds on State and private land in conservation districts and other areas (HRS, chapt. 152; Hawaii Department of Agriculture (DOA) 1981, 1991).

Despite the existence of State laws and regulations that protect Hawaii's native plants, their enforcement is difficult due to limited funding and personnel. Federal listing of these 14 plant taxa would reinforce and supplement the protection available under the State Act and other laws.

Listing under the Federal Act would trigger many additional State law protections. Hawaii's endangered species act states, "Any species of aquatic life, wildlife, or land plant that has been determined to be an endangered species pursuant to the [Federal] Endangered Species Act shall be deemed to be an endangered species under the provisions of this chapter \* \* \* " (HRS, sect. 195D-4(a)).

Therefore, Federal listing automatically invokes listing under Hawaii State law. State law prohibits cutting, collecting, uprooting, destroying, injuring, or possessing any listed species of plant on State or private land, or attempting to engage in any such conduct. The State law encourages conservation of such species by State agencies and triggers other State regulations to protect the species (HRS, sect. 195AD-4 and 5). State laws relating to the conservation of biological resources allow for the acquisition of land as well as the development and implementation of programs concerning the conservation of biological resources (HRS, sect. 195D-5(a)). The State also may enter into agreements with Federal agencies to administer and manage any area required for the conservation, management, enhancement, or protection of endangered species (HRS, sect. 195D-5(c)). Funds for these activities could be made available under section 6 of the Act (State Cooperative Agreements).

E. *Other natural or manmade factors affecting its continued existence.* All 14 of the taxa in this final rule are threatened by competition with one or more alien plant taxa (see Table 2). The most significant of these are *Lantana camara* (lantana), *Psidium cattleianum* (strawberry guava), *Schinus terebinthifolius* (Christmas berry), *Rubus rosifolius* (thimbleberry), *Clidemia hirta* (Koster's curse), *Grevillea robusta* (silk oak), *Melinis minutiflora* (molasses grass), *Paspalum conjugatum* (Hilo grass), *Psidium guajava* (common guava), *Ageratina adenophora* (Maui pamakani), and *Ageratina riparia*

(Hamakua pamakani). A number of other alien plant taxa also pose significant threats to populations of the plants in this final rule.

*Lantana camara* (lantana), native to the West Indies, is an aggressive, thicket-forming shrub that produces chemicals that inhibit the growth of other plant species. Lantana can now be found on all of the main islands in mesic forests, dry shrublands, and other dry, disturbed habitats (Cuddihy and Stone 1990, Smith 1985, Wagner *et al.* 1990). On Kauai, lantana poses a threat to two populations of *Euphorbia haeleleana* and one population of *Isodendron laurifolium* within Kuia NAR, three other populations of *E. haeleleana*, three other populations of *I. laurifolium*, and one population of *I. longifolium*. In the Waianae Mountains of Oahu, one population each of *Cenchrus agrimonioides* and *Cyanea grimesiana* ssp. *grimesiana* and three populations of *Schiedea hookeri* are immediately threatened by this shrub (HHP 1994d8, 1994e34, 1994g1, 1994g3, 1994g7, 1994g14, 1994h9, 1994h11, 1994h15, 1994h21, 1994m13, 1994m15, 1994m17; HPCC 1993b; Lorence and Flynn 1993).

*Psidium cattleianum* (strawberry guava), an invasive shrub or small tree native to tropical America, has become widely naturalized on all of the main Hawaiian islands, forming dense stands that exclude other plant species in disturbed areas (Cuddihy and Stone 1990). This alien plant grows primarily in mesic and wet habitats and is dispersed mainly by feral pigs and fruit-eating birds (Smith 1985, Wagner *et al.* 1990). Strawberry guava is considered to be one of the greatest alien plant threats to Hawaiian rain forests and is known to pose a direct threat to at least one population each of *Euphorbia haeleleana* and *Isodendron laurifolium* and four populations of *I. longifolium* on the island of Kauai (HHP 1994g7, 1994h11, 1994i15, 1994i16; Lorence and Flynn 1991, 1993). Strawberry guava is a major invader of forests in the Waianae and Koolau Mountains of Oahu, where it often forms single-species stands. It poses an immediate threat to two populations each of *Cenchrus agrimonioides* and *I. laurifolium* and one population each of *Cyanea grimesiana* ssp. *grimesiana*, *Euphorbia haeleleana*, *I. laurifolium*, *I. longifolium*, and *Schiedea hookeri* (HHP 1994d8, 1994d12, 1994e34, 1994g13, 1994h18, 1994h20, 1994i2, 1994m12). On Lanai, this invasive alien plant threatens one of that island's populations of *Cyanea grimesiana* ssp. *grimesiana* (HHP 1994e37).

*Schinus terebinthifolius* (Christmas berry), introduced to Hawaii before 1911, is a fast-growing tree or shrub invading most mesic to wet lowland areas of the major Hawaiian Islands (Wagner *et al.* 1990). Christmas berry is distributed mainly by feral pigs and fruit-eating birds and forms dense thickets that shade out and displace other plants (Cuddihy and Stone 1990, Smith 1985, Stone 1985). It is a major component of the mesic forests of the Waianae and Koolau Mountains of Oahu. Two-thirds of the *Cenchrus agrimonioides* populations, one-third of the *Isodendron laurifolium* populations, 1 of 2 known populations of *Phyllostegia parviflora*, and 6 of 11 populations of *Schiedea hookeri* are negatively affected by this invasive plant (HHP 1994d8, 1994d11, 1994d12, 1994d14, 1994h2, 1994h16, 1994h18, 1994h20, 1994m5, 1994m11, 1994m15 to 1994m17; 1994y1).

*Rubus rosifolius* (thimbleberry), native to Asia, is naturalized in disturbed mesic to wet forest on all of the main Hawaiian Islands (Cuddihy and Stone 1990). On Kauai, this shrub poses a threat to the largest population of *Euphorbia haeleleana*, two populations of *Isodendron laurifolium*, five populations of *I. longifolium*, and one population of *Schiedea kauaiensis* (HHP 1994g1, 1994h9, 1994h11, 1994i13, 1994i15 to 1994i17; HPCC 1992c2; Lorence and Flynn 1993). One of the two populations of *Cyanea grimesiana* ssp. *grimesiana* on Lanai is threatened by thimbleberry (HHP 1994e37).

*Clidemia hirta* (Koster's curse), a noxious shrub native to tropical America, is found in mesic to wet forests on at least six islands in Hawaii (Almeda 1990, Hawaii Department of Agriculture 1981, Smith 1992). Koster's curse was first reported on Oahu in 1941 and had spread through much of the Koolau Mountains by the early 1960s. Koster's curse spread to the Waianae Mountains around 1970 and is now widespread throughout the southern half of that mountain range. This noxious plant forms a dense understory, shading out other plants and hindering plant regeneration (Cuddihy and Stone 1990). In the Waianae Mountains of Oahu, Koster's curse poses a serious threat to two populations of *Cyanea grimesiana* ssp. *grimesiana*, one population of *Isodendron longifolium*, the largest population of *Phyllostegia parviflora*, and one of the largest populations of *Schiedea hookeri*. Koster's curse also threatens one population of *I. laurifolium* in Oahu's Koolau Mountains. This prolific alien plant has

recently spread to five other islands, and immediately threatens two populations of *I. longifolium* in Waioli Valley on Kauai, and one of the two populations of *Cyanea grimesiana* ssp. *grimesiana* on Molokai (HHP 1994e7, 1994e34, 1994h17, 1994i2, 1994i17, 1994m11, 1994z1; Lorence and Flynn 1993; H. Bornhorst and S. Perlman, *in litt.* 1992).

*Grevillea robusta* (silk oak), native to Queensland and New South Wales, Australia, was extensively planted in Hawaii for timber and is now naturalized on most of the main Hawaiian Islands (Smith 1985, Wagner *et al.* 1990). On Kauai, this alien tree threatens *Euphorbia haeleleana* in Hipalau Valley. In the Waianae Mountains of Oahu, silk oak negatively affects one population each of *Cenchrus agrimonioides*, *E. haeleleana*, *Isodendron laurifolium*, *Schiedea hookeri*, and *S. nuttallii* (HHP 1994d8, 1994g14, 1994h16, 1994m13, 1994n2).

First introduced to the Hawaiian Islands as cattle fodder, *Melinis minutiflora* (molasses grass) was later planted for erosion control (Cuddihy and Stone 1990). This alien grass quickly spread to dry and mesic forests previously disturbed by ungulates. Molasses grass produces a dense mat capable of smothering plants, essentially preventing seedling growth and native plant reproduction (Cuddihy and Stone 1990, Smith 1985). Because it burns readily and often grows at the border of forests, molasses grass tends to carry fire into areas with woody native plants (Cuddihy and Stone 1990, Smith 1985). It is able to spread prolifically after a fire and effectively out-compete less fire-adapted native plant species, ultimately creating a stand of alien grass where forest once stood. In the Waianae Mountains on Oahu, molasses grass is a serious threat to one population each of *Cenchrus agrimonioides* and *Euphorbia haeleleana* and two populations of *Schiedea hookeri* (HHP 1994d11, 1994g10, 1994m8, 1994m11).

*Paspalum conjugatum* (Hilo grass) is naturalized in moist to wet disturbed areas on all of the main Hawaiian Islands except Niihau and Kahoolawe, and produces a dense ground cover. On Kauai, this perennial grass threatens the Wahiawa Mountains and Waioli Valley populations of *Isodendron longifolium* (HHP 1994i15, 1994i17; Lorence and Flynn 1991, 1993). In the Waianae Mountains of Oahu, Hilo grass threatens one population of *Cenchrus agrimonioides* and the largest population of *Schiedea hookeri* (HHP 1994d11, 1994m13; Lorence and Flynn 1993).

*Psidium guajava* (common guava), a shrub or small tree native to the New World tropics, is naturalized on all of the main islands, except perhaps Niihau and Kahoolawe (Wagner *et al.* 1990). Common guava is a serious weed that invades disturbed sites, forming dense thickets in dry as well as mesic and wet forests (Smith 1985, Wagner *et al.* 1990). On Kauai, common guava poses a threat to a population of *Isodendron longifolium* in Waioli Valley (Lorence and Flynn 1993). In the Waianae Mountains of Oahu, this alien plant threatens the largest populations of *Schiedea hookeri* and *S. nuttallii*, while on the island of Hawaii, common guava threatens the only known population of *Achyranthes mutica* (HHP 1994m13, 1994n2; HPCC 1992a).

*Ageratina adenophora* (Maui pamakani) and *A. riparia* (Hamakua pamakani), both native to tropical America, have naturalized in dry areas to wet forest on Oahu, Molokai, Lanai, Maui, and Hawaii (Wagner *et al.* 1990). These two noxious weeds form dense mats with other alien plants and prevent regeneration of native plants (Anderson *et al.* 1992). In the Waianae Mountains of Oahu, two populations of *Schiedea hookeri* are threatened by both Maui pamakani and Hamakua pamakani, and the largest population of *Phyllostegia parviflora* is threatened by Maui pamakani (HHP 1994m16, 1994m17, 1994y1). On Hawaii, the only known population of *Achyranthes mutica* is threatened by Hamakua pamakani (HPCC 1992a).

*Rubus argutus* (prickly Florida blackberry) was introduced to the Hawaiian Islands in the late 1800s from the continental U.S. (Haselwood and Motter 1983). The fruits are easily spread by birds to open areas such as disturbed mesic or wet forests, where the species forms dense, impenetrable thickets (Smith 1985). The largest population of *Cenchrus agrimonioides* on Oahu is threatened by prickly Florida blackberry, as well as other alien plant taxa (HHP 1994d8). *Leucaena leucocephala* (koa haole) is a naturalized shrub which is sometimes the dominant species in low elevation, dry, disturbed areas on all of the main Hawaiian islands (Geesink *et al.* 1990). On Kauai, the only known population of *Panicum niihauense* is threatened by several alien plants, including koa haole (HHP 1994j3, HPCC 1992b). Oahu's only known population of *Cyperus trachyanthos* is threatened by alien grasses and possibly by koa haole (HHP 1994f1; J. Lau, pers. comm. 1994). The largest population of *C. trachyanthos*, in the Nualolo Valley on Kauai, is threatened by established alien species

*Plantago lanceolata* and *Pteris vittata* (Kenneth Wood, pers. comm. 1996). *Plantago lanceolata*, native to Europe and north-central Asia, was first collected on Kauai in 1895 and is now naturalized and locally common in the Hawaiian Islands (Wagner *et al.* 1990). *Prosopis pallida* (kiawe) was introduced to Honolulu from a single seed grown on the Catholic Mission Grounds in 1828. In the early part of this century, pods were collected and sold to ranchers for cattle ration. The seeds pass through the digestive system of cattle and spread rapidly throughout the drier habitats of the Hawaiian islands (Geesink *et al.* 1990). The only known population of *Panicum niihauense* is threatened by kiawe (HHP 1994j3, HPCC 1992b).

*Pennisetum clandestinum* (Kikuyu grass), an aggressive, perennial grass introduced to Hawaii as a pasture grass, withstands trampling and grazing and is naturalized on four Hawaiian Islands in dry to mesic forest. It produces thick mats which choke out other plants and prevent their seedlings from establishing and has been declared a noxious weed by the U.S. Department of Agriculture (7 CFR 360) (O'Connor 1990, Smith 1985). Kikuyu grass is a threat to the only known population of *Achyranthes mutica* (HPCC 1992a). The introduced fern *Blechnum occidentale* was noted by Dr. Clifford Smith of the University of Hawaii as a potential pest in 1985 (Cuddihy and Stone 1990, Smith 1985). Found in mesic forests, *B. occidentale* is a threat to one population of *Schiedea kauaiensis* (HHP 1994n18). *Conyza bonariensis* (hairy horseweed) is nearly cosmopolitan in distribution, although it is perhaps native to South America. It was naturalized in Hawaii prior to 1871 and is a common weed in various urban and non-urban areas throughout Hawaii, generally in dry habitats. It threatens the only known population of *Achyranthes mutica* (HPCC 1992a, Wagner *et al.* 1990). *Opuntia ficus-indica* (panini) was introduced to Hawaii prior to 1809 from Mexico and has become naturalized in dry, disturbed habitats on Kauai, Oahu, Maui, Kahoolawe, and Hawaii. Panini threatens the only known population of *A. mutica* (HPCC 1992a, Wagner *et al.* 1990). *Axonopus fissifolius* (narrow-leaved carpet grass) is native to subtropical North America and the New World tropics. Introduced to Hawaii in 1912, narrow-leaved carpet grass has become common in wet pastures, disturbed wet forest, and bogs on Kauai, Oahu, Lanai, Maui, and Hawaii. Narrow-leaved carpet grass is a threat to one population of *Sanicula purpurea* on

Oahu (HHP 1994l1, O'Connor 1990). *Kalanchoe pinnata* (air plant) is an herb which occurs on all the main islands except Niihau and Kahoolawe, especially in dry to mesic areas (Wagner *et al.* 1990). Air plant threatens one population of *Schiedea kauaiensis* (HPCC 1992c2).

Fire poses a potential threat to populations of six of the taxa—*Cenchrus agrimonoides*, *Cyanea grimesiana* ssp. *grimesiana*, *Euphorbia haeleleana*, *Isodendron longifolium*, *Schiedea hookeri*, and *S. nuttallii* (HHP 1994e1, 1994e34, 1994g5, 1994g6, 1994g10, 1994i2, 1994m8, 1994m12, 1994m15 to 1994m17). Because Hawaii's native plants have evolved with only infrequent, naturally occurring episodes of fire (lava flows, infrequent lightning strikes), most species are not adapted to fire and are unable to recover well after recurring fires. Alien plants are often more fire-adapted than native taxa and quickly exploit suitable habitat after a fire (Cuddihy and Stone 1990). On Oahu, unintentionally ignited fires have resulted from military training exercises in Makua Military Reservation and Schofield Barracks Military Reservation and pose a possible threat to populations of *C. agrimonoides*, *E. haeleleana*, and *S. nuttallii* that grow in dry and mesic forest on those installations (Environment Impact Study Corp. 1977; HHP 1994a, 1994b, 1994d11, 1994g5, 1994g6, 1994g10, 1994n14; Yoshioka *et al.* 1991). Accidentally or maliciously set fires in residential areas near the Lualualei Naval Magazine and the Makua Military Reservation could easily spread and pose a possible threat to one of the four populations of *C. agrimonoides*, most of the island's individuals of *E. haeleleana*, one population of *I. longifolium*, several populations of *S. hookeri*, and one population of *S. nuttallii* (HHP 1994d11, 1994g5, 1994g6, 1994g10, 1994i2, 1994m8, 1994m15 to 1994m17, 1994n14).

Erosion, landslides, and rockslides due to natural weathering result in the death of individual plants as well as habitat destruction. This especially affects the continued existence of taxa or populations found on cliffs and steep slopes that have limited numbers and/or narrow ranges such as the Oahu populations of *Cyanea grimesiana* ssp. *grimesiana*; the Pahole-Makua Ridge population of *Schiedea nuttallii* on Oahu; and the Kalalau Valley population of *S. kauaiensis* on Kauai (HHP 1994n2; HPCC 1992c2; L. Mehrhoff, pers. comm. 1995).

The small number of populations and individuals of many of these taxa increases the potential for extinction

from naturally occurring events. A single human-caused or natural environmental disturbance could destroy a significant percentage of the individuals or the only extant population. Two of the plant taxa, *Achyranthes mutica* and *Panicum niihauense*, are each known from a single population. Five additional taxa have 5 or fewer populations (*Cyperus trachysanthos*, *Phyllostegia parviflora*, *Platanthera holochila*, *Sanicula purpurea*, and *Schiedea kauaiensis*), and 8 of the taxa are estimated to number no more than 100 individuals (*A. mutica*, *Cenchrus agrimonoides*, *Cyanea grimesiana* ssp. *grimesiana*, *P. niihauense*, *Phyllostegia parviflora*, *Platanthera holochila*, *S. kauaiensis*, and *S. nuttallii*). All of the taxa either number fewer than 20 populations or total fewer than 1,000 individuals (see Table 2). The small gene pool maintained by these taxa may depress reproductive vigor through inbreeding and decreased variability. Variability in genetic makeup of a population provides resilience to that population by decreasing the chances that an entire cohort is negatively impacted by a selective episode. Some individuals may prove more resistant or hardy than others and survive the event, allowing the population to persist. Small populations with low variability stand less chance of survival.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by these taxa in determining to issue this final rule. Based on this evaluation, the preferred action is to list 13 of these plant taxa as endangered (*Achyranthes mutica*, *Cenchrus agrimonoides*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyperus trachysanthos*, *Euphorbia haeleleana*, *Isodendron laurifolium*, *Panicum niihauense*, *Phyllostegia parviflora*, *Platanthera holochila*, *Sanicula purpurea*, *Schiedea hookeri*, *Schiedea kauaiensis*, and *Schiedea nuttallii*) and *Isodendron longifolium* as threatened. The 13 taxa to be listed as endangered are threatened by one or more of the following—habitat degradation and/or predation by pigs, goats, deer, cattle, and rats; competition for space, light, water, and nutrients from alien plants; habitat loss from fires; human impacts from military training practices and recreational activities; and substrate loss. Seven of the taxa have 5 or fewer populations, and 8 of the taxa are estimated to number no more than 100 individuals. Small population size and limited distribution make these taxa particularly vulnerable to extinction

from reduced reproductive vigor or from naturally occurring events. Because these 13 taxa are in danger of extinction throughout all or a significant portion of their ranges, they fit the definition of endangered as defined in the Act. Therefore, the determination of endangered status for these 13 taxa is warranted.

Although populations of *Isodendron longifolium* are threatened by habitat degradation and/or destruction by goats and pigs and competition with six alien plant species, the larger distribution of populations and total numbers of plants reduce the likelihood that this species will become extinct in the near future. For these reasons, *I. longifolium* is not now in immediate danger of extinction throughout all or a significant portion of its range. However, *I. longifolium* is likely to become endangered in the foreseeable future if the threats affecting it are not reduced. As a result, *I. longifolium* meets the definition of threatened species as defined in the Act.

Critical habitat is not being designated for the 14 taxa included in this rule for reasons discussed in the "Critical Habitat" section of this rule.

#### Critical Habitat

Critical habitat is defined in section 3 of the Act as—(i) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management consideration or protection; and (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures needed to bring the species to the point at which listing under the Act is no longer necessary.

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time a species is determined to be endangered or threatened. The Service finds that designation of critical habitat is not prudent for the 14 taxa in this rule.

Service regulations (50 CFR 424.12(a)(1)) state that designation of critical habitat is not prudent when one or both of the following situations exist—(1) The species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of threat

to the species, or (2) such designation of critical habitat would not be beneficial to the species.

As discussed under Factor B, these taxa are threatened by overcollection, due to low numbers or population size. The publication of precise maps and descriptions of critical habitat in the Federal Register and local newspapers as required in a proposal for critical habitat would increase the degree of threat to these plants from take or vandalism and, therefore, could contribute to their decline. The listing of these taxa publicizes the rarity of the plants and, thus, can make these plants attractive to researchers, curiosity seekers, or collectors of rare plants.

The additional protection provided by the designation of critical habitat to a species would be granted through section 7 of the Act. Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is designated. Section 7(a)(2) requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or destroy or adversely modify its critical habitat. The 14 species in this rule are confined to small geographic areas, and each population is composed of so few individuals that the determinations for jeopardy to the species and adverse modification of critical habitat would be similar. Therefore, designation of critical habitat provides no benefits beyond those that these species would receive by virtue of their listing as endangered species, and would likely increase the risk of threat from collecting or other human activities. Critical habitat protections apply only to Federal actions, and provide little added protection for populations occurring on State or private land. All involved parties and the major landowners have been notified of the location and importance of protecting the habitat of these taxa. Additional protection of the habitat of these taxa will be addressed through the recovery process and through the section 7 consultation process. For this reason Service concludes that designation of critical habitat for these 14 taxa is not prudent at this time.

#### Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities.

Recognition through listing can encourage and result in conservation actions by Federal, State, and local agencies, private organizations, and individuals. The Act provides for possible land acquisition and cooperation with the State and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against certain activities involving listed plants are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Nine of the endangered taxa occur on land under Federal jurisdiction, including the U.S. Army and U.S. Navy. Of those, four taxa are found on federally owned land and six taxa occur on land leased by the Federal government from the State. Activities carried out by the U.S. Army include ordnance training practices, ground troop training activities, and construction, maintenance, and utilization of helicopter landing and drop-off sites. The Army is coordinating with TNCH to develop management plans for Schofield Barracks Military Reservation, Kawailoa Training Area, and Makua Military Reservation to limit the impact of these activities on endangered species and their habitats. The Navy is in the process of developing a management plan for Lualualei Naval Magazine.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened plants. With respect to the 14 taxa in this rule, all prohibitions of section 9(a)(2) of the Act, implemented by 50 CFR 17.61 for

endangered plants and 17.71 for threatened plants, would apply. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to import or export, transport in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale in interstate or foreign commerce; remove and reduce the species to possession from areas under Federal jurisdiction. In addition, for plants listed as endangered, the Act prohibits the malicious damage or destruction on areas under Federal jurisdiction and the removal, cutting, digging up, or damaging or destroying of such plants in knowing violation of any State law or regulation, including State criminal trespass law. Section 4(d) of the Act allows for the provision of such protection to threatened species through regulation. This protection may apply to *Isodendron longifolium* in the future if regulations are promulgated. Seeds from cultivated specimens of threatened plants are exempt from these prohibitions provided that their containers are marked "Of Cultivated Origin." Certain exceptions to the prohibitions apply to agents of the Service and State conservation agencies.

The Act and 50 CFR 17.62, 17.63, and 17.72 also provide for the issuance of permits to carry out otherwise prohibited activities involving endangered or threatened plants under certain circumstances. Such permits are available for scientific purposes and to enhance the propagation or survival of the species. For threatened plants, permits are also available for botanical or horticultural exhibition, educational purposes, or special purposes consistent with the purposes of the Act. It is anticipated that few permits would be sought or issued because these 14 taxa are not common in cultivation or in the wild.

It is the policy of the Service (59 FR 34272) to identify to the maximum extent practicable at the time a species is listed those activities that would or would not constitute a violation of section 9 of the Act. Such information is intended to clarify the potential

impacts of the species' listing on proposed and ongoing activities within the species' range. Nine of the taxa occur on Federal lands under the jurisdiction of the U.S. Army or U.S. Navy. Collection, damage, or destruction of these taxa on Federal lands is prohibited although in appropriate cases a Federal endangered species permit may be issued to allow collection. Such activities on non-Federal lands would constitute a violation of section 9 if conducted in knowing violation of Hawaii State law or regulations or in violation of State criminal trespass law. The Service is not aware of any trade in these species.

Questions regarding whether specific activities will constitute a violation of section 9 should be directed to the Field Supervisor of the Service's Pacific Islands Office (see ADDRESSES section). Requests for copies of the regulations concerning listed plants and general inquiries regarding prohibitions and permits may be addressed to the Fish and Wildlife Service, Ecological Services, Endangered Species Permits Branch, 911 N.E. 11th Avenue, Portland, Oregon 97232-4181 (telephone: 503/231-6241; facsimile: 503/231-6243).

**Hawaii State Law**

Federal listing will automatically invoke listing under the State's endangered species act. Hawaii's Endangered Species Act states, "Any species of aquatic life, wildlife, or land plant that has been determined to be an endangered species pursuant to the [Federal] Endangered Species Act shall be deemed to be an endangered species under the provisions of this chapter \* \* \*" (Hawaii Revised Statutes (HRS), sect. 195D-4(a)). The State law prohibits taking of listed species on private and State lands and encourages conservation by State agencies (HRS, sect. 195D-4).

**National Environmental Policy Act**

The Service has determined that Environmental Assessments or Environmental Impact Statements, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted

pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the Federal Register on October 25, 1983 (48 FR 49244).

**Required Determinations**

The Service has examined this regulation under the Paperwork Reduction Act of 1995 and found it to contain no information collection requirements. This rulemaking was not subject to review by the Office of Management and Budget under Executive Order 12866.

**References Cited**

A complete list of all references cited herein is available upon request from the Pacific Islands Ecoregion Office (see ADDRESSES section).

**Author**

The authors of this rule are Christa Russell and Marie M. Bruegmann, Pacific Islands Ecoregion Office (see ADDRESSES section).

**List of Subjects in 50 CFR Part 17**

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

**Regulation Promulgation**

Accordingly, part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, is amended as set forth below:

**PART 17—[AMENDED]**

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500, unless otherwise noted.

2. Section 17.12(h) is amended by adding the following, in alphabetical order under FLOWERING PLANTS, to the List of Endangered and Threatened Plants to read as follows:

**§ 17.12 Endangered and threatened plants.**  
 \* \* \* \* \*  
 (h) \* \* \*

Species		Historic range	Family name	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
FLOWERING PLANTS:							
<i>Achyranthes mutica</i> .....	None .....	U.S.A. (HI) .....	Amaranthaceae .....	E	592	NA	NA
<i>Cenchrus agrimonoides</i> .....	Kamanomano .....	U.S.A. (HI) .....	Poaceae .....	E	592	NA	NA
<i>Cyanea grimesiana</i> ssp. <i>grimesiana</i> .....	Haha .....	U.S.A. (HI) .....	Campanulaceae .....	E	592	NA	NA



Species		Historic range	Family name	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
<i>Cyperus trachysanthos</i>	Pu'uka'a	U.S.A. (HI)	Cyperaceae	E	592	NA	NA
<i>Euphorbia haeleeleana</i>	'Akoko	U.S.A. (HI)	Euphorbiaceae	E	592	NA	NA
<i>Isodendron laurifolium</i>	Aupaka	U.S.A. (HI)	Violaceae	E	592	NA	NA
<i>Isodendron longifolium</i>	Aupaka	U.S.A. (HI)	Violaceae	T	592	NA	NA
<i>Panicum niihauense</i>	Lau 'ehu	U.S.A. (HI)	Poaceae	E	592	NA	NA
<i>Phyllostegia parviflora</i>	None	U.S.A. (HI)	Lamiaceae	E	592	NA	NA
<i>Platanthera holochila</i>	None	U.S.A. (HI)	Orchidaceae	E	592	NA	NA
<i>Sanicula purpurea</i>	None	U.S.A. (HI)	Apiaceae	E	592	NA	NA
<i>Schiedea hookeri</i>	None	U.S.A. (HI)	Caryophyllaceae	E	592	NA	NA
<i>Schiedea kauaiensis</i>	None	U.S.A. (HI)	Caryophyllaceae	E	592	NA	NA
<i>Schiedea nuttallii</i>	None	U.S.A. (HI)	Caryophyllaceae	E	592	NA	NA

Dated: September 24, 1996.

John G. Rogers,

Acting Director, Fish and Wildlife Service.

[FR Doc. 96-25556 Filed 10-9-96; 8:45 am]

BILLING CODE 4310-55-P

## 50 CFR Part 17

### RIN 1018-AC56

#### Endangered and Threatened Wildlife and Plants; Endangered Status for the Plant *Delissea undulata* (No Common Name)

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

**SUMMARY:** The U.S. Fish and Wildlife Service (Service) determines endangered species status pursuant to the Endangered Species Act of 1973, as amended (Act), for the plant *Delissea undulata* (No Common Name). This species is known in the wild from only a single individual, located on the island of Hawaii. The greatest immediate threats to the survival of this species are habitat degradation and predation by domestic and feral mammals, fire, and competition with alien plants. The small population size of one individual with its limited gene pool also comprises a serious threat to this species. This rule implements the protection provisions provided by the Act for this species.

**EFFECTIVE DATE:** November 12, 1996.

**ADDRESSES:** The complete file for this rule is available for public inspection, by appointment, during normal business

hours at the Pacific Islands Ecoregion Office, U.S. Fish and Wildlife Service, 300 Ala Moana Boulevard, Room 6307, P.O. Box 50167, Honolulu, Hawaii 96850.

**FOR FURTHER INFORMATION CONTACT:** Marie M. Brueggemann, at the above address or telephone 808-541-3441.

#### SUPPLEMENTARY INFORMATION:

##### Background

*Delissea undulata* was first described by Charles Gaudichaud-Beaupre from specimens he collected in the Hawaiian Islands ("Isles Sandwich") in 1819 (St. John 1959). He chose the specific epithet to refer to the undulating margins of the leaves. F.E. Wimmer named a specimen J.F. Rock collected in 1911 from Kanahaha, Kona, as *Cyanea argutidentata*, which H. St. John later moved to the genus *Delissea* (St. John 1959, Wimmer 1943). St. John also named a specimen collected in 1968 from the southern Kona District as *D. konaensis* (St. John 1986). The current treatment of the family (Lammers 1988, 1990) considers all of the above species to be synonymous with *D. undulata*. Lammers recognizes three subspecies of *D. undulata*—subsp. *niihauensis*, subsp. *kauaiensis*, and subsp. *undulata* (Lammers 1988, 1990).

*Delissea undulata* of the bellflower family (Campanulaceae) is a palm-like tree with unbranched woody stems 2 to 10 meters (m) (6 to 30 feet (ft)) tall. The leaves are long and narrow or elliptic with long petioles and undulate or flat, toothed margins, about 5 to 21 centimeters (cm) (2 to 8 inches (in)) long

and 3 to 10 cm (1 to 4 in) wide. The 5 to 15 flowering stalks each bear 5 to 20 greenish-white, slightly down-curved flowers 1.6 to 2.5 cm (0.6 to 1.0 in) long with one or two small knobs on the upper surfaces. The fruits are ovoid to globose purple berries 0.6 to 1.2 cm (0.2 to 0.4 in) long. The three subspecies of *D. undulata* can be distinguished from each other by leaf shape and leaf margin characteristics—subsp. *kauaiensis* has ovate leaves with flat, sharply toothed margins; subsp. *niihauensis* has leaves with heart-shaped bases and shallow roundly toothed margins; and subsp. *undulata* has narrower, lance-shaped leaves with undulating margins and spreading, pointed teeth (Lammers 1988, 1990). The species *D. undulata* is distinguished from closely related species in this genus by its broader leaf bases, larger flowers, and larger berries (Lammers 1990).

Historically, *Delissea undulata* is known from Niihau, Kauai, Maui, and Hawaii. Subspecies *kauaiensis* was collected west of the Hanapepe River on the island of Kauai by A.A. Heller in 1895 and has not been relocated (Hawaii Heritage Program (HHP) 1991a, Heller 1897, Lammers 1988). Subspecies *niihauensis* was collected twice in the 1800's on the island of Niihau and has not been located since (HHP 1991b, Hillebrand 1888, St. John 1959). Both of these subspecies are considered extinct (HHP 1991a, 1991b; Lammers 1990). *Delissea undulata* subsp. *undulata* was reported from four valleys of southwestern Maui in the 1800's, and from the Kona region of the island of Hawaii (HHP 1991c1 to 1991c9). This