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**Margaret Milner Richardson,**

*Commissioner of Internal Revenue.*

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**DEPARTMENT OF THE INTERIOR**

**Fish and Wildlife Service**

**50 CFR Part 17**

**RIN 1018-AE22**

**Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for 10 Plant Taxa From Maui Nui, Hawaii**

**AGENCY:** Fish and Wildlife Service, Interior.

**ACTION:** Proposed rule.

**SUMMARY:** The U.S. Fish and Wildlife Service (Service) proposes endangered status pursuant to the Endangered Species Act of 1973, as amended (Act), for 10 plant taxa: *Clermontia samuelii* ('oha wai), *Cyanea copelandii* ssp. *haleakalaensis* (haha), *Cyanea glabra* (haha), *Cyanea hamatiflora* ssp. *hamatiflora* (haha), *Dubautia plantaginea* ssp. *humilis* (na'ena'e), *Hedyotis schlechtendahliana* var. *remyi* (kopa), *Kanaloa kahoolawensis* (kohe malama malama o Kanaloa), *Labordia tinifolia* var. *lanaiensis* (kamakahala), *Labordia triflora* (kamakahala), and *Melicope munroi* (alani). All 10 taxa are endemic to the Maui Nui group of islands, in the Hawaiian Islands. This group includes Maui, Molokai, Lanai, and Kahoolawe. *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, and *Dubautia plantaginea* ssp. *humilis* are endemic to the island of Maui. *Hedyotis schlechtendahliana* var. *remyi* and *Labordia tinifolia* var. *lanaiensis* are endemic to the island of Lanai. *Kanaloa kahoolawensis* is endemic to the island of Kahoolawe, although pollen studies indicate it may have been a dominant species on Oahu

until 800 years ago. *Labordia triflora* is endemic to Molokai, and *Melicope munroi* is found on Lanai but was also known historically from Molokai. The 10 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, natural disasters, and random environmental events. This proposal, if made final, would implement the Federal protection provisions provided by the Act.

**DATES:** Comments from all interested parties must be received by July 14, 1997. Public hearing requests must be received by June 30, 1997.

**ADDRESSES:** Comments and materials concerning this proposal should be sent to Robert P. Smith, Manager, Pacific Islands Ecoregion Office, U.S. Fish and Wildlife Service, 300 Ala Moana Boulevard, Room 6307, P.O. Box 50167, Honolulu, Hawaii 96850. Comments and materials received will be available for public inspection, by appointment, during normal business hours at the above address.

**FOR FURTHER INFORMATION CONTACT:** Robert P. Smith, Manager, Pacific Islands Ecoregion Office, see **ADDRESSES** section, or telephone 808-541-2749 or FAX 808-541-2756.

**SUPPLEMENTARY INFORMATION:**

**Background**

*Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, *Hedyotis schlechtendahliana* var. *remyi*, *Kanaloa kahoolawensis*, *Labordia tinifolia* var. *lanaiensis*, *Labordia triflora*, and *Melicope munroi* are, or were, known from four Hawaiian Islands: Molokai, Lanai, Maui, and Kahoolawe. The current and historical distribution by island for each of the 10 taxa is presented in Table 1.

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 northwest end of the chain. 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' to 28°15' N and longitude 154°40' to 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 four main central islands of Maui, Molokai, Lanai, and Kahoolawe are part of a large volcanic mass of six major volcanoes, which were united as a single island during times of lower sea level. This island, called Maui Nui, covered about 5,200 sq km (2,000 sq m). The youngest island in this group, Maui, consists of two volcanoes—the older West Maui, 1.3 million years old, and the younger Haleakala, 0.4 to 0.8 million years old. The islands progress in age from Haleakala (or East Maui), through Kahoolawe (1 million years old), West Maui, Lanai (1.2 to 1.5 million years old), to Molokai. Molokai consists of three volcanoes: East Molokai (1.3 to 1.5 million years old), West Molokai (1.5 to 1.8 million years old), and Kalaupapa Peninsula (1.2 million years old). The older islands are increasingly eroded (Macdonald *et al.* 1986). The topography of the Hawaiian Islands comprising Maui Nui is extremely diverse. On the youngest part of the island of 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 volcanoes, West Maui 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).

TABLE 1.—SUMMARY OF ISLAND DISTRIBUTION OF THE PROPOSED SPECIES

Species	Island within Maui Nui			
	M	Mo	L	Ka
<i>Clermontia samuelii</i> .....	C	.....	.....	.....
<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i> .....	C	.....	.....	.....
<i>Cyanea glabra</i> .....	C	.....	.....	.....
<i>Cyanea hamatiflora</i> ssp. <i>hamatiflora</i> .....	C	.....	.....	.....
<i>Dubautia plantaginea</i> ssp. <i>humilis</i> .....	C	.....	.....	.....
<i>Hedyotis schlechtendahliana</i> ssp. <i>remyi</i> .....	.....	.....	C	.....
<i>Kanaloa kahoolawensis</i> .....	.....	.....	.....	C*
<i>Labordia tinifolia</i> var. <i>lanaiensis</i> .....	.....	.....	C	.....

TABLE 1.—SUMMARY OF ISLAND DISTRIBUTION OF THE PROPOSED SPECIES—Continued

Species	Island within Maui Nui			
	M	Mo	L	Ka
Labordia triflora .....	.....	C	.....	.....
Melicope munroi .....	.....	H	C	.....

KEY

C = current; population last observed within the past 20 years.

H = historical; population not seen for over 20 years.

M-Maui

Mo-Molokai

L-Lanai

Ka-Kahoolawe

\*Kanaloa kahoolawensis was most likely a dominant species in the lowland areas of Oahu, and possibly Maui, up until 800 years ago, according to pollen records.

The climate of the Hawaiian Islands reflects the tropical setting buffered by the surrounding ocean (Department of Geography 1983). The prevailing winds are northeast trades with some seasonal fluctuation in strength. There are also winter storm systems and occasional hurricanes. Temperatures vary over the year an average of 5 °Celsius (C) (11 °Fahrenheit (F)) or less, with daily variation usually exceeding seasonal variation in temperature. Temperature varies with elevation and ranges from a maximum recorded temperature of 37.7 °C (99.9 °F), measured at 265 m (870 ft) elevation, to a minimum of -12.7 °C (9.1 °F) recorded at 4,205 m (13,795 ft) elevation. 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 tradewind-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. The most recent classification of Hawaiian natural communities recognizes nearly 100 native vegetation types. Within these types are numerous island-specific or region-specific associations, comprising an extremely rich array of vegetation types within 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). Three of the taxa proposed for listing (*Cyanea copelandii* ssp. *haleakalaensis*, *Labordia tinifolia* var. *lanaiensis*, and *Labordia triflora*) have been reported from lowland mesic forest habitat. 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 stature. Montane wet forests are usually dominated by several species of native trees and tree ferns. Four of the proposed taxa (*Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, and *Cyanea hamatiflora* ssp. *hamatiflora*) have been reported from montane wet forest habitat.

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. One of the proposed taxa, *Kanaloa kahoolawensis*, has been reported from coastal dry shrubland on Kahoolawe. Two of the proposed taxa, *Dubautia plantaginea* ssp. *humilis* and *Melicope munroi*, have been reported from lowland wet shrublands, and *Hedyotis schlechtendahlia* var. *remyi* has been reported from lowland mesic shrublands.

The land that supports these 10 plant taxa is owned by various private parties, the State of Hawaii (including forest reserves and natural area reserves), and the Federal government (Department of the Interior, National Park Service).

**Discussion of the 10 Plant Taxa**

*Clermontia samuelii*

*Clermontia samuelii*, was first described by C.N. Forbes from a collection he made in 1919 (Degener and Degener 1958, Forbes 1920). Harold

St. John described *C. hanaensis* in 1939, based on a specimen collected by C.N. Forbes in 1920 (Degener and Degener 1960, St. John 1939). Later, St. John formally described *C. gracilis*, *C. kiphuluensis*, and *C. rosacea* (St. John 1987a). In the most recent treatment of this endemic Hawaiian genus, Lammers considers all four species to be synonymous with *C. samuelii*, and divides the species into two subspecies—ssp. *hanaensis* (including the synonyms *C. hanaensis* and *C. kiphuluensis*) and ssp. *samuelii* (including *C. gracilis* and *C. rosacea*) (Lammers 1989, 1990).

*Clermontia samuelii*, a member of the bellflower family (Campanulaceae), is a terrestrial shrub 1.2 to 5 m (4 to 16 ft) tall. The leaves are elliptical, sometimes broader at the tip, with blades 5 to 10 cm (2 to 4 in.) long and 1.8 to 4.5 cm (0.7 to 1.8 in.) wide. The upper surfaces of the leaves are dark green, often tinged purplish, and may be sparsely hairy. The lower surfaces of the leaves are pale green, and sparsely to densely hairy. The leaf margins are thickened, with shallow, ascending, rounded teeth. The tips and bases of the leaves are typically sharply pointed. The inflorescences (flowering clusters) bear 2 to 5 flowers on a main stem that is 4 to 18 mm (0.2 to 0.7 in.) long. The stalk of each individual flower is 12 to 28 mm (0.5 to 1.1 in.) long. The hypanthium (cup-like structure at the base of the flower) is widest on the top, 8 to 14 mm (0.3 to 0.6 in.) long, and 5 to 10 mm (0.2 to 0.4 in.) wide. The sepals and petals are similar in color (rose or greenish white to white), curved, and tubular. The flowers are 36 to 55 mm (1.4 to 2.2 in.) long and 5 to 10 mm (0.2 to 0.4 in.) wide. The lobes of the sepals and petals are erect, and extend 0.2 to 0.5 times beyond the tube. Berries of this species have not yet been observed. *C. samuelii* ssp. *hanaensis* is differentiated from *C. samuelii* ssp. *samuelii* by the greenish white to white flowers; longer, narrower

leaves with the broadest point near the base of the leaves; and fewer hairs on the lower surface of the leaves. The species is separated from other members of this endemic Hawaiian genus by the size of the flowers and the hypanthium (Lammers 1990).

Historically, *Clermontia samuelii* has been reported from eight locations on Haleakala, East Maui, from Keanae Valley on the windward (northeastern) side to Manawainui on the more leeward (southeastern) side of Haleakala (Hawaii Heritage Program (HHP) 1991a1 to 1991a4, 1991b1 to 1991b4; Medeiros and Loope 1989). Currently, *C. samuelii* ssp. *hanaensis* is known from several populations limited to the northeastern side of Haleakala, totaling fewer than 300 individuals. The populations occur on State owned land, within a Natural Area Reserve and a Forest Reserve (FR) (Arthur C. Medeiros, Biological Resources Division—U.S. Geological Survey (BRD), pers. comm. 1995). *C. samuelii* ssp. *samuelii* is known from 5 to 10 populations totalling 50 to 100 individuals. Most of the populations occur on the back walls of Kipahulu Valley, within Haleakala National Park, with 2 or 3 of the populations on adjacent State owned land (Robert Hobdy, Hawaii Division of Forestry and Wildlife (DOFAW) and A.C. Medeiros, pers. comms. 1995). *C. samuelii* ssp. *hanaensis* is found at, or below, 915 m (3,000 ft) elevation (A.C. Medeiros, pers. comm. 1995), while *C. samuelii* ssp. *samuelii* is typically found between 1,800 to 2,100 m (6,000 to 6,900 ft) elevation (HHP 1991b1, 1991b2, 1991b4). Both taxa are found in montane wet forest dominated by *Metrosideros polymorpha* (o'hi'a) with an understory of *Cibotium* sp. (hapu'u) and various native shrubs. Associated plant taxa include *Dubautia* sp. (na'ena'e), *Clermontia* sp. ('oha wai), *Hedyotis* sp. (pilo), *Vaccinium* sp. (ohelo), *Carex alligata*, *Melicope* sp. (alani), and *Cheirodendron trigynum* ('olapa) (HHP 1991a1, 1991a2, 1991b4).

Threats to *Clermontia samuelii* ssp. *hanaensis* include habitat degradation and/or destruction by feral pigs (*Sus scrofa*) and competition with alien plant taxa such as *Tibouchina herbacea* (glorybush) and two species of *Hedychium* (ginger) (A.C. Medeiros, pers. comm. 1995; Fredrick R. Warshauer, BRD, pers. comm. 1995). In addition, two extremely invasive alien plant taxa, *Miconia calvescens* (velvet tree) and *Clidemia hirta* (Koster's curse), are found in nearby areas and may invade this habitat if not controlled (A.C. Medeiros, pers. comm. 1995). The habitat of *Clermontia samuelii* ssp. *samuelii* was extensively damaged by

pigs in the past, and pigs are still a major threat to the populations on State owned lands. The populations of *Clermontia samuelii* ssp. *samuelii* within the park have been fenced and pigs have been eradicated. Due to the large populations of pigs in adjacent areas, the park populations must constantly be monitored to prevent further ingress (R. Hobdy and A.C. Medeiros, pers. comms. 1995). Rats (mainly *Rattus rattus*) and slugs are known to eat leaves, stems, and fruits of other members of this genus, and therefore are a potential threat to both subspecies (Loyal Mehrhoff, U.S. Fish and Wildlife Service (USFWS), *in litt.* 1995).

#### *Cyanea copelandii* ssp. *haleakalaensis*

*Cyanea haleakalaensis* was first described in 1971 by St. John, from a collection made by G.Y. Kikudome in 1951 (St. John 1971). In 1987, St. John (St. John 1987b) merged the two genera *Cyanea* and *Delissea*, formally recognizing only *Delissea*, the genus with priority. This resulted in the combination *D. haleakalaensis*. Lammers retains both genera in the currently accepted treatment of the Hawaiian members of the family, and in 1988 he recognized *C. haleakalaensis* as a subspecies of *C. copelandii*, publishing the new combination *C. copelandii* ssp. *haleakalaensis* (Lammers 1988, 1990). *C. copelandii* ssp. *copelandii* was previously listed as an endangered species (59 FR 10305).

*Cyanea copelandii* ssp. *haleakalaensis*, a member of the bellflower family, is a vine-like shrub 0.3 to 2 m (1 to 7 ft) tall, with sprawling stems. The sap of this species is a tan latex. Stems are unbranched or sparingly branched from the base. The leaves are elliptical, 10 to 19 cm (4 to 7 in.) long, and 3.5 to 8.5 cm (1.4 to 3.3 in.) wide. The upper surfaces of the leaves have no hairs, while the lower surfaces are hairy. The margins of the leaves are thickened, with small, widely spaced, sharp teeth. The leaf stalks are 2.5 to 10 cm (1 to 4 in.) long. The inflorescences are 5 to 12-flowered and hairy. The main inflorescence stalks are 20 to 45 mm (0.8 to 1.8 in.) long. The hypanthium is oval and widest at the top, 6 to 10 mm (0.2 to 0.4 in.) long, about 5 mm (0.2 in.) wide, and hairy. The corolla (petals collectively) is yellowish but appears pale rose in color due to a covering of dark red hairs. The corolla is 37 to 42 mm (1.4 to 1.6 in.) long and about 5 mm (0.2 in.) wide. The corolla tube is gently curved and the lobes spread about 0.25 times beyond the tube. The berries are dark orange, oval, and 7 to 15 mm (0.3 to 0.6 in.)

long. This subspecies is differentiated from the other subspecies by the elliptical leaves, which are also shorter. This species differs from others in this endemic Hawaiian genus by the vine-like stems and the yellowish flowers that appear red due to the covering of hairs (Lammers 1990).

#### *Cyanea copelandii* ssp.

*haleakalaensis* was historically reported from six locations on the windward (northeastern) side of Haleakala, East Maui, from Waikamoi to Kipahulu Valley (Chock and Kikudome (299) 1950; Forbes (1680.M) 1919, (1708.M) 1919, (2616.M) 1920, (2675.M) 1920; Hobdy (887) 1980; Kikudome (454) 1951; Lamoureux and DeWreede (3917) 1967; Rock (25660b) 1954; St. John (24732) 1950; Warshauer and Kepler (FRW 2698) 1980; Warshauer and McEldowney (FRW 2769) 1980; Wagner *et al.* (5912) 1988). Currently, this taxon is known from two populations: One population of about 200 individuals in Kipahulu Valley, within Haleakala National Park; and one population of 35 individuals on lower Waikamoi flume, which is privately owned. Typical habitat is stream banks and wet scree slopes in montane wet or mesic forest dominated by *Acacia koa* (koa) and/or *Metrosideros polymorpha* (Hobdy (887) 1980; Medeiros and Loope 1989; National Tropical Botanical Garden (NTBG) 1994; Wagner *et al.* (5912) 1988; R. Hobdy and A.C. Medeiros, pers. comms. 1995). *C. copelandii* ssp. *haleakalaensis* is found at elevations between 730 and 1,340 m (2,400 and 4,400 ft) (Hobdy (887) 1980; Wagner *et al.* (5912) 1988; Warshauer and Kepler (FRW 2698) 1980; Warshauer and McEldowney (FRW 2769) 1980; A.C. Medeiros, pers. comm. 1995). Associated species include *Perrottetia sandwicensis* (olomea), *Psychotria hawaiiensis* (kopiko 'ula), *Broussaisia arguta* (kanawao), and *Hedyotis acuminata* (au) (Wagner *et al.* (5912) 1988).

The major threats to *Cyanea copelandii* ssp. *haleakalaensis* are habitat degradation and/or destruction by feral pigs and competition with several alien plant taxa (Higashino *et al.* 1988; Hobdy (887) 1980; NTBG 1994; R. Hobdy, A.C. Medeiros, and F.R. Warshauer, pers. comms. 1995). Rats (mainly *Rattus rattus*) and slugs (mainly *Milax gagetes*) are known to eat leaves, stems, and fruits of other members of this genus, and therefore are a potential threat to this species (L. Mehrhoff, *in litt.* 1995). In addition, *C. copelandii* ssp. *haleakalaensis* is threatened by random environmental events since it is known from only two populations.

*Cyanea glabra*

*Cyanea glabra* was first collected on West Maui by Willam Hillebrand who named it *Cyanea holophylla* var. *obovata* (Hillebrand 1888). In 1943, F.E. Wimmer named it *C. knudsenii* var. *glabra*, based on a specimen collected by Forbes on East Maui (Wimmer 1943). In 1981, St. John elevated *C. knudsenii* var. *glabra* to full species status as *C. glabra* (St. John 1981). Lammers, in the most recent treatment of the Hawaiian members of the family, upheld the species name, and included *C. holophylla* var. *obovata* as well as the following synonyms in *C. glabra*: *C. scabra* var. *variabilis*, *Delissea glabra*, *D. holophylla* var. *obovata*, and *D. scabra* var. *variabilis* (Lammers 1990, Rock 1919).

*Cyanea glabra*, a member of the bellflower family, is a branched shrub. The leaves of juvenile plants are deeply pinnately lobed, while those of the adult plants are more or less entire and elliptical. Adult leaves are 23 to 36 cm (9 to 14 in.) long and 7 to 12 cm (3 to 5 in.) wide. The upper surfaces of the leaves are green and hairless, while the lower surfaces are pale green and hairless to sparsely hairy. The margins of the adult leaves are thickened and shallowly toothed to irregularly lobed. Six to eight flowers are borne in each inflorescence. The main inflorescence stalk is 20 to 55 mm (0.8 to 2.2 in.) long, while the individual flower stalk is 12 to 25 mm (0.5 to 1.0 in.) long. The hypanthium is widest at the top, 7 to 10 mm (0.3 to 0.4 in.) long, and about 5 mm (0.2 in.) wide. The corolla is white, often with a pale lilac tinge, 50 to 60 mm (2 to 2.4 in.) long, and about 8 mm (0.3 in.) wide. The tube of the corolla is curved. The lobes are spreading, 0.25 to 0.33 times as long as the tube, and are covered by small, sharp projections. The berries are yellowish orange, elliptical, and 10 to 15 mm (0.4 to 0.6 in.) long. The calyx (sepals collectively) persist on the berry. This species is differentiated from others in this endemic Hawaiian genus by the size of the flower and the pinnately lobed juvenile leaves (Lammers 1990).

*Cyanea glabra* has been reported historically from two locations on West Maui (Hillebrand 1888; Steve Perlman, NTBG, pers. comm. 1992) and five locations on Haleakala, East Maui (HHP 1991c1 to 1991c5). This species is currently known from only two populations: One population of 12 individuals in Kauaula Gulch on West Maui, on privately owned land (S. Perlman, pers. comm. 1995); and one scattered population of approximately 200 individuals in Kipahulu Valley,

within Haleakala National Park (A.C. Medeiros, pers. comm. 1995). Typical habitat is wet forest dominated by *Acacia koa* and/or *Metrosideros polymorpha*, at elevations between 975 to 1,340 m (3,200 to 4,400 ft) (A.C. Medeiros, pers. comm. 1995).

The primary threat to *Cyanea glabra* is slugs (A.C. Medeiros, pers. comm. 1995). Additional threats are habitat degradation and/or destruction by feral pigs, flooding, and competition with several alien plant taxa (R. Hobdy and A.C. Medeiros, pers. comms. 1995). Rats are a potential threat to *C. glabra*, since they are known to eat plant parts of other members of the bellflower family (L. Mehrhoff, *in litt.* 1995; A.C. Medeiros, pers. comm. 1995). Leaf damage in the form of stippling and yellowing by the twospotted leafhopper (*Saphonia rufofascia*) has been observed on other native species within the area of *C. glabra* on West Maui and is a potential threat to this species (Kenneth Wood, NTBG, pers. comm. 1995). Random environmental events are a threat to this species, with only two populations remaining.

*Cyanea hamatiflora* ssp. *hamatiflora*

*Cyanea hamatiflora* was first collected by Joseph Rock in 1910 and described in 1913 (Rock 1913). In 1987, St. John (St. John 1987b) merged the two genera *Cyanea* and *Delissea*, formally recognizing only *Delissea*, the genus with priority. This resulted in the combination *D. hamatiflora*. In 1988, Lammers upheld *Cyanea* as a separate genus and combined *C. carlsonii* with this species, resulting in two subspecies: The federally endangered *C. hamatiflora* ssp. *carlsonii* (59 FR 10305) and the nominative *C. hamatiflora* ssp. *hamatiflora* (Lammers 1988, 1990).

*Cyanea hamatiflora* ssp. *hamatiflora*, a member of the bellflower family, is a palm-like tree 3 to 8 m (10 to 26 ft) tall. The latex is tan in color. The leaves are elliptical with the broadest point at the tip, or they may be narrowly oblong. The leaf blades are 50 to 80 cm (20 to 30 in.) long, 8 to 14 cm (3 to 5.5 in.) wide, and have no stem. The upper surface of the leaf is sparsely hairy to hairless and the lower surface is hairy at least along the midrib and veins. The leaf margins are minutely round-toothed. The inflorescence is 5 to 10 flowered with main stalks 15 to 30 mm (0.6 to 1.2 in.) long. The stalks of individuals flowers are 5 to 12 mm (0.2 to 0.5 in.) long. The hypanthium is widest at the top, 12 to 30 mm (0.5 to 1.2 in.) long, and 6 to 12 mm (0.2 to 0.5 in.) wide. The corolla is magenta in color, 60 to 80 mm (2 to 3 in.) long, 6 to 11 mm (0.2 to 0.4 in.) wide, and

hairless. The tube of the corolla is slightly curved, with lobes 0.25 to 0.5 times as long as the tube. The corolla lobes all curve downward, making the flower appear one-lipped. The anthers (pollen-bearing structures) are hairless except for the lower two, which have apical tufts of white hairs. The fruit is a purplish red berry 30 to 45 mm (1.2 to 1.8 in.) long and 20 to 27 mm (0.8 to 1.1 in.) wide. The berry is crowned by persistent calyx lobes. This subspecies is differentiated from the previously listed subspecies (*C. hamatiflora* ssp. *carlsonii*) by its longer calyx lobes and shorter individual flower stalks. This species is separated from others in this endemic Hawaiian genus by fewer flowers per inflorescence and narrower leaves (Lammers 1990).

*Cyanea hamatiflora* ssp. *hamatiflora* was historically known from eight locations on the windward (northeastern) side of Haleakala, on Maui, stretching from Puu o Kaka'e to Manawainui (Degener (7977) 1927; Forbes (1294.M) 1919, (1654.M) 1919, (2607.M) 1920; Higashino and Haratani (10037) 1983; Higashino and Holt (9398) 1980; Higashino and Mizuro (2850) 1976; Hobdy (2630) 1986; Rock (8514) 1918; St. John (24730) 1951; Skottsberg (870) 1920; Warshauer and McEldowney (FRW 2614) 1980; Warshauer and McEldowney (FRW 2876) 1980). Currently, this taxon is known from two locations. Five or 6 populations totalling 50 to 100 individuals in Kipahulu Valley occur within Haleakala National Park (A.C. Medeiros, pers. comm. 1995), and 5 or 6 populations totalling 20 to 25 widely scattered individuals occur in the Waikamoi-Koolau Gap area on privately owned land (NTBG 1995; R. Hobdy, pers. comm. 1995). Typical habitat for this taxon is montane wet forest dominated by *Metrosideros polymorpha*, with a *Cibotium* sp. and/or native shrub understory, from 975 to 1,500 m (3,200 to 4,920 ft) elevation (NTBG 1995; Warshauer and McEldowney (FRW 2614) 1980; Warshauer and McEldowney (FRW 2876) 1980). Associated native plant taxa include *Dicranopteris linearis* (uluhe), *Cheirodendron trigynum*, *Broussaisia arguta*, *Cyanea solenocalyx* (haha), *Cyanea kunthiana* (haha), *Vaccinium* sp. (ohelo), *Melicope* sp., and *Myrsine* sp. (kolea) (Higashino and Mizuro (2850) 1976; NTBG 1995).

The major threats to *Cyanea hamatiflora* ssp. *hamatiflora* are habitat degradation and/or destruction by feral pigs, landslides, and competition with the alien plant *Ageratina adenophora* (Maui pamakani) (NTBG 1995; R. Hobdy and A.C. Medeiros, pers. comms. 1995). Pig damage in the form of peeled bark

has been observed on individuals of *C. hamatiflora* ssp. *hamatiflora* (A.C. Medeiros, pers. comm. 1995). Rats and slugs are potential threats, since other Hawaiian members of this family are known to be eaten by rats and slugs (L. Mehrhoff, *in litt.* 1995). All populations of this taxon are in areas where rats and slugs have been observed (A.C. Medeiros, pers. comm. 1995).

*Dubautia plantaginea* ssp. *humilis*

*Dubautia plantaginea* ssp. *humilis* was first described in 1985, from specimens collected by Gerald Carr, Robert Robichaux, and Rene Sylva in Black Gorge on West Maui (Carr 1985, Carr 1990).

*Dubautia plantaginea* ssp. *humilis*, a member of the aster family (Asteraceae), is a dwarfed shrub less than 80 cm (30 in.) tall. The stems are hairless or occasionally strigulose (having straight hairs pressed against the stem). The leaves are opposite, narrow, 8 to 15 cm (3 to 6 in.) long, and 0.7 to 4.5 cm (0.3 to 1.8 in.) wide. The leaves usually have five to nine nerves, and are hairless or moderately strigulose. The leaf margins are toothed from the apex to near the middle. Between 20 to 90 flowering heads are found in each inflorescence, which is about 20 cm (8 in.) long and 28 cm (11 in.) wide. Eight to 20 florets (small flower that is part of a dense cluster) are found in each head, borne on a flat receptacle. The bracts on the receptacle are about 5 mm (0.2 in.) long, sharply toothed, and fused together. The corolla is yellow, and may purple with age. The fruit is an achene (a dry, one-celled, indehiscent fruit) 2.5 to 4 mm (0.08 to 0.2 in.) long. The taxon is self-incompatible, meaning flowers must be pollinated by pollen from a different plant. This subspecies differs from the other two subspecies (*D. plantaginea* ssp. *magnifolia* and *D. plantaginea* ssp. *plantaginea*) by having fewer heads per inflorescence but more florets per head. The species differs from other Hawaiian members of the genus by the number of nerves in the leaves and by the close resemblance of the leaves to the genus *Plantago* (Carr 1985, 1990).

*Dubautia plantaginea* ssp. *humilis* has only been reported from two locations in Iao Valley, on West Maui. Both populations are on privately owned land, and the two populations total fewer than 300 individuals. Typical habitat is wet, barren, wind-blown cliffs, between 350 to 400 m (1,150 to 1,300 ft) elevation. Associated native plant taxa include *Metrosideros polymorpha*, *Pipturus albidus* (mamaki), *Eragrostis variabilis* (kawelu), *Carex* sp., *Hedyotis formosa*, *Lysimachia remyi*, *Bidens* sp. (ko'oko'olau), *Pritchardia* sp. (loulou),

and the federally endangered *Plantago princeps* ('ale) (Hawaii Plant Conservation Center 1990; HHP 1991d1, 1991d2; R. Hobdy, pers. comm. 1995).

Threats to *Dubautia plantaginea* ssp. *humilis* include landslides and several alien plant taxa (HPCC 1990; HHP 1991d1; R. Hobdy, pers. comm. 1995). Random environmental events are also a threat, with only two known populations less than a half mile apart within the same valley.

*Hedyotis schlechtendahliana* var. *remyi*

Hillebrand described a new species, *Kadua remyi*, based on collections on Lanai and East Maui by Reverend John Lydgate (Hillebrand 1888). F. Raymond Fosberg combined the genus *Kadua* with *Hedyotis* in 1943, and combined *K. remyi* with *Hedyotis schlechtendahliana*. Fosberg considered the Lanai plants different enough from the Maui plants to create a separate variety, *H. schlechtendahliana* var. *remyi*. This variety has been upheld in the most recent revision of the Hawaiian members of this genus (Wagner *et al.* 1990).

*Hedyotis schlechtendahliana* var. *remyi*, a member of the coffee family (Rubiaceae), is a few branched subshrub from 60 to 600 cm (24 to 240 in.) long, with weakly erect or climbing stems that may be somewhat square, smooth, and glaucous (with a fine waxy coating that imparts a whitish or bluish hue to the stem). The leaves are opposite, glossy, thin or somewhat thickened, egg-shaped or with a heart-shaped base and a very pointed tip, and 3 to 6 cm (1.2 to 2.4 in.) long. The margins of the leaves curl under. The veins of the leaves are impressed on the upper surface with hairs along the veins and raised on the lower surface. The lower surface of the leaves are usually glaucous, like the stems. The leaf stalks are up to 1 cm (0.4 in.) long, slightly fused to the stem, and bear stipules (appendages on the base of the leaf stalks).

The inflorescence stalks are 2 to 15 mm (0.1 to 0.6 in.) long, square, usually glaucous, and borne at the ends of the stems. The flowers have either functional male and female parts or only functional female parts. Leaf-like bracts are found at the base of each flower. The hypanthium is top-shaped and 1.5 to 2.2 mm (0.06 to 0.09 in.) wide. The calyx lobes are usually leaf-like and oblong to broadly egg-shaped, 2 to 8 mm (0.08 to 0.3 in.) long, and 1.5 to 2.5 mm (0.08 to 0.09 in.) wide, enlarging somewhat in fruit. The corolla is cream-colored, fleshy, usually glaucous, trumpet-shaped, with a tube 6 to 17 mm (0.2 to 0.7 in.) long and lobes 1.5 to 10 mm (0.06 to 0.4 in.) long when the anthers

are ripe. The stamens reach only to 1 to 3 mm (0.04 to 0.1 in.) below the sinuses of the corolla lobes. The styles are woolly on the lower portions, and two to four lobed. The fruits are top-shaped to sub-globose capsules 2 to 4 mm (0.1 to 0.2 in.) long and 3 to 7 mm (0.1 to 0.3 in.) in diameter. The fruits break open along the walls of the cells within the fruit. Seeds are dark brown, irregularly wedge-shaped and angled, and darkly granular. This variety is distinguished from the other variety by the leaf shape, narrow flowering stalks, and flower color. It is distinguished from others in the genus by the distance between leaves and the length of the sprawling or climbing stems (Wagner *et al.* 1990).

Historically, *Hedyotis schlechtendahliana* var. *remyi* was known from five locations on the northwestern portion of Lanaihale on the island of Lanai (Degener *et al.* (24193) 1957; Forbes (33.L) 1913, (315.L) 1917; Fosberg (12463) 1939; HHP 1991e1 to 1991e3; Hillebrand 1888; Hillebrand and Lydgate (s.n.) n.d.; Munro (s.n.) 1913, (s.n.) 1914, (257, 335) 1928, (506) 1930; Nagata and Ganders (2524) 1982; Rock (8116) 1910; St. John and Eames (18738) 1938; Wagner *et al.* 1990). Currently, this species is known from six individuals in three populations on Kaiholeha-Hulupoe ridge, Kapohaku drainage, and Waiapaa drainage on Lanaihale (HHP 1991e1 to 1991e3; R. Hobdy, pers. comm. 1995). *H. schlechtendahliana* var. *remyi* typically grows in mesic windswept shrubland with a mixture of dominant plant taxa that may include *Metrosideros polymorpha*, *Dicranopteris linearis*, and/or *Styphelia tameiameia* (pukiawe) at elevations between 730 and 900 m (2,400 to 3,000 ft). Associated plant taxa include *Dodonaea viscosa* ('a'al'ii), *Sadleria* sp. ('ama'u), *Dubautia* sp. (na'ena'e), *Myrsine* sp., and several others (HHP 1991e1 to 1991e3; Lau (2866) 1986; Nagata and Ganders (2524) 1982).

The primary threats to *Hedyotis schlechtendahliana* var. *remyi* are habitat degradation and/or destruction by axis deer (*Axis axis*); competition with alien plant taxa such as *Psidium cattleianum*, *Myrica faya* (firetree), *Leptospermum scoparium* (New Zealand tea), and *Schinus terebinthifolius* (Christmas berry); and random environmental events and/or reduced reproductive vigor due to the small number of remaining individuals and populations (HHP 1994e1 to 1991e3; Joel Lau, The Nature Conservancy of Hawaii, pers. comm. 1995).

*Kanaloa kahoolawensis*

*Kanaloa kahoolawensis* was previously unknown to science until its discovery by Steve Perlman and Ken Wood in 1992 on a steep rocky spine on the coast of Kahoolawe. David Lorence and Wood have determined that this plant represents a new genus, and have named the species *Kanaloa kahoolawensis* (Lorence and Wood 1994).

*Kanaloa kahoolawensis*, a member of the legume family (Fabaceae), is a densely branched shrub 0.75 to 1 m (2.5 to 3.5 ft) tall. The branches are sprawling and 0.75 to 1.5 m (2.5 to 5 ft) long. New growth is densely covered with brown and white hairs. The twigs are brown, ribbed or angled, and become whitish gray with corky fissures. The leaves are clustered near twig tips and have two persistent stipules. The leaf stalk is 6 to 24 mm (0.2 to 0.9 in.) long. The leaves are divided into three pairs of leaflets, with a leaf nectary (nectar-bearing gland) at the joint between each pair of leaflets. The leaflet pairs are 22 to 55 mm (0.8 to 2 in.) long. The main stalk of the leaf terminates in a short, brown appendage. The leaflets are egg-shaped, unequal-sided, 1.4 to 4.2 cm (0.6 to 1.7 in.) long, and 0.9 to 3.2 cm (0.4 to 1.3 in.) wide. One to three inflorescences are found in the leaf axils (joint between leaf and stem), developing with the flush of new leaves. The main stalk of the inflorescence is 8 to 30 mm (0.3 to 1.2 in.) long. The inflorescence is a globose head 6 to 8 mm (0.3 to 0.3 in.) in diameter, with small bracts 1 to 1.5 mm (0.04 to 0.06 in.) long at the base. Each inflorescence has 20 to 54 white flowers. The calyx of the male flowers has limbs that are wider at the tip; densely covered with long, white hairs; and have lobes that overlap when the flower is in bud. The corolla lobes also overlap when the flower is in bud, and the petals are 1.5 to 1.8 mm (0.06 to 0.07 in.) long. The petals are hairy on the outside at the tip, and are not fused at the base. Ten stamens are found in the male flowers, fused at the base. Male flowers have only vestigial female parts. Female flowers have not been observed. The fruit is borne on a stalk about 5 mm (0.2 in.) long. Up to four fruit develop in each flowering head. The fruit is egg-shaped to subcircular, compressed, hairy at the base, and open along two sides. One slender, brown seed, about 2 mm (0.08 in.) long, is found in each fruit. There is no other species of legume in Hawaii that bears any resemblance to this species or genus (Lorence and Wood 1994).

The only known location of *Kanaloa kahoolawensis* is a rocky stack on the

southern coast of the island of Kahoolawe, which is owned by the State of Hawaii (Lorence and Wood 1994). While there are no previous records of the plant, pollen core studies on the island of Oahu revealed a legume pollen that could not be identified until this species was discovered. The pollen cores indicate that *K. kahoolawensis* was a codominant with *Dodonaea viscosa* and *Pritchardia* sp. from before 1210 B.C. to 1565 A.D., at which point *K. kahoolawensis* disappeared from the pollen record and *D. viscosa* and *Pritchardia* sp. declined dramatically (Athens *et al.* 1992, Athens and Ward 1993, Lorence and Wood 1994). Only two living individuals and 10 to 12 dead individuals are known (D. Lorence, NTBG, pers. comm. 1995). The only known habitat is mixed coastal shrubland on steep rocky talus slopes at 45 to 60 m (150 to 200 ft) elevation. Associated native plant taxa include *Sida fallax* ('ilima), *Senna gaudichaudii* (kolomona), *Bidens mauiensis* (ko'oko'olau), *Lipochaeta lavarum* (nehe), *Portulaca molokinensis* ('ihi), and *Capparis sandwichiana* (pua pilo). In addition, the area is also a nesting site for Bulwer's petrel (*Bulweria bulwerii*) and wedge-tailed shearwater (*Puffinus pacificus*) (Lorence and Wood 1994).

The major threats to *Kanaloa kahoolawensis* are landslides and the alien plant taxa *Emelia fosbergii*, *Chloris barbata* (swollen finger grass), and *Nicotiana glauca* (tobacco tree) (Lorence and Wood 1994). Goats (*Capra hircus*) played a major role in the destruction of vegetation on Kahoolawe before they were removed (Cuddihy and Stone 1990), and *K. kahoolawensis* probably survived only because the rocky stack is almost completely separated from the island and inaccessible to goats (Lorence and Wood 1994). Rats are a potential threat to this species, since it has seeds similar in appearance and presentation to the federally endangered *Caesalpinia kavaiensis*, which is eaten by rats. Rats may have been the cause of the decline of this species 800 years ago (L. Mehrhoff, *in litt.* 1995). Random environmental events and/or reduced reproductive vigor are also a threat to this species, because only two individuals are known.

*Labordia tinifolia* var. *lanaiensis*

Hillebrand determined, but did not name, a new variety of *Labordia tinifolia* based on specimens he collected on the islands of Kauai, West Maui, Lanai, and Hawaii. E.E. Sherff named the variety *L. tinifolia* var. *lanaiensis* in 1938 (Sherff 1938). In the revision of the Hawaiian members of this family, Wagner *et al.*

(1990), retained the nomenclature, but included only those plants from Lanai and Mapulehu on Molokai (previously considered *L. triflora*) as *L. tinifolia* var. *lanaiensis*. This endemic Hawaiian genus is currently being revised, and only the Lanai populations are included in *L. tinifolia* var. *lanaiensis*, while *L. triflora* is being resurrected for the Molokai population (see discussion of the next taxon, below) (Motley, in press).

*Labordia tinifolia* var. *lanaiensis*, a member of the logan family (Loganiaceae), is an erect shrub or small tree 1.2 to 15 m (4 to 49 ft) tall. The stems branch regularly into two forks of nearly equal size. The leaves are medium to dark green, oval to narrowly oval, 3.8 to 21 cm (1.5 to 8.3 in.) long, and 1.4 to 7.3 cm (0.6 to 2.9 in.) wide. The leaf stalks are 2.2 to 4 cm (0.9 to 1.6 in.) long. The stipules are fused together, forming a sheath around the stem that is 1 to 4 mm (0.04 to 0.2 in.) long. Three to 19 flowers are found in each inflorescence, and the entire inflorescence is pendulous and has a stalk 9 to 22 mm (0.4 to 0.8 in.) long. The flowers have a semen-like fragrance, and are borne on stalks 8 to 11 mm (0.3 to 0.4 in.) long. The corolla is pale yellowish green or greenish yellow, narrowly urn-shaped, and 6.5 to 19 mm (0.2 to 0.7 in.) long. The fruit is broadly oval, 8 to 17 mm (0.3 to 0.7 in.) long, 2 to 3 valved, and has a beak 0.5 to 1.5 mm (0.02 to 0.06 in.) long. The seeds are brown and about 1.8 mm (0.06 in.) long. This subspecies differs from the other two subspecies and other species in this endemic Hawaiian genus by having larger capsules and smaller corollas (Motley, in press; Wagner *et al.* 1990).

*Labordia tinifolia* var. *lanaiensis* was historically known from the entire length of the summit ridge of Lanaihale, on the island of Lanai (HHP 1991f1 to 1991f12; Motley, in press; Sherff 1938). Currently, *L. tinifolia* var. *lanaiensis* is known from only one population at the southeastern end of the summit ridge of Lanaihale. This population is on privately owned land and totals 300 to 1,000 scattered individuals. The typical habitat of *L. tinifolia* var. *lanaiensis* is lowland mesic forest, associated with such native species as *Dicranopteris linearis* and *Scaevola chamissoniana* (naupaka kuahiwi), at elevations between 760 and 915 m (2,500 and 3,000 ft) (HHP 1991f3; Motley, in press; R. Hobdy and J. Lau, pers. comms. 1995).

*Labordia tinifolia* var. *lanaiensis* is threatened by deer and several alien plant taxa (R. Hobdy, pers. comm. 1994;

J. Lau, pers. comm. 1995). The single population is also threatened by random environmental factors.

#### *Labordia triflora*

Hillebrand named *Labordia triflora* based on a specimen he collected on Molokai in the early 1800s (Hillebrand 1888). Wagner *et al.* considered this species to be synonymous with *L. tinifolia* var. *lanaiensis* (Wagner *et al.* 1990). Timothy Motley of the University of Hawaii (UH) is revising this endemic Hawaiian genus, and has resurrected *L. triflora* as a valid species (Motley, in press).

*Labordia triflora*, a member of the logan family, is very similar to *L. tinifolia* var. *lanaiensis*, described above, except in the following characteristics. Stems of *L. triflora* are climbing. The leaf stalks are only 1 to 3 mm (0.04 to 0.1 in.) long. The inflorescence stalks are 40 to 50 mm (1.6 to 2 in.) long. Each flower stalk is 10 to 25 mm (0.4 to 1 in.) long (Motley, in press).

Until 1990, *Labordia triflora* was known only from the type collection at Mapulehu, on the island of Molokai. This collection was made by Hillebrand in 1870 (Motley, in press). In 1990, Joel Lau of The Nature Conservancy of Hawaii, rediscovered the species in Kua Gulch on Molokai (Motley, in press; J. Lau, pers. comm. 1995). Only 10 individuals are known, all occurring on privately owned land (J. Lau, pers. comm. 1995). Of these individuals, only two are male plants (Timothy Motley, University of Hawaii, pers. comm. 1993). This species occurs in mixed lowland mesic forest, at an elevation of 800 m (2,600 ft). Associated species include *Pouteria sandwicensis* ('ala 'a), the federally endangered *Cyanea mannii* (haha), and *Tetraplasandra* sp. ('ohe) (Motley, in press).

The threats to *Labordia triflora* include habitat degradation and/or destruction by pigs and goats, rats that eat seeds, and competition with the alien plant species *Schinus terebinthifolius* (Motley in press; T. Motley, pers. comm. 1993). Random environmental events and reduced reproductive vigor also threaten this species, as only 10 individuals remain in one population.

#### *Melicope munroi*

In 1944, St. John described *Pelea munroi*, based on a collection by George C. Munro in 1915 (St. John 1944). The genus *Pelea* has since been submergered with *Melicope*, creating the combination *M. munroi* (Hartley and Stone 1989).

*Melicope munroi*, a member of the citrus family (Rutaceae), is a sprawling

shrub up to 3 m (10 ft) tall. The new growth of this species is minutely hairy. The leaves are opposite, broadly elliptical, 6 to 11 cm (2.4 to 4.3 in.) long, and 3.5 to 7.5 cm (1.4 to 3.0 in.) wide. The veins of the leaf are parallel, in 8 to 12 pairs, and are connected by arched veins near the margin of the leaf. The margins of the leaves are sometimes rolled under. The leaf stalks are 4 to 12 mm (0.2 to 0.5 in.) long. The inflorescence is found in the axil of the leaf and contains one to three flowers. The inflorescence stalk is 10 to 15 mm (0.4 to 0.5 in.) long, and the individual flower stalk is 15 to 35 mm (0.6 to 1.4 in.) long. Male flowers have not been reported. Female flowers have ovoid sepals about 2.5 mm (0.1 in.) long and delatate petals about 8 mm (0.3 in.) long. The fruit is about 18 mm (0.7 in.) wide, and the 4 carpels (egg-bearing structures) are fused about one-third of their length. This species differs from other Hawaiian members of the genus in the shape of the leaf and the length of the inflorescence stalk (Stone *et al.* 1990).

Historically known from the Lanaihale summit ridge of Lanai and above Kamalo on Molokai, *Melicope munroi* is currently known from only the Lanaihale summit ridge (HHP 1991g1 to 1991g10). The one widely scattered population totals an estimated 300 to 500 individuals (J. Lau, pers. comm. 1995). *M. munroi* is typically found in lowland mat fern shrubland, at elevations of 790 to 1020 m (2,600 to 3,350 ft). Associated native plant taxa include *Diplopterygium pinnatum*, *Dicranopteris linearis*, *Metrosideros polymorpha*, *Cheirodendron trigynum*, *Coprosma* sp. (pilo), *Broussaisia arguta*, *Melicope* sp., and *Machaerina angustifolia* ('uki) (HHP 1991g3 to 1991g10).

The major threats to *Melicope munroi* are deer and the alien plant taxa *Leptospermum scoparium* and *Psidium cattleianum* (HHP 1991g3 to 1991g10; J. Lau, pers. comm. 1995). Random environmental events also threaten the one remaining population.

#### Previous Federal Action

Federal action on these plants began as a result of section 12 of the Endangered Species Act (16 U.S.C. 1533), which directed the Secretary of the Smithsonian Institution to prepare a report on plants considered to be endangered or threatened in the United States. This report, designated as House Document No. 94-51, was presented to Congress on January 9, 1975. One of the 10 proposed taxa, *Cyanea glabra* (as *C. scabra* var. *variabilis*) was considered to be endangered in that document. One

taxon, *Labordia tinifolia* var. *lanaiensis*, was considered to be threatened and two taxa, *L. triflora* and *Melicope munroi* (as *Pelea munroi*), were considered to be extinct. 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. As a result of that review, on June 16, 1976, the Service published a proposed rule in the **Federal Register** (41 FR 24523) to determine endangered status pursuant to section 4 of the Act for approximately 1,700 vascular plant species. The list of 1,700 plant taxa was assembled on the basis of comments and data received by the Smithsonian Institution and the Service in response to House Document No. 94-51 and the July 1, 1975, **Federal Register** publication.

General comments received in response to the 1976 proposal are summarized in an April 26, 1978, **Federal Register** publication (43 FR 17909). In 1978, amendments to the Act required that all proposals over two years old be withdrawn. A one-year grace period was given to proposals already over two years old. On December 10, 1979, the Service published a notice in the **Federal Register** (44 FR 70796) withdrawing the portion of the June 16, 1976, proposal that had not been made final, along with four other proposals that had expired. 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). Six of the species in this proposal (including synonymous taxa) were at one time or another considered category 1 or category 2 candidates for Federal listing. Category 1 species were those for which the Service had on file substantial information on biological vulnerability and threats to support preparation of listing proposals but for which listing proposals had not yet been published because they were precluded by other listing activities. Category 2 species were those for which listing as endangered or threatened was possibly appropriate, but for which sufficient data on biological vulnerability and threats were not currently available to support proposed rules. Two taxa, *Labordia tinifolia* var. *lanaiensis* and *L. triflora*, were considered category 2 species in the 1980 and 1985 notices of review. *Melicope munroi* (as *Pelea munroi*) was considered a category 1\* in

the 1980 and 1985 notices. Category 1\* species were those that could possibly be extinct.

In the 1990 and 1993 notices, *Dubautia plantaginea* ssp. *humilis*, *Hedyotis schlechtendahlia* var. *remyi*, and *Melicope munroi* were considered category 2 species. *Labordia tinifolia* var. *lanaiensis* was considered more abundant than previously thought and moved to category 3C in the 1990 notice. Category 3C species were those that had proven to be more abundant or widespread than previously believed and/or were not subject to any identifiable threat. *Labordia triflora* was considered a synonym of *L. tinifolia* var. *lanaiensis* in the 1990 notice. As published in the **Federal Register** (61 FR 7596) on February 28, 1996, the Service discontinued the designation of category 2 and category 3 candidate species.

Since the last notice, new information suggests that the numbers and distribution are sufficiently restricted and the taxa are imminently threatened for the previously designated category 2 and category 3C species mentioned above, as well as six additional taxa (*Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, the newly discovered *Kanaloa kahoolawensis*, and the resurrected *Labordia triflora*), to warrant listing.

The processing of this proposed listing rule conforms with the Service's final listing priority guidance for fiscal year 1997, published in the **Federal Register** on December 5, 1996 (61 FR 64475-64481). 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 significant 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 giving highest priority to handling emergency situations (Tier 1) and second highest priority (Tier 2) to resolving the listing status of the outstanding proposed listings. Tier 3 includes the processing of new proposed listings for species facing high magnitude threats. This proposed rule for 10 plant taxa from Maui Nui in the Hawaiian Islands falls under Tier 3. The Pacific Islands Ecoregion currently has no outstanding Tier 1 or 2 species, therefore processing of Tier 3 activities is encouraged under the Listing Priority Guidance. This proposed rule has been updated by the Pacific Islands Ecosystem Office to reflect any changes

in distribution, status and threats since the expiration date of the listing moratorium.

**Summary of Factors Affecting the Species**

Section 4 of the Endangered Species Act and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal lists of endangered and threatened species. 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 10 taxa in this proposed rule are summarized in Table 2. The factors and their application to *Clermontia samuelii* C. Forbes ('oha wai), *Cyanea copelandii* Rock ssp. *haleakalaensis* (St. John) Lammers (haha), *Cyanea glabra* (F. Wimmer) St. John (haha), *Cyanea hamatiflora* Rock ssp. *hamatiflora* (haha), *Dubautia plantaginea* Gaud. ssp. *humilis* G. Carr (na'ena'e), *Hedyotis schlechtendahlia* Steud. var. *remyi* (Hillebr.) Fosb. (kopa), *Kanaloa kahoolawensis* Lorence & K.R. Wood (kohe malama malama o Kanaloa), *Labordia tinifolia* A. Gray var. *lanaiensis* Sherff (kamakahala), *Labordia triflora* Hillebr. (kamakahala), and *Melicope munroi* (St. John) B. Stone (alani) follow.

TABLE 2.—SUMMARY OF THREATS

Species	Alien mammals				Alien plants	Invertebrates	Substrate loss	Limited Nos*
	Pigs	Goats	Deer	Rats				
<i>Clermontia samuelii</i> .....	X	.....	.....	P	X	P	.....	
<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i> .	X	.....	.....	P	P	P	.....	X1
<i>Cyanea glabra</i> .....	X	.....	.....	P	X	X	X	X1
<i>Cyanea hamatiflora</i> ssp. <i>hamatiflora</i> .	X	.....	.....	P	X	P	X	
<i>Dubautia plantaginea</i> ssp. <i>humilis</i> .	.....	.....	.....	.....	X	.....	X	X1
<i>Hedyotis schlechtendahlia</i> var. <i>remyi</i> .	.....	.....	X	.....	X	.....	.....	X1,2
<i>Kanaloa kahoolawensis</i> .....	.....	.....	.....	P	X	.....	X	X1,2
<i>Labordia tinifolia</i> var. <i>lanaiensis</i> .	.....	.....	X	.....	X	.....	.....	X1
<i>Labordia triflora</i> .....	X	X	.....	X	X	.....	.....	X1,2
<i>Melicope munroi</i> .....	.....	.....	X	.....	X	.....	.....	X1

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 individuals.

**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 primary threats facing the 10 plant taxa included in this ruling are ongoing and

threatened destruction and adverse modification of habitat by feral animals and competition with alien plants (see Factor E).

Eight of the 10 taxa in this rule are variously threatened by feral animals (See Table 2). Animals such as pigs,



goats, axis deer, and cattle were introduced either by the early Hawaiians or more recently by European settlers 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 native plants, feral ungulates have contributed significantly to the heavy erosion still taking place on most of the main Hawaiian islands (Cuddihy and Stone 1990).

Pigs (*Sus scrofa*), 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 five of the proposed 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 proposed taxa (Cuddihy and Stone 1990, Smith 1985, Stone 1985). On Maui, pigs threaten both subspecies of *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, the only known population of *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, and the only known population of *Labordia triflora* (NTBG 1994; A.C. Medeiros, R. Hobdy, and J. Lau, pers. comms. 1995; F.R. Warshauer, pers. comm. 1995).

Goats (*Capra hircus*), 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). On Molokai, goats threaten the only known population of *Labordia triflora* (T. Motley, pers. comm. 1993).

In 1920, a group of 12 axis deer (*Axis axis*) was introduced to the island of Lanai and about 60 years later the population was estimated at 2,800

(Tomich 1986). Axis deer degrade habitat by trampling and overgrazing vegetation, which removes ground cover and exposes the soil to erosion. Extensive red erosional scars caused by decades of deer activity are evident on Lanai (Cuddihy and Stone 1990). Activity of axis deer threatens all populations of *Hedyotis schlechtendahlia* var. *remyi*, *Labordia tinifolia* var. *lanaiensis*, and *Melicope munroi* on Lanai (HHP 1991g8 to 1991g10; J. Lau, pers. comm. 1995).

#### B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Unrestricted collecting for scientific or horticultural purposes or excessive visits by individuals interested in seeing rare plants could result from increased publicity. This is a potential threat to all of the proposed taxa, but would seriously impact the eight taxa whose low numbers and/or few populations make them especially vulnerable to disturbances (*Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Dubautia plantaginea* ssp. *humilis*, *Hedyotis schlechtendahlia* var. *remyi*, *Kanaloa kahoolawensis*, *Labordia tinifolia* var. *lanaiensis*, *Labordia triflora*, and *Melicope munroi*).

#### C. Disease and Predation

Disease is not known to be a significant threat to any of the proposed taxa. None of the 10 proposed taxa are known to be unpalatable to pigs, deer, or goats. Feral pigs not only destroy native vegetation through their rooting activities and dispersal of alien plant seeds (see Factor A), 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). There is direct evidence of pigs eating bark off individuals of *Cyanea hamatiflora* ssp. *hamatiflora* (A.C. Medeiros, pers. comm. 1995), and predation is a possible threat to other members of the bellflower family (*Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, and *Cyanea glabra*). Predation is also a possible threat to the one other taxon, *Labordia triflora*, known from areas where pigs have been reported (A.C. Medeiros and R. Hobdy, pers. comms. 1995; F.R. Warshauer, pers. comm. 1995).

Two rat species, the black rat (*Rattus rattus*) and the Polynesian rat (*Rattus exulans*), and to a lesser extent other introduced rodents, eat large, fleshy fruits and strip the bark of some native plants, particularly fruits of the native plants in the bellflower family (Cuddihy and Stone 1990, Tomich 1986, Wagner

*et al.* 1985). It is possible that rats eat the fruits of *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, and *Cyanea hamatiflora* ssp. *hamatiflora*, which produce fleshy fruits and stems, and grow in areas where rats occur (A.C. Medeiros, pers. comm. 1995; L. Mehrhoff, *in litt.* 1995). Rats also eat the seeds of *Labordia triflora* (T. Motley, pers. comm. 1993). Rats are a potential threat to *Kanaloa kahoolawensis*, which has seeds of a type preferred by rats (L. Mehrhoff, *in litt.* 1995).

Slugs (including *Milax gagates*) are widespread in Hawaii and a serious threat to many native plant taxa, in addition to possibly being an attractant to pigs (Howarth 1985). Slugs feed preferentially on plants with fleshy leaves, stems, and fruits, including all taxa in the family Campanulaceae in Hawaii (L. Mehrhoff, *in litt.* 1995). Slugs are the primary threat to *Cyanea glabra*. All recent observations of this species have shown slug damage on both juveniles and adults (A.C. Medeiros, pers. comm. 1995). Slugs are also a potential threat to the following proposed taxa with fleshy tissues: *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, and *Cyanea hamatiflora* ssp. *hamatiflora* (A.C. Medeiros, pers. comm. 1995; L. Mehrhoff, *in litt.* 1995).

Twospotted leafhopper (*Sophonia rufofascia*) is a recently introduced insect that feeds on leaves, damaging them typically in the form of stippling and chlorosis. In addition to mechanical feeding damage, this insect may be a vector of a plant virus and is suspected of causing severe dieback of the native fern *Dicranopteris linearis* (uluhe), and economic damage to crops and ornamental plants in Hawaii. The twospotted leafhopper is a potential threat to all native taxa, since it has shown no host preference. It is a particularly grave threat to *Cyanea glabra*, since leafhoppers have been observed near the West Maui population (Adam Asquith, USFWS, pers. comm. 1994; K. Wood, pers. comm. 1995).

#### D. The Inadequacy of Existing Regulatory Mechanisms

Of the 10 proposed taxa, 8 have populations located on private land, 2 on State land, and 4 on Federal land within Haleakala National Park. While four of the taxa occur in more than one of those four ownership categories, five are known only from private land, and *Kanaloa kahoolawensis* is found only on State land.

Sections 2(c)(1) and 7(a)(1) of the Act direct Federal agencies to seek to conserve all listed endangered and

threatened plants, but requires no such activities if the plants are not federally listed. There are no State laws or existing regulatory mechanisms at the present time to protect or prevent further decline of these plants on private land, except for minimal protection offered to those that occur on land classified as a conservation district.

Populations of one of the proposed taxa, *Clermontia samuelii*, occur in a State Natural Area Reserve, which has rules and regulations for the protection of resources (HRS, sect. 195-5).

The majority of the populations of the 10 proposed 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 the 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. Due to lack of staff and funding, land uses within conservation districts are rarely adequately enforced. In addition, requests for amendments to district boundaries or variances within existing classifications can be made by government agencies and any person with a property interest in the land (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 conservation district, an environmental assessment is required to determine whether or not 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)) and includes guidelines to "protect endangered species of individual plants and animals \* \* \*" (HRS, sect. 344-

4(3)(A)). Federal listing, because it automatically invokes State listing, would also implement these other State regulations protecting the plants.

#### *E. Other Natural or Manmade Factors Affecting Its Continued Existence*

All 10 of the taxa proposed for listing are threatened by competition with one or more alien plant taxa (see Table 2). The most significant of these appear to be *Psidium cattleianum* (strawberry guava), *Schinus terebinthifolius* (Christmas berry), *Rubus rosifolius* (thimbleberry), *Clidemia hirta* (Koster's curse), *Miconia calvescens* (velvet tree), *Myrica faya* (firetree), *Paspalum conjugatum* (Hilo grass), *Psidium guajava* (common guava), *Casuarina equisetifolia* (ironwood tree), *Leptospermum scoparium* (New Zealand tea), and *Ageratina adenophora* (Maui pamakani). There are a number of other alien plant taxa that pose a significant threat to populations of the proposed plants.

*Psidium cattleianum* (strawberry guava), an invasive shrub or small tree native to tropical America, has become widely naturalized on all of the main 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). *P. cattleianum* is considered to be one of the greatest alien plant threats to Hawaiian rain forests and is a threat on Maui to one of two known populations of *Cyanea copelandii* ssp. *haleakalaensis* and *Cyanea glabra* (Higashino *et al.* 1988; A.C. Medeiros, pers. comm. 1995). On Lanai, this invasive alien plant threatens all populations of *Hedyotis schlechtendahlia* var. *remyi*, the only two known populations of *Labordia tinifolia* var. *lanaiensis*, and the only known population of *Melicope munroi* (HHP 1991e1 to 1991e3; R. Hobdy, pers. comm. 1994; J. Lau, pers. comm. 1995).

*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). *S. terebinthifolius* 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). This species is a threat to one population of *Hedyotis schlechtendahlia* var. *remyi*, both populations of *Labordia tinifolia* var. *lanaiensis*, and the only known population of *Labordia triflora* (HHP

1991e2; R. Hobdy, pers. comm. 1994; J. Lau, pers. comm. 1995).

*Rubus rosifolius* (thimbleberry), native to Asia, is naturalized in disturbed mesic to wet forest on all of the main Hawaiian Islands and is perhaps the most widespread of all species of *Rubus* introduced to Hawaii (Cuddihy and Stone 1990). On Maui, this species threatens one of two populations of *Cyanea copelandii* ssp. *haleakalaensis* as well as *Cyanea glabra* (NTBG 1994; A.C. Medeiros, pers. comm. 1995).

*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). *C. hirta* was first reported on Oahu in 1941 and had spread through much of the Koolau Mountains by the early 1960s. This noxious plant forms a dense understory, shading out other plants and hindering plant regeneration (Cuddihy and Stone 1990). This prolific alien plant has recently spread to five other islands and, on Maui is a potential threat to *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis* and *Cyanea glabra* (A.C. Medeiros, pers. comm. 1995).

*Miconia calvescens* (velvet tree) is a recently naturalized species native to tropical America. This species has become invasive in the Hilo and Pahoia areas of the island of Hawaii, and has become established on East Maui. This species has the potential to be very disruptive, as it has become an understory dominate where introduced to similar habitat in Tahiti (Almeda 1990, Cuddihy and Stone 1990). This species occurs on Maui near populations of *Clermontia samuelii* and poses a potential threat (A.C. Medeiros, pers. comm. 1995).

*Myrica faya* (firetree), native to the Azores, Madeira, and the Canary Islands, was introduced to Hawaii before 1900 for wine-making, firewood, or an ornamental. Trees were planted in forest reserves in the 1920s. By the mid-1980s *M. faya* had infested over 34,000 hectares (83,980 acres) throughout the State, with the largest infestations on the island of Hawaii. It is now considered a noxious weed (Cuddihy and Stone 1990, DOA 1981). *M. faya* can form a dense stand with no ground cover beneath the canopy. This lack of ground cover may be due to dense shading or to chemicals released by the tree that prevent other species from growing. *M. faya* also fixes nitrogen and increases nitrogen levels in Hawaii's typically nitrogen-poor volcanic soils. This may encourage the invasion of alien plants that would not normally be

able to grow as well as native species in the low-nitrogen soils of Hawaii (Cuddihy and Stone 1990). On Lanai, this species threatens *Hedyotis schlechtendahlia* var. *remyi* and *Labordia tinifolia* var. *lanaiensis* (HHP 1991e3; R. Hobdy, pers. comm. 1994).

*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 (Cuddihy and Stone 1990). In Maui's Kipahulu Valley, this grass threatens one of two populations of *Cyanea copelandii* ssp. *haleakalaensis* as well as *Cyanea glabra* (NTBG 1994; A.C. Medeiros, pers. comm. 1995). On West Maui, *P. conjugatum* threatens *Dubautia plantaginea* ssp. *humilis* (HPCC 1990).

*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). *P. guajava* 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 Maui, this species threatens one of the two known populations of *Cyanea copelandii* ssp. *haleakalaensis* as well as *Cyanea glabra*, and *Dubautia plantaginea* ssp. *humilis* (HPCC 1990; Higashino *et al.* 1988; A.C. Medeiros, pers. comm. 1995).

*Casuarina equisetifolia* (ironwood) is a large, fast-growing tree that reaches up to 20 m (65 ft) in height (Wagner *et al.* 1990). This large tree shades out other plants, takes up much of the available nutrients, and possibly releases a chemical agent that prevents other plants from growing beneath it (Neal 1965, Smith 1985). *C. equisetifolia* is invading the wet cliffs of Iao Valley and is a threat to *Dubautia plantaginea* ssp. *humilis* (HPCC 1990; HHP 1991d1; R. Hobdy, pers. comm. 1995).

*Leptospermum scoparium* (New Zealand tea), brought to Hawaii as an ornamental plant and now naturalized in disturbed mesic to wet forest on three islands, threatens *Hedyotis schlechtendahlia* var. *remyi*, *Labordia tinifolia* var. *lanaiensis*, and *Melicope munroi* (Wagner *et al.* 1990; J. Lau, pers. comm. 1995).

*Ageratina adenophora* (Maui pamakani), native to tropical America, has become naturalized in dry areas to wet forest on Oahu, Molokai, Lanai, Maui, and Hawaii (Wagner *et al.* 1990). This noxious weed forms dense mats with other alien plants and prevents regeneration of native plants (Anderson *et al.* 1992). On Maui, one of the two known populations of *Cyanea copelandii* ssp. *haleakalaensis* as well

as *Cyanea glabra*, and *Cyanea hamatiflora* ssp. *hamatiflora* are threatened by this species (NTBG 1995; R. Hobdy, pers. comm. 1995).

*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). One of two known populations of *Cyanea copelandii* ssp. *haleakalaensis* as well as *Cyanea glabra* are threatened by this species (A.C. Medeiros, pers. comm. 1995).

*Hedychium coronarium* (white ginger) was introduced to Hawaii in the late 1800s, probably by Chinese immigrants. It escaped from cultivation and is found in wet and mesic forests on most of the main Hawaiian islands. The large, vigorous herbs mainly reproduce vegetatively, forming very dense stands that exclude all other growth. *H. gardnerianum* (kahili ginger) was introduced to Hawaii before 1940 from the Himalayas, and now has major infestations on the islands of Hawaii, Maui, and Kauai. This species is considered a more serious threat to native forests because it produces abundant fruit (Cuddihy and Stone 1990, Wagner *et al.* 1990). Both species of *Hedychium* threaten *Clermontia samuelii* (A.C. Medeiros, pers. comm. 1995), and *H. gardnerianum* is a threat to *Labordia tinifolia* var. *lanaiensis* (R. Hobdy, pers. comm. 1994).

*Tibouchina herbacea* (glorybush), a relative of Koster's curse, first became established on the island of Hawaii in the late 1970s and, by 1982, was collected in Lanilili on West Maui (Almeda 1990). Although the disruptive potential of this alien plant is not fully known, *T. herbacea* appears to be invading mesic and wet forests of Hawaii and Maui (Cuddihy and Stone 1990), and is considered a threat to *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, and *Cyanea glabra* (R. Hobdy and A.C. Medeiros, pers. comm. 1995).

*Sporobolus africanus* (smutgrass) was introduced from Africa and has become naturalized on all the main islands of Hawaii except Niihau and Kahoolawe. It is typically found in disturbed areas such as road sides and pastures (O'Connor 1990), and on Maui is a threat to *Dubautia plantaginea* ssp. *humilis* (HPCC 1990).

*Pluchea symphytifolia* (sourbush) is native to Mexico, the West Indies, and northern South America. This species is naturalized in dry forests and ranges

into mesic and wet forests on all the main Hawaiian islands (Wagner *et al.* 1990). It is a fast growing shrub and can form dense thickets (Smith 1985). *P. symphytifolia* is a threat to *Dubautia plantaginea* ssp. *humilis* on West Maui (HPCC 1990).

*Emelia fosbergii* is a pantropical weed of unknown origin. In Hawaii it is a common weed in disturbed lowland dry habitats on all the main islands (Wagner *et al.* 1990). *E. fosbergii* is a threat to the only known population of *Kanaloa kahoolawensis* (Lorence and Wood 1994).

*Nicotiana glauca* (tree tobacco) was brought to Oahu as an ornamental from Argentina in the 1860s. It is now naturalized in all warm temperate regions of the world. On Oahu, Lanai, Maui, and Kahoolawe, this species is naturalized in disturbed open, dry habitats (Symon 1990). *N. glauca* is a threat to the only known population of *Kanaloa kahoolawensis* (Lorence and Wood 1994).

*Chloris barbata* (swollen finger grass) is native to Central America, the West Indies, and South America. In Hawaii it is naturalized in disturbed dry areas on all the main islands, and is a threat to the only known population of *Kanaloa kahoolawensis* (Lorence and Wood 1994, O'Connor 1990).

Erosion, landslides, rockslides, and flooding 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, steep slopes, and stream banks that have limited numbers and/or narrow ranges such as the West Maui population of *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, and *Kanaloa kahoolawensis* (Lorence and Wood 1994; R. Hobdy, pers. comm. 1995).

The small number of populations and individuals of many of these taxa increases the potential for extinction from a single human-caused or natural environmental disturbance. In addition, the small gene pool may depress reproductive vigor. Four of the proposed plant taxa, *Kanaloa kahoolawensis*, *Labordia tinifolia* var. *lanaiensis*, *Labordia triflora*, and *Melicope munroi*, are each known from a single population. Four additional proposed taxa have five or fewer populations (*Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Dubautia plantaginea* ssp. *humilis*, and *Hedyotis schlechtendahlia* var. *remyi*), and three of the taxa are estimated to number no more than 10 individuals (*Hedyotis schlechtendahlia* var. *remyi*, *Kanaloa kahoolawensis*, and

*Labordia tinifolia*). All of the proposed taxa either number fewer than 15 populations or total fewer than 800 individuals (see Table 2).

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 propose this rule. Based on this evaluation, this rulemaking will list these 10 species as endangered: *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, *Hedyotis schlechtendahlina* var. *remyi*, *Kanaloa kahoowawensis*, *Labordia tinifolia* var. *lanaiensis*, *Labordia triflora*, and *Melicope munroi*. The 10 taxa are threatened by one or more of the following: Habitat degradation and/or predation by pigs, goats, deer, rats, and invertebrates; competition for space, light, water, and nutrients by alien plant taxa; and substrate loss. Eight of the proposed taxa have five or fewer populations, and three of the taxa are estimated to number no more than 10 individuals. Small population size and limited distribution make these taxa particularly vulnerable to extinction from reduced reproductive vigor or from random environmental events. Because these 10 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 10 taxa is warranted.

Critical habitat is not being proposed for the 10 taxa included in this rule for reasons discussed in the "Critical Habitat" section of this proposal.

#### 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 propose critical habitat at the time the species is determined to be endangered or threatened. The Service finds that designation of critical habitat is not prudent for the 10 taxa proposed 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.

Designation of critical habitat is not prudent for the six taxa (*Dubautia plantaginea* ssp. *humilis*, *Hedyotis schlechtendahlina* var. *remyi*, *Kanaloa kahoowawensis*, *Labordia tinifolia* var. *lanaiensis*, *Labordia triflora*, and *Melicope munroi*) that are located primarily on non-Federal lands with limited Federal activities. It is likely that the publication of precise maps and descriptions of critical habitat in the **Federal Register** would increase the vulnerability of these plant species to incidents of collection and general vandalism. The listing of these plants as endangered elevates awareness of their rarity and makes them more sought after by curiosity seekers, researchers, and rare plant collectors. Such increased visits to the sites where these species are found could contribute to the decline of existing populations through vandalism. The remaining four taxa (*Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, and *Cyanea hamatiflora* ssp. *hamatiflora*) are located primarily on Federal lands within Haleakala National Park. These Federal lands are managed to some extent by the National Park Service for the protection of native ecosystems, which the Fish and Wildlife Service believes will facilitate the protection, conservation, and recovery of these four taxa. As a result, all 10 of these species will receive no significant benefit from the designation of critical habitat. Protection of the habitats of these 10 taxa will be addressed through the recovery process and through the section 7 consultation process. The Service believes that Federal involvement in areas where these plants occur can be identified without the designation of critical habitat. All involved parties and the major landowners have been notified.

#### Available Conservation Measures

Conservation measures provided to species listed as endangered or

threatened under the Endangered Species 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 plans be developed for 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)(2) of the Act 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.

Populations of four of the endangered taxa occur on U.S. National Park Service land. The Park Service actively monitors and manages rare and endangered species populations within Haleakala National Park, although it continually struggles for adequate funding to control feral pigs and alien plant taxa.

Populations of *Clermontia samuelii* ssp. *samuelii* on State land are being considered for a fencing project that may preclude the need for listing as endangered. This project is a cooperative effort between the Service and the State Division of Forestry and Wildlife.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered plants. With respect to the 10 proposed species in this rule, all prohibitions of section 9(a)(2) of the Act, implemented by 50 CFR 17.61, would apply. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to import or export any endangered plant species to/from the United States; transport such species in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale such a species in interstate or foreign

commerce; remove and reduce such a species to possession from areas under Federal jurisdiction; maliciously damage or destroy any such species from areas under Federal jurisdiction; or remove, cut, dig up, or damage or destroy any such species in knowing violation of any State law or regulation, including State criminal trespass law. Certain exceptions to the prohibitions apply to agents of the Service and State conservation agencies.

The Act and 50 CFR 17.62 provide for the issuance of permits to carry out otherwise prohibited activities involving endangered plant species under certain circumstances. Such permits are available for scientific purposes and to enhance the propagation or survival of the species. It is anticipated that few permits would ever be sought or issued because these 10 species are not common in cultivation or in the wild.

It is Service policy, published in the **Federal Register** (59 FR 34272) on July 1, 1994, 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 a species' listing on proposed and ongoing activities within the species' range. Four of the species occur on Federal lands under the jurisdiction of the U.S. National Park Service. Collection, damage, or destruction of these species on Federal lands is prohibited without a Federal endangered species permit. 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 a State criminal trespass law (see Hawaii State Law section below). The Service is not aware of any trade in these species.

Requests for copies of the regulations concerning listed plants and inquiries regarding prohibitions and permits may be addressed to the Fish and Wildlife Service, Ecological Services, Permits Branch, 911 N.E. 11th Avenue, Portland, Oregon 97232-4181 (telephone 503-231-6241; FAX 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 \* \* \*" (HRS, sect. 195D-4(a)).

Therefore, Federal listing will accord the species listed status 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).

#### Public Comments Solicited

The Service intends that any final action resulting from this proposal will be as accurate and as effective as possible. Therefore, comments or suggestions from the public, other concerned governmental agencies, the scientific community, industry, or any other interested party concerning this proposed rule are hereby solicited. Comments particularly are sought concerning:

(1) Biological, commercial trade, or other relevant data concerning any threat (or lack thereof) to these species;

(2) The location of any additional populations of these species and the reasons why any habitat should or should not be determined to be critical habitat as provided by section 4 of the Act;

(3) Additional information concerning the range, distribution, and population size of these species; and

(4) Current or planned activities in the subject area and their possible impacts on these species.

Final promulgation of the regulation(s) on these 10 species will take into consideration the comments and any additional information received by the Service, and such communications may lead to a final regulation that differs from this proposal.

The Endangered Species Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days of the date of publication of the proposal in the **Federal Register**. Such requests must be made in writing and addressed to the Ecoregion Manager (see **ADDRESSES** section).

#### National Environmental Policy Act

The Fish and Wildlife Service has determined that Environmental Impact 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).

The Service has examined this regulation under the Paperwork Reduction Act of 1995 and found it to contain no information collection requirements.

#### References Cited

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

Author: The author of this proposed rule is Marie M. Bruegmann, telephone 808-541-3441 or facsimile 808-541-3470 (see **ADDRESSES** section). Substantial data were contributed by the Hawaii Heritage Program, Hawaii Division of Forestry and Wildlife, and Biological Resources Division of the U.S. Geological Survey (formerly National Biological Service).

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

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

#### Proposed Regulation Promulgation

Accordingly, the Service hereby proposes to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, 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	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
<b>Flowering Plants</b>							
* <i>Clermontia samuelii</i>	* 'Oha wai .....	* U.S.A. (HI) .....	* Campanulaceae— Bellflower.	* E	* .....	NA	* NA
* <i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i> .	* Haha .....	* U.S.A. (HI) .....	* Campanulaceae— Bellflower.	* E	* .....	NA	* NA
* <i>Cyanea glabra</i> .....	* Haha .....	* U.S.A. (HI) .....	* Campanulaceae— Bellflower.	* E	* .....	NA	* NA
* <i>Cyanea hamatiflora</i> ssp. <i>hamatiflora</i> .	* Haha .....	* U.S.A. (HI) .....	* Campanulaceae— Bellflower.	* E	* .....	NA	* NA
* <i>Dubautia plantaginea</i> ssp. <i>humilis</i> .	* Na'ena'e .....	* U.S.A. (HI) .....	* Asteraceae—Sun- flower.	* E	* .....	NA	* NA
* <i>Hedyotis schlechtendahliana</i> var. <i>remyi</i> .	* Kopa .....	* U.S.A. (HI) .....	* Rubiaceae—Coffee	* E	* .....	NA	* NA
* <i>Kanaloa kahoolawensis</i> .	* None .....	* U.S.A. (HI) .....	* Fabaceae—Legume	* E	* .....	NA	* NA
* <i>Labordia tinifolia</i> var. <i>lanaiensis</i> .	* Kamakahala .....	* U.S.A. (HI) .....	* Loganiaceae— Logan.	* E	* .....	NA	* NA
* <i>Labordia triflora</i> .....	* Kamakahala .....	* U.S.A. (HI) .....	* Loganiaceae— Logan.	* E	* .....	NA	* NA
* <i>Melicope munroi</i> .....	* Alani .....	* U.S.A. (HI) .....	* Rutaceae—Citrus ....	* E	* .....	NA	* NA
* .....	* .....	* .....	* .....	* .....	* .....	.....	* .....

Dated: April 28, 1997.

**John G. Rogers,**

Director, Fish and Wildlife Service.

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