

to establish a plan for informing and advising any small governments that may be significantly or uniquely impacted by the rule.

EPA has determined that the approval action promulgated does not include a Federal mandate that may result in estimated costs of \$100 million or more to either State, local, or tribal governments in the aggregate, or to the private sector. This Federal action approves pre-existing requirements under State or local law, and imposes no new Federal requirements. Accordingly, no additional costs to State, local, or tribal governments, or to the private sector, result from this action.

D. Submission to Congress and the General Accounting Office

Under 5 U.S.C. § 801(a)(1)(A) as added by the Small Business Regulatory Enforcement Fairness Act of 1996, EPA submitted a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives and the Comptroller General of the General Accounting Office prior to publication of the rule in today's Federal Register. This rule is not a major rule as defined by 5 U.S.C. § 804(2).

E. Petitions for Judicial Review

Under section 307(b)(1) of the CAA, petitions for judicial review of this action must be filed in the United States Court of Appeals for the appropriate circuit by December 9, 1996. Filing a petition for reconsideration by the Administrator of this final rule does not affect the finality of this rule for the purposes of judicial review nor does it extend the time within which a petition for judicial review may be filed, and shall not postpone the effectiveness of such rule or action. This action may not be challenged later in proceedings to enforce its requirements. (See section 307(b)(2).)

List of Subjects in 40 CFR Part 52

Environmental protection, Air pollution control, Carbon monoxide, Incorporation by reference, Intergovernmental relations, Reporting and recordkeeping requirements.

Dated: September 26, 1996.

Chuck Clarke,

Regional Administrator.

Note: Incorporation by reference of the Implementation Plan for the State of Washington was approved by the Director of the Office of Federal Register on July 1, 1982.

Part 52, chapter I, title 40 of the Code of Federal Regulations is amended as follows:

PART 52—[AMENDED]

1. The authority citation for Part 52 continues to read as follows:

Authority: 42 U.S.C. 7401-7671q.

Subpart WW—Washington

2. Section 52.2470 is amended by adding paragraph (c)(62) to read as follows:

§ 52.2470 Identification of plan.

* * * * *

(c) * * *

(62) On September 30, 1994, the Director of WDOE submitted to the Regional Administrator of EPA a revision to the Carbon Monoxide State Implementation Plan for, among other things, the CO attainment demonstration for the Central Puget Sound carbon monoxide nonattainment area. This was submitted to satisfy federal requirements under section 187(a)(7) of the Clean Air Act, as amended in 1990, as a revision to the carbon monoxide State Implementation Plan.

(i) Incorporation by reference.

(A) September 30, 1994, letter from WDOE to EPA submitting an attainment demonstration revision for the Central Puget Sound CO nonattainment area (adopted on September 30, 1994); a supplement letter and document from WDOE, "Reexamination of Carbon Monoxide Attainment Demonstration for the Tacoma Carbon Monoxide Monitoring Site for the Supplement to the State Implementation Plan for Washington State, A Plan for Attaining and Maintaining National Ambient Air Quality Standards for Carbon Monoxide in the Puget Sound Nonattainment Area," dated May 10, 1996; and a supplement letter and document from WDOE, "Revisions to the May 1996 Reexamination of Carbon Monoxide Attainment Demonstration for the Tacoma Carbon Monoxide Monitoring Site", dated September 12, 1996.

[FR Doc. 96-25980 Filed 10-9-96; 8:45 am]

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018-AD46

Endangered and Threatened Wildlife and Plants; Determination of Endangered or Threatened Status for Nineteen Plant Species From the Island of Kauai, Hawaii

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The U.S. Fish and Wildlife Service (Service) determines endangered status pursuant to the Endangered Species Act of 1973, as amended (Act), for 17 plants: *Alsinidendron lychnoides* (kuawawaenuhu), *Alsinidendron viscosum* (No common name (NCN)), *Cyanea remyi* (haha), *Cyrtandra cyaneoides* (mapele), *Delissea rivularis* ('oha), *Hibiscadelphus woodii* (hau kuahiwi), *Hibiscus waimeae* ssp. *hannerae* (koki'o ke'oke'o), *Kokia kauaiensis* (koki'o), *Labordia tinifolia* var. *wahiawaensis* (kamakahala), *Phyllostegia knudsenii* (NCN), *Phyllostegia wawrana* (NCN), *Pritchardia napaliensis* (loulou), *Pritchardia viscosa* (loulou), *Schiedea helleri* (NCN), *Schiedea membranacea* (NCN), *Schiedea stellarioides* (lauhilihi), and *Viola kauaensis* var. *wahiawaensis* (nani wai'ale'ale). The Service also determines threatened status for two plant species: *Cyanea recta* (haha) and *Myrsine linearifolia* (kolea). All of the species are endemic to the island of Kauai, Hawaiian Islands. The 19 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 introduced species, natural disasters, and trampling by humans. This rule implements the Federal protection provisions provided by the Act. Listing under the Act also triggers listed status for these 19 taxa under State law.

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

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

FOR FURTHER INFORMATION CONTACT: Brooks Harper, Field Supervisor, Ecological Services (see ADDRESSES

section) (telephone: 808/541-3441; facsimile: 808/541-3470).

SUPPLEMENTARY INFORMATION:

Background

Alsinidendron lychnoides, *Alsinidendron viscosum*, *Cyanea recta*, *Cyanea remyi*, *Cyrtandra cyaneoides*, *Delissea rivularis*, *Hibiscadelphus woodii*, *Hibiscus waimeae* ssp. *hannerae*, *Kokia kauaiensis*, *Labordia tinifolia* var. *wahiawaensis*, *Myrsine linearifolia*, *Phyllostegia knudsenii*, *Phyllostegia wawrana*, *Pritchardia napaliensis*, *Pritchardia viscosa*, *Schiedea helleri*, *Schiedea membranacea*, *Schiedea stellarioides*, and *Viola kauaiensis* var. *wahiawaensis* are endemic to the island of Kauai.

The island of Kauai is the northernmost and oldest of the eight major Hawaiian Islands (Foote *et al.* 1972). This highly eroded island, characterized by deeply dissected canyons and steep ridges, is 1,430 square kilometers (sq km) (553 sq miles (mi)) in area (Department of Geography 1983). Kauai was formed about six million years ago by a single shield volcano. Its caldera, once the largest in the Hawaiian Islands, now extends about 16 km (10 mi) in diameter and comprises the extremely wet, elevated tableland of Alakai Swamp (Department of Geography 1983). Because the highest point on Kauai, at Kawaikini Peak, is only 1,598 m (5,243 ft) in elevation (Walker 1990), it lacks the contrasting leeward montane rainfall patterns found on other Hawaiian islands that have higher mountain systems. Rainfall is distributed throughout the upper elevations, especially at Mount Waialeale, Kauai's second highest point at 1,569 m (5,148 ft) in elevation (Walker 1990) and one of the wettest spots on earth, where annual rainfall averages 1,145 centimeters (cm) (450 inches (in)) (Wagner *et al.* 1990). To the west of the Alakai Swamp is the deeply dissected Waimea Canyon, extending 16 km (10 mi) in length and up to 1.6 km (1 mi) in width. Later volcanic activity on the southeastern flank of the volcano formed the smaller Haupu caldera. Subsequent erosion and collapse of its flank formed Haupu Ridge (Macdonald *et al.* 1983). One of the island's most famous features is the Na Pali Coast, where stream and wave action have cut deep valleys and eroded the northern coast to form precipitous cliffs as high as 910 m (3,000 ft) (Joesting 1984).

Because of its age and relative isolation, levels of floristic diversity and endemism are higher on Kauai than on any other island in the Hawaiian archipelago. However, the vegetation of

Kauai has undergone extreme alterations because of past and present land use. Land with rich soils was altered by the early Hawaiians and, more recently, converted to agricultural use (Gagne and Cuddihy 1990) or pasture. Intentional or inadvertent introduction of alien plant and animal species has also contributed to the reduction of native vegetation on the island of Kauai. Native forests are now limited to the upper elevation mesic and wet regions within Kauai's conservation district. The 19 taxa in this final rule occur in that district, between 150 and 1,310 m (500 and 4,300 ft) elevation, within large State-owned tracts of natural area reserves, forest reserves, and parks, and smaller privately owned tracts. Most of the taxa persist on steep slopes, precipitous cliffs, valley headwalls, and other regions where unsuitable topography has prevented agricultural development or where inaccessibility has limited encroachment by alien animal and plant species.

The 19 taxa in this final rule are distributed mostly in the northern and northwestern portions of the island and grow in a variety of vegetation communities (shrublands, forests, and mixed communities), elevational zones (lowland to montane), and moisture regimes (dry to wet). Only one species, *Pritchardia napaliensis*, is found in lowland dry communities. These once abundant communities are now fragmented due to fire, development, and the ingression of alien plants and animals. Lowland dry forests in Hawaii are characterized by an annual rainfall of 50 to 200 cm (20 to 80 in) that falls between November and March, and a well-drained, highly weathered substrate rich in aluminum (Gagne and Cuddihy 1990).

Most populations of the 19 taxa in this final rule are in lowland mesic or wet shrubland or forest communities. Lowland mesic shrublands lie between 30 and 850 m (100 and 2,790 ft) elevation and are characterized by an open or closed canopy up to 3 m (10 ft) tall with little or no herbaceous layer development. These shrublands usually occur in habitats where forests cannot develop, such as on cliffs, ridges, and steep slopes. The annual rainfall of 100 to 200 cm (40 to 80 in) falls primarily during the winter months (Gagne and Cuddihy 1990). Lowland mesic forest communities lie between 30 and 1,600 m (100 and 5,250 ft) elevation and are characterized by a 2 to 20 m (6.5 to 65 ft) canopy and a diverse understory of shrubs, herbs, and ferns. The annual rainfall of 120 to 380 cm (45 to 150 in) falls predominantly between October

and March (Gagne and Cuddihy 1990). Lowland mesic forests often grade into lowland wet forests that are typically found on the windward sides of islands or in sheltered leeward situations between 100 and 1,200 m (330 and 3,940 ft) elevation. The rainfall in this lowland wet community may exceed 500 cm (200 in) per year. These forests were once the predominant vegetation on Kauai but now exist only on steep rocky terrain or cliff faces. The substrate is generally well-drained soils that may support tree canopies up to 40 m (130 ft) in height (Cuddihy and Stone 1990, Gagne and Cuddihy 1990). The habitat of eight of the 19 taxa in this final rule extends to the higher elevation montane mesic or wet forests. *Alsinidendron lychnoides*, *Delissea rivularis*, and *Schiedea helleri* are the only taxa found strictly within these montane communities, which typically occur above 910 m (3,000 ft) elevation (Hawaii Heritage Program (HHP) 1994a). The annual rainfall in montane communities may exceed 700 cm (280 in) (Gagne and Cuddihy 1990).

The land that supports these 19 plant taxa is owned by various private parties and the State of Hawaii (including State parks, forest reserves, and natural area reserves).

Discussion of the 19 Plant Taxa Included in This Final Rule

Alsinidendron lychnoides was first described by Wilhelm Hillebrand (1888) as *Schiedea lychnoides* based on a specimen collected by Valdemar Knudsen (between about 1853 and 1871) above Waimea, Kauai. While both Hillebrand and Amos Heller (1897) believed that there were good reasons to place *Schiedea lychnoides* in the genus *Alsinidendron*, it wasn't until 1944 that Earl Sherff transferred the species to this genus.

Alsinidendron lychnoides, a member of the pink family (Caryophyllaceae), is a weakly climbing or sprawling subshrub. The main stems are 0.4 to 3 m (1.3 to 9.8 ft) long with short side branches. The plant is woody, at least at the base, and densely covered with fine glandular hairs throughout. The thin leaves are egg-shaped to elliptic and are 3.5 to 6.5 cm (1.4 to 2.6 in) long and 1.5 to 3.8 cm (0.6 to 1.5 in) wide. Scattered clusters of 18 to 21 flowers range from 2 to 2.4 cm (0.8 to 0.9 in) in length. The four sepals are white and thin, and remain so at maturity. The outer two sepals greatly overlap the inner ones. The sepals are oblong-ovate, 10 to 12 millimeters (mm) (0.4 to 0.5 in) long, but enlarge to 12 to 16 mm (0.5 to 0.6 in) long in fruit, completely enclosing the fruit at maturity. The stamens are

scarcely fused at the base with basal outgrowths 2.5 to 3.5 mm (0.1 in) long, nearly as wide, and two- to three-toothed. The fruit are egg-shaped capsules, 9 to 12 mm (0.4 to 0.5 in) long, with 8 to 11 valves. The black seeds are approximately 1 mm (0.04 in) long with low transverse ridges on the surface. This species is distinguished from others in this endemic Hawaiian genus by the weakly climbing or sprawling habit, color of the sepals, number of flowers per cluster, and size of the leaves. *Alsinidendron lychnoides* is closely related to *Alsinidendron viscosum*, which differs primarily in having narrower leaves, fewer capsule valves, and fewer flowers per cluster (Wagner *et al.* 1990).

Historically, *Alsinidendron lychnoides* has been found on the east rim of Kalalau Valley near Keanapuka, the western and southeastern margins of the Alakai Swamp, and southwest of the Swamp near Kaholuamano on the island of Kauai (HHP 1994b2 to 1994b4, 1994b7; Wagner *et al.* 1990). This species is extant on State-owned land in the Alakai Swamp, including the Alakai Wilderness Preserve, and on State-owned land on the east rim of Kalalau Valley. This latter population occurs on the boundary of Hono O Na Pali Natural Area Reserve (NAR) and Na Pali Coast State Park. The four known populations contain a total of between 50 and 100 plants (HHP 1994b1, 1994b5, 1994b6; Hawaii Plant Conservation Center (HPCC) 1992a; Wood and Perlman 1993a; Yoshioka 1992; Diane Ragone, National Tropical Botanical Garden (NTBG), *in litt.* 1995). *Alsinidendron lychnoides* typically grows in montane wet forest dominated by *Metrosideros polymorpha* ('ohi'a) and *Cheirodendron* sp. ('olapa), or by 'ohi'a and *Dicranopteris linearis* (uluhe), trailing on the ground or on other vegetation, and at elevations between 1,100 and 1,320 m (3,600 and 4,330 ft). Associated plant species include *Athyrium* sp., *Carex* sp., *Cyrtandra* sp. (ha'iwale), *Machaerina* sp. ('uki), *Vaccinium* sp. ('ohelo), *Peperomia* sp. ('ala 'ala wai nui), *Hedyotis terminalis* (manono), *Astelia* sp. (pa'iniu), and *Broussaisia arguta* (kanawao) (HHP 1994b5, 1994b6; HPCC 1992a; Wagner *et al.* 1990; Marie M. Brueggemann, U.S. Fish and Wildlife Service, *in litt.* 1994).

The major threats to *Alsinidendron lychnoides* are competition from the aggressive alien plant species *Rubus argutus* (prickly Florida blackberry), habitat degradation by feral pigs (*Sus scrofa*), and trampling by humans. One plant has died since Hurricane 'Iniki struck Kauai in September 1992. This species is also threatened by a risk of

extinction from naturally occurring events (such as landslides or hurricanes) and/or reduced reproductive vigor due to the small number of extant individuals (Center for Plant Conservation (CPC) 1990; HHP 1994b1, 1994b5, 1994b6; HPCC 1992a; M. Brueggemann, *in litt.* 1994).

Horace Mann, Jr. (1866) originally described *Alsinidendron viscosum* as *Schiedea viscosa* based on a collection he made with William Brigham (between 1864 and 1865) on Kauai (Wagner *et al.* 1990). He chose the specific name in reference to the sticky hairs covering the whole plant. Later, Sherff (1944) placed the taxon in the genus *Alsinidendron* based on a reassessment of this species and *Schiedea lychnoides*, as suggested by Hillebrand (1888) and Heller (1897).

Alsinidendron viscosum, a member of the pink family, is a weakly climbing or sprawling subshrub. The stems are 0.6 to 3 m (2.0 to 9.8 ft) long, and densely covered with fine glandular hairs throughout. The thin and membranous leaves are narrowly elliptic and are 2.5 to 5 cm (1.0 to 2.0 in) long and 0.8 to 1.8 cm (0.3 to 0.7 in) wide. Usually three to nine flowers are arranged in loose clusters with stalks ranging from 2 to 3.5 cm (0.8 to 1.4 in) long. The four sepals are white, thin, and membranous, and remain so at maturity. The outer two sepals greatly overlap the inner ones. The sepals are oblong in shape and 8 to 9 mm (0.3 in) long, but enlarge to approximately 12 mm (0.5 in) long in fruit, completely enclosing the fruit at maturity. The stamens are sparsely fused at the base and the basal outgrowths are about 3 mm (0.1 in) long, nearly as wide, and two-toothed. The fruits are egg-shaped capsules, 8 to 12 mm (0.3 to 0.5 in) long, and opening by five to seven valves. The seeds are dark reddish brown, and approximately 0.8 mm (0.03 in) long with a minutely hairy surface. This species is distinguished from others in this endemic Hawaiian genus by the weakly climbing or sprawling habit, color of the sepals, number of flowers per cluster, and size of the leaves. *Alsinidendron viscosum* is closely related to *Alsinidendron lychnoides*, which differs primarily in having wider leaves and more capsule valves and flowers per cluster (Wagner *et al.* 1990).

Historically, *Alsinidendron viscosum* was known from the Kaholuamano, Kokee, Halemanu, Nawaimaka, and Waialae areas of northwestern Kauai (HHP 1994c1 to 1994c3). This species had not been seen since Charles Noyes Forbes' 1917 collection near Kauaikinana in Kokee when, in 1991, Steven Perlman and Kenneth Wood of

HPCC discovered a population of 11 mature plants on the ridge between Waialae and Nawaimaka valleys. In 1993, another 20 to 30 plants were discovered in the same general area on a north-facing ridge in Nawaimaka Valley. In 1992, Timothy Flynn and David Lorence of the National Tropical Botanical Garden (NTBG) located 10 plants along the Mohihi-Waialae Trail. The two known populations (two subpopulations in Nawaimaka Valley and one population on Mohihi-Waialae Trail) total between 40 and 60 mature plants on State-owned land. One population is within the Alakai Wilderness Preserve (Flynn and Lorence 1992; HHP 1994c4; HPCC 1993a1, 1993a2; Yoshioka 1992; Flynn and Wood, NTBG, pers. comms. 1994). *Alsinidendron viscosum* is typically found at elevations between 820 and 1,070 m (2,700 and 3,510 ft), on steep slopes in *Acacia koa* (koa)-'ohi'a lowland mesic or wet forest. Associated plant species include *Alyxia oliviformis* (maile), *Bohea* sp. ('ahakea), *Carex* sp., *Dodonaea viscosa* ('a'ali'i), *Ilex anomala* ('aiea), *Melicope* sp. (alani), *Pleomele* sp. (hala pepe), and *Psychotria* sp. (kopiko) (HHP 1994c4; HPCC 1993a1, 1993a2; Flynn and Lorence 1992; Wagner *et al.* 1990; K. Wood, pers. comm. 1994).

Destruction of habitat by feral pigs and goats (*Capra hircus*); competition with the alien plant species prickly Florida blackberry, *Lantana camara* (lantana), and *Melinis minutiflora* (molasses grass); and a risk of extinction from naturally occurring events and/or reduced reproductive vigor, due to the small number of extant populations and individuals, are the major threats to *Alsinidendron viscosum* (HHP 1994c4; HPCC 1993a1, 1993a2; S. Perlman, and K. Wood, NTBG, pers. comms. 1994; Christa Russell, The Nature Conservancy of Hawaii (TNCH), *in litt.* 1994).

While a member of the Austrian East Asiatic Exploring Expedition, Dr. Heinrich Wawra collected a new lobelioid on Kauai which he later described and named *Delissea recta* (Wawra 1873). In 1888, Hillebrand transferred this species to the genus *Cyanea*, and this is the name accepted in the current treatment of the family (Lammers 1990). Other published names that Lammers (1990) considers to be synonymous with *Cyanea recta* include *Cyanea larrisonii*, *Cyanea rockii*, *Cyanea salicina*, *Delissea larrisonii*, and *Delissea rockii* (Rock 1915, St. John 1987b, Wimmer 1968).

Cyanea recta, a member of the bellflower family, is an unbranched shrub 1 to 1.5 m (3.3 to 4.9 ft) tall. The

narrowly elliptic leaves are 12 to 28 cm (4.7 to 11 in) long and 1.2 to 5 cm (0.5 to 2 in) wide, with minutely toothed margins. The upper surface is green and smooth, while the lower surface is whitish green to pale green, and smooth or hairy. Five to seven flowers are arranged on an inflorescence stalk 7 to 10 cm (3 to 4 in) long, each having an individual stalk 5 to 17 mm (0.2 to 0.7 in) in length. The densely hairy flowers are purple or white with purple longitudinal stripes, 30 to 40 mm (1.2 to 1.6 in) long, and 3 to 4 mm (0.1 to 0.2 in) wide, with spreading lobes. The staminal column is smooth or sparsely hairy at the base. The anthers are covered with minute epidermal projections, the lower two with tufts of white hairs at the tip. The fruit is an egg-shaped, purple berry. *Cyanea recta* is distinguished from other species in the genus that grow on Kauai by the following collective characteristics: horizontal or ascending inflorescence, narrowly elliptic leaves 12 to 28 cm (4.7 to 11 in) long, flat leaf margins, and purple berries (Lammers 1990).

Historically, *Cyanea recta* was known from scattered locations of northeastern and central Kauai, including upper Hanalei Valley, Waioli Valley, Hanapepe Valley, Kalalau cliffs, Wainiha Valley, Makaleha Mountains, Limahuli Valley, Powerline Trail, and the Lehua Makanoe-Alakai area (HHP 1994d1 to 1994d7). Currently, six populations of this species, totalling approximately 500 to 1,500 individuals, are found on State and private land in the following areas: upper Waioli Valley, with more than 150 plants; Wainiha Valley, with several hundreds of plants; Makaleha Mountains, with an estimated 123 plants; Limahuli Valley with fewer than 50 plants; Powerline Trail with a single plant; and the back of Hanalei Valley with an unknown number of plants (HHP 1994d3, 1994d8 to 1994d10; HPCC 1992b, 1993c1, 1993c2; Lorence and Flynn 1993a, 1993b; K. Wood and S. Perlman, pers. comms. 1994). *Cyanea recta* grows in lowland wet or mesic 'ohi'a forest or shrubland, usually in gulches or on slopes, and typically from 400 to 940 m (1,300 to 3,070 ft) elevation. Associated plant species include kopiko, *Antidesma* sp. (hame), *Cheirodendron platyphyllum* (lapalapa), *Cibotium* sp. (hapu'u), and *Diplazium* sp. (HHP 1992; HPCC 1992b, 1993c1, 1993c2; Lammers 1990; Lorence and Flynn 1993a, 1993b).

The major threats to *Cyanea recta* are bark removal by rats; habitat degradation by feral pigs; browsing by goats; and competition with the alien plant species *Blechnum occidentale* (blechnum fern), lantana, *Rubus*

rosifolius (thimbleberry), *Clidemia hirta* (Koster's curse), *Crassocephalum crepidioides*, *Deparia petersenii*, *Erechtites valerianifolia* (fireweed), *Melastoma candidum*, *Paspalum conjugatum* (Hilo grass), *Sacciolepis indica* (Glengrass), and *Youngia japonica* (Oriental hawkbeard) (Lorence and Flynn 1993a, 1993b; Wood and Perlman 1993b; K. Wood, pers. comm. 1994).

The French naturalist and ethnologist Ezechiel Jules Remy first collected *Cyanea remyi* on Kauai or Niihau between 1851 and 1855. The specimen, labelled as an unidentified *Delissea*, languished in the herbarium of the Natural History Museum in Paris until Joseph Rock formally described it and named it in honor of the collector, in 1917. In the current treatment of the family, Lammers (1990) surmised that the taxon may be synonymous with *Cyanea truncata* due, at that time, to the inadequate material available for study. However, several recent collections by botanists from NTBG have confirmed the distinctness of this species (Lammers 1993; Thomas Lammers, Field Museum of Natural History, and S. Perlman, pers. comms. 1994).

Cyanea remyi, a member of the bellflower family, is a shrub 0.9 to 2 m (3 to 6.6 ft) tall with generally unbranched stems 1 to 2.5 cm (0.4 to 1 in) in diameter. The stems are erect, unarmed (lacking prickles), dark purple and hairy toward the apex, and brown and hairless below. The leaves are broadly elliptic, egg-shaped, or broadly oblong, and 16 to 40 cm (6 to 16 in) long and 9.5 to 19.5 cm (3.7 to 7.7 in) wide. The upper leaf surface is green, glossy, and hairless. The lower leaf surface is whitish green and glossy with scattered short white hairs on the midrib and veins. The leaf margins are hardened and slightly toothed. The inflorescence rises upward, contains six to 13 flowers, and is covered with short white hairs. The dark maroon sepal lobes are triangular or narrowly triangular, spreading or ascending, and 4 to 6 mm (0.2 in) long and 1 to 2 mm (0.04 to 0.08 in) wide. The tubular flowers, 40 to 53 mm (2 in) long, have two lips, are dark purple (shading to purplish white at the apex of the lobes on their inner surface), and are densely covered with short white hairs. The flower tube is curved, 30 to 31 mm (1 in) long and 5 to 5.5 mm (0.2 in) in diameter. The staminal column is slightly protruding. The maroon or dark purple fruit is a round berry, 10 to 13 mm (0.4 to 0.5 in) in diameter, with orange flesh and small projections on the outer surface. *Cyanea remyi* is distinguished from others in the genus that grow on Kauai by its

shrubby habit; relatively slender, unarmed (lacking prickles) stems; smooth or minutely toothed leaves; densely hairy flowers; the shape of the calyx lobes; length of the calyx and corolla, and length of the corolla lobe relative to the floral tube (Lammers and Lorence 1993).

Cyanea remyi was originally known only from Remy's nineteenth century collection. In 1991, after more than 130 years, *Cyanea remyi* was rediscovered in the Blue Hole on Kauai by botanists from NTBG. Currently, this species is known from four widely separated locations in northeastern and southeastern Kauai: a population of 14 plants in Waioli Valley; several hundred plants at the base of Mount Waialeale; about 140 to 180 plants in the Wahiawa Mountains, near Hulua; and a population of about ten to 50 plants on the summit plateau of the Makaleha Mountains. This species, therefore, totals over several hundred plants on State and private land. *Cyanea remyi* is usually found in lowland wet forest or shrubland at an elevation of 360 to 930 m (1,180 to 3,060 ft). Associated plant species include hame, kanawao, 'ohi'a, *Freycinetia arborea* ('ie'ie), and *Perrottetia sandwicensis* (olomea) (HHP 1992, 1994e; HPCC 1991a1, 1991a2, 1992c; Lorence and Flynn 1991, 1993a, 1993b).

Competition with the alien plant species fireweed, Hilo grass, *Psidium cattleianum* (strawberry guava), thimbleberry, and *Melastoma candidum*; habitat degradation by feral pigs; browsing by goats; predation by rats; unidentified slugs that feed on the stems; and a risk of extinction from naturally occurring events, due to the small number of remaining populations, are the major threats to *Cyanea remyi* (HPCC 1991a1, 1991a2, 1992c; Lorence and Flynn 1991, 1993b; S. Perlman, pers. comm. 1994).

In 1909, Rock collected a plant specimen on Kauai that he named *Cyrtandra cyaneoides* (Rock 1913a). The specific epithet refers to the resemblance of this distinctive plant to a species of the endemic Hawaiian genus *Cyanea*.

Cyrtandra cyaneoides, a member of the African violet family (Gesneriaceae), is an erect or ascending, fleshy, unbranched shrub, about 1 to 1.3 m (3.3 to 4.3 ft) tall. The opposite, symmetrical, egg-shaped leaves are fleshy and leathery, 40 to 55 cm (16 to 22 in) long and 22 to 35 cm (9 to 14 in) wide. The upper surface of the toothed leaves is wrinkled with impressed veins and sparsely covered with long hairs. The lower surface has raised veins and is sparsely covered with hairs. The leaf

stalks are 4.5 to 14 cm (1.8 to 5.5 in) long and winged. The white flowers, covered with shaggy brown hairs, arise from the leaf axils in small dense clusters. The corolla tube (fused petals) is narrowly funnellform, curved near the middle, about 25 mm (1 in) long, and hairless. The corolla lobes are elliptic and about 7 mm (0.3 in) long. The bilaterally symmetrical calyx is spindle-shaped in bud and about 26 to 36 mm (1 to 1.4 in) in length when the flower is fully open, but falls off after the flower matures. The fruit is an egg-shaped berry which is covered with shaggy hairs, at least when young. Although poorly known, *Cyrtandra cyaneoides* is a very distinctive species (Wagner et al. 1990). It differs from others of the genus that grow on Kauai by being a succulent, erect or ascending shrub and having a bilaterally symmetrical calyx that is spindle-shaped in bud and that falls off after flowering; leaves with a wrinkled surface, 40 to 55 cm (16 to 22 in) long and 22 to 35 cm (9 to 14 in) wide; and berries with shaggy hairs (Wagner et al. 1990).

Cyrtandra cyaneoides was originally known only from the type collection made at Kaholuamanu 80 years ago, along the trail to Waialae Valley on the island of Kauai (HHP 1994f1, Wagner et al. 1990). In 1991, botanists from NTBG discovered a population of 50 to 100 individuals at Namolokama above Lumahai Valley. Three additional populations were discovered over the next 2 years: one plant on the Makaleha Plateau; more than 300 plants in Wainiha Valley; and one plant in upper Waioli Valley for a total of between 350 and 400 plants (HHP 1994f2; Lorence and Flynn 1993a, 1993b; Wood and Perlman 1993b). The four known populations occur on private and State land, between 550 and 1,220 m (1,800 and 4,000 ft) elevation. This species typically grows on steep slopes or cliffs near streams or waterfalls in lowland or montane wet forest or shrubland dominated by 'ohi'a or a mixture of 'ohi'a and uluhe. Associated species include *Boehmeria grandis* ('akolea), *Pipturus* sp. (mamaki), 'olapa, 'uki, *Athyrium* sp., and *Hedyotis* sp. (manono) (Lorence and Flynn 1993a, 1993b; Wood and Perlman 1993b).

The major threat to *Cyrtandra cyaneoides* is competition with alien plant species such as fireweed, Hilo grass, thimbleberry, *Deparia petersenii*, and *Drymaria cordata* (pipili). Because of the small number of known populations, this species is especially vulnerable to extinction by reduced reproductive vigor and/or naturally occurring events (for example,

landslides and hurricanes). Feral pigs are reported to occur in lower Wainiha Valley; however, no evidence exists of their incursion into the upper valley to date (HHP 1994f2; HPCC 1993d; Lorence and Flynn 1993a, 1993b; S. Perlman, pers. comm. 1994).

In 1909, Rock collected a plant specimen on Kauai that he later named *Cyanea rivularis* (Rock 1913b). In 1943, F.E. Wimmer transferred this species to *Delissea*, and Lammers (1990) concurred in the current treatment of this endemic Hawaiian genus. The specific epithet refers to streams or brooks, the typical habitat of this plant.

Delissea rivularis, a member of the bellflower family, is a shrub, unbranched or branched near the base, with hairy stems 4 to 5 m (13 to 16 ft) long. The leaves are arranged in a rosette at the tips of the stems. The elliptic to lance-shaped leaves are 20 to 30 cm (8 to 12 in) long and 3 to 8 cm (1.2 to 3.2 in) wide, with minutely toothed margins. Both leaf surfaces are covered with hairs. Six to twelve flowers are arranged on an inflorescence stalk 4 to 8 cm (1.6 to 3.2 in) long, each having an individual stalk 10 to 15 mm (0.4 to 0.6 in) in length. The curved, hairy flowers are white with blue longitudinal stripes, 30 to 40 mm (1.2 to 1.6 in) long, with one dorsal knob. The fruit is a spherical, dark purple berry 10 to 15 mm (0.4 to 0.6 in) in diameter. This species is distinguished from others of the genus by the color, length, and curvature of the corolla; shape of the leaves; and presence of hairs on the stems, leaves, flower clusters, and corolla (Lammers 1990).

Historically, *Delissea rivularis* was known from Waiakealoha waterfall (location unknown), Waialae Valley, Hanakoa Valley, and Kaholuamanu on the island of Kauai (HHP 1994g1 to 1994g3, Lammers 1990). This species, recently recollected after almost 80 years, is now known only from the upper Hanakoa Valley stream area of northwestern Kauai (HPCC 1993e; S. Perlman, pers. comm. 1994). This population of 15 to 20 plants, scattered over an area of more than 100 sq m (1,100 sq ft), is on State land within the Hono O Na Pali NAR at about 1,190 m (3,900 ft) elevation. *Delissea rivularis* is found on steep slopes in 'ohi'a-'olapa montane wet or mesic forest, near streams. Associated native species include kanawao, *Athyrium* sp., *Carex* sp., *Coprosma* sp. (pilo), and *Sadleria* sp. ('ama'u) (HPCC 1993e; Lammers 1990; S. Perlman, pers. comm. 1994).

The major threats to *Delissea rivularis* are competition with the encroaching alien plant prickly Florida blackberry, habitat destruction by feral pigs, and

reduced reproductive vigor and/or a risk of extinction from naturally occurring events due to the small number of remaining individuals in the single remaining population (HPCC 1993e; S. Perlman, pers. comm. 1994).

In 1991, several new species were collected by K. Wood, M. Query, and Steve Montgomery on the cliff walls of Kalalau Valley, Kauai, including a new species in the endemic Hawaiian genus *Hibiscadelphus*. *Hibiscadelphus woodii* was described in 1995 by Lorence and Warren Wagner (1995; Wood and Perlman 1993a; D. Lorence and K. Wood, pers. comms. 1994).

Hibiscadelphus woodii, a member of the mallow family (Malvaceae), is a small branched tree 2.5 to 5 m (8.2 to 16.4 ft) tall with a rounded crown. The leaves have stalks 2.8 to 5.8 cm (1.1 to 2.3 in) long, with star-shaped hairs when young which are mostly lost as the leaf matures. Awl-shaped stipules, also covered with star-shaped hairs, are found at the base of the leaf stalk. The leaf blade is ovate, 7 to 9 cm (2.6 to 3.5 in) long, and 6.5 to 8.4 cm (2.6 to 3.3 in) wide. Star-shaped hairs are scattered along the veins of the leaves. The leaf margins are irregularly and coarsely toothed with the teeth either pointed or rounded. Flowers are borne individually on stalks 1.4 to 2.1 cm (0.6 to 0.8 in) long with star-shaped hairs. Below each flower are four to six bracts 11 to 15 mm (0.4 to 0.6 in) long and 1.8 to 4 mm (0.07 to 0.16 in) wide. The calyx is tubular, 1.3 to 1.5 cm (0.5 to 0.6 in) long, green, shallowly lobed, and moderately hairy with star-shaped hairs. The corolla is 4.5 to 4.7 cm (1.8 to 1.9 in) long, yellow with a coppery tinge when fresh which rapidly turns purplish-maroon. The staminal column extends about 7 mm (0.3 in) beyond the lobes of the corolla. Fruits are not known from this species. *Hibiscadelphus woodii* differs from the other known Kauai species by differences in leaf surface and involucre bract characters, and by flower color (Lorence and Wagner 1995; D. Lorence, pers. comm. 1994).

Hibiscadelphus woodii is known only from the site of its discovery in Kalalau Valley on the island of Kauai within the Na Pali Coast State Park, from about 990 to 1,000 m (3,250 to 3,280 ft) elevation. Only four trees of this species are known. The plants grow on cliff walls in an 'ohi'a montane mesic forest with alani, *Dubautia* sp. (na'ena'e), *Lepidium serra* ('anaunau), *Lipochaeta* sp. (nehe), *Lysimachia* sp., *Chamaesyce* sp. ('akoko), manono, *Nototrichium* sp. (kulu'i), *Myrsine* sp. (kolea), and the federally endangered species *Stenogyne campanulata*, *Lobelia niihauensis*, and *Poa mannii* (Mann's bluegrass) (HPCC

1991c; Lorence and Wagner 1995; D. Lorence and K. Wood, pers. comms. 1994).

Habitat degradation by feral goats and pigs, competition and invasion by the alien plant species *Erigeron karvinskianus* (daisy fleabane), nectar robbing by Japanese white-eye (*Zosterops japonicus*), and a risk of extinction from naturally occurring events (e.g., rock slides) and/or reduced reproductive vigor, due to the small number of existing individuals in the only known population, are the major threats to *Hibiscadelphus woodii* (HPCC 1991c; Lorence and Wagner 1995; D. Lorence, pers. comm. 1994).

Reverend John Mortimer Lydgate collected *Hibiscus waimeae* ssp. *hannerae* on Kauai in 1913, and more than 60 years passed before it was collected again, in 1978, by Perlman. Otto and Isa Degener named Lydgate's collection as a variety of *H. waimeae* in honor of Mrs. Ruth Knudsen Hanner, a supporter of their work on Kauai (Degener and Degener 1962). David M. Bates, the author of the current treatment of the Hawaiian members of the family, elevated the plant to subspecies rank (Bates 1989, 1990).

Hibiscus waimeae ssp. *hannerae*, a member of the mallow family, is a gray-barked tree, 6 to 10 m (20 to 33 ft) tall, with star-shaped hairs densely covering its leaf and flower stalks and branchlets. The circular to broadly egg-shaped leaves are usually 5 to 18 cm (2 to 7 in) long and 3 to 13 cm (1.2 to 5 in) wide. The strongly fragrant flowers are borne singly near the ends of the branches on flower stalks 2 to 3 cm (0.8 to 1.2 in) long. The calyx is tubular, normally 3 to 4.5 cm (1.2 to 1.8 in) long, with lobes 8 to 15 mm (0.2 to 0.6 in) long. The flaring petals are white when the flower opens in the morning, but fade to pinkish in the afternoon. The petals, usually 4 to 6 cm (1.6 to 2.4 in) long, are basally attached to the staminal column to form a tube about 1.5 cm (0.6 in) long. The exerted staminal column is up to 15 cm (6 in) long and reddish to crimson at the tip. The filaments arise in the upper half of the staminal column and spread up to 2.5 cm (1 in) long. The fruit is a cartilaginous, egg-shaped capsule 1.8 to 2.5 cm (0.7 to 1 in) long and hairless. Two subspecies are recognized, both occurring on Kauai: ssp. *hannerae* and ssp. *waimeae*. Subspecies *hannerae* is distinguished by having larger leaves but smaller flowers (Bates 1990). The species is distinguished from others of the genus by the position of the anthers along the staminal column, length of the staminal column relative to the petals, color of

the petals, and length of the calyx (Bates 1990).

Three collections of *Hibiscus waimeae* ssp. *hannerae* are known, all from the island of Kauai (HHP 1994i2). The Kalihiwai population of this subspecies is apparently extinct and the two remaining populations are found in adjacent valleys on Kauai's northern coast on State and private land, and total between 75 and 125 individuals. Between 50 and 100 plants are scattered over a 100 sq m (1,100 sq ft) area along the stream in Limahuli Valley, and another 50 or so plants were distributed over a 10 to 100 sq m (110 to 1,100 sq ft) area below the cliffs in the back of Hanakapiai Valley before Hurricane 'Iniki (HPCC 1990a, 1991d). After the hurricane, only 25 plants remain in Hanakapiai Valley (M. Brueggemann, *in litt.* 1994). In Limahuli Valley, *H. waimeae* ssp. *hannerae* is growing in an 'ohi'a-uluhe lowland wet forest between 190 and 560 m (620 and 1,850 ft) elevation. At this location, associated species include 'ahakea, 'ama'u, haha, ha'iwale, and *Syzygium* sp. The Hanakapiai Valley population is growing in *Pisonia* sp. (papala kepau)—*Charpentiera elliptica* (papala) lowland mesic forest with 'ahakea, hame, kopiko, mamaki, and the alien species *Aleurites moluccana* (kukui), between 220 and 370 m (720 and 1,200 ft) (Bates 1990; HHP 1990a, 1994i1, 1994i2; HPCC 1990a, 1991d).

The major threats to *Hibiscus waimeae* ssp. *hannerae* are habitat degradation by feral pigs; competition with alien plant species, including thimbleberry, Koster's curse, and lantana; and a risk of extinction from naturally occurring events (e.g., hurricanes) and/or reduced reproductive vigor due to the small number of remaining populations (HHP 1994i2, 1994i3; HPCC 1990a, 1991d; M. Brueggemann, *in litt.* 1994).

In 1919, Rock and Augustus Knudsen collected a specimen of a tree that Rock (1919) named as *Kokia rockii* var. *kauaiensis*. Later, Otto Degener and Albert Duvel (1934) elevated the variety to a full species, *Kokia kauaiensis*. The current treatment of the family upholds this designation (Bates 1990).

Kokia kauaiensis, a member of the mallow family, is a tree 5 to 10 m (16.4 to 33 ft) tall. The seven- or nine-lobed, circular leaves are 12 to 25 cm (5 to 10 in) wide with a heart-shaped base. The solitary, brick-red flowers are clustered near the ends of the branches on stout flower stalks 3 to 9 cm (1.2 to 3.5 in) long. The broadly egg-shaped floral bracts are 4 to 6 cm (1.5 to 2.4 in) long and hairless except toward the base, which has a sparse covering of long, soft

hairs. The curved petals, 10 to 15 cm (4 to 6 in) long, are twisted at the base and densely covered with yellowish, silky hairs. The fruit is an egg-shaped capsule. The egg-shaped seeds are 10 to 12 mm (0.4 to 0.5 in) long and densely covered with reddish, woolly hairs up to 10 mm (0.4 in) long. This species is distinguished from others of this endemic Hawaiian genus by the length of the bracts surrounding the flower head, number of lobes and the width of the leaves, the length of the petals, and the length of the hairs on the seeds (Bates 1990).

Kokia kauaiensis is known from six scattered populations on northwestern Kauai, but only five of these populations have been relocated within the last six years (HHP 1994j1 to 1994j4). The five extant populations are found on State land in the following areas: Paai Valley; Mahanaloa-Kuia Valley junction within or on the boundary of Kuia NAR; the western side of Kalalau Valley, and Pohakuao Valley, both within Na Pali Coast State Park; and Koaie Stream branch of Waimea Canyon, where some plants may be within the boundary of the Alakai Wilderness Preserve. The three largest populations contain between 30 and 70 individuals each, with the others each numbering fewer than 10 individuals. Estimates of the total number of individuals range from 145 to 170 (HHP 1994j1, 1994j3 to 1994j6; Joel Lau, Hawaii Heritage Program, and S. Perlman, pers. comms. 1994). This species typically grows in diverse mesic forest at elevations between 475 and 795 m (1,960 and 2,600 ft). Associated species include 'ahakea, koa, kukui, *Diospyros sandwicensis* (lama), manono, hala pepe, papala, *Nestegis sandwicensis* (olopua), and 'ohi'a (Bates 1990; HHP 1990a, 1994j1, 1994j3 to 1994j6; HPCC 1990b1 to 1990b3; Wood and Perlman 1993a; M. Brueggemann, *in litt.* 1994; J. Lau, pers. comm. 1994).

Competition with and habitat degradation by the invasive alien plant species lantana, *Passiflora ligularis* (sweet granadilla), thimbleberry, *Kalanchoe pinnata* (air plant), strawberry guava, and *Triumfetta semitriloba* (Sacramento bur); substrate loss; habitat degradation and browsing by feral goats and mule deer (*Odocoileus hemionus*); predation by rats, which eat the seeds; and a risk of extinction from naturally occurring events due to the small number of remaining populations are the major threats affecting the survival of *Kokia kauaiensis* (HHP 1994j1, 1994j3 to 1994j6; HPCC 1990b1 to 1990b3; Wood and Perlman 1993a; M. Brueggemann, *in*

litt. 1994; J. Lau, S. Perlman, and K. Wood, pers. comms. 1994).

Based upon a specimen collected by Perlman on Kauai in 1980, Harold St. John (1984) described *Labordia tinifolia* var. *wahiawaensis*, naming it for the Wahiawa Mountains where it was first collected.

Labordia tinifolia var. *wahiawaensis*, a member of the logania family (Loganiaceae), is a shrub or small tree, usually 2 to 8 m (6.6 to 26.2 ft) tall. The young branches are cylindrical or nearly so and hairless. The elliptic to lance-shaped leaves are usually 4.5 to 21 cm (1.8 to 8.3 in) long and 2 to 5 cm (0.8 to 2 in) wide. The membranous leaves are medium green, hairless, and the veins are not impressed on the upper leaf surface. Normally, 9 to 12 hairless flowers are clustered on a downward curving inflorescence stalk 9 to 22 mm (0.35 to 0.9 in) long, each having an individual stalk 8 to 11 mm (0.2 to 0.4 in) in length. The pale yellowish green flower is narrowly urn-shaped, 17 to 19 mm (0.7 to 0.75 in) long. The tubular portion of the flower is 5.5 to 7.8 mm (0.2 to 0.3 in) long with long, white hairs inside, while the egg-shaped lobes are 1.7 to 2.3 mm (0.07 to 0.09 in) long. The fruit is an egg-shaped capsule, 8 to 17 mm (0.2 to 0.7 in) long, usually with two valves and an apex with a beak 0.5 to 1.5 mm (0.02 to 0.1 in) long. Three varieties of *Labordia tinifolia* are recognized: var. *lanaiensis* on Lanai and Molokai, var. *tinifolia* on Kauai and four other islands, and var. *wahiawaensis*, endemic to Kauai. Variety *wahiawaensis* is distinguished from the other two by its larger corolla. This species differs from others of the genus by having a long common flower cluster stalk, hairless young stems and leaf surfaces, transversely wrinkled capsule valves, and corolla lobes usually 1.7 to 2.3 mm (0.1 in) long (Wagner *et al.* 1990).

Labordia tinifolia var. *wahiawaensis* is only known from the Wahiawa Drainage in the Wahiawa Mountains of Kauai from about 630 to 740 m (2,070 to 2,430 ft) elevation on privately owned land, within a 0.8 by 1.2 km (0.5 by 0.75 mi) area (HHP 1994k; HPCC 1991e1, 1991e2; Lorence and Flynn 1991). More than 100 plants were known from the area before Hurricane 'Iniki swept over Kauai in 1992. During a 1994 visit to the area, only 20 to 30 surviving individuals were found (S. Perlman, pers. comm. 1994). The plants grow along streams in lowland wet forests dominated by 'ohi'a and often in association with 'olapa or uluhe. Plants found in association with this taxon include ha'iwale, hame, kopiko, manono, and *Athyrium* sp. (HPCC 1991e1, 1991e2).

The primary threats to the remaining individuals of *Labordia tinifolia* var. *wahiawaensis* are competition with the alien plant strawberry guava, habitat degradation by pigs, trampling by humans, and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of individuals in the only known population (HPCC 1991e1, 1991e2; S. Perlman, pers. comm. 1994).

Lydgate first collected *Myrsine linearifolia* on Kauai in 1912. Edward Hosaka (1940) chose the specific epithet to describe its distinctive linear-lanceolate curved leaves. In an action that was not supported by other taxonomists, Otto and Isa Degener (1971, 1975) transferred several species from the genus *Myrsine* to the genus *Rapanea* based upon minute floral features. The currently accepted treatment of the Hawaiian members of the family follows Hosaka's earlier, broad concept of *Myrsine* (Wagner *et al.* 1990).

Myrsine linearifolia, a member of the myrsine family (Myrsinaceae), is a branched shrub, 2.5 to 8 m (8.2 to 26.2 ft) tall. The slightly fleshy, linear leaves are 5 to 9 cm (1.7 to 3 in) long, 0.25 to 0.4 cm (0.09 to 0.14 in) wide, often yellowish purple toward the base, and tend to be clustered toward the upper branches. The margins of the leaves are smooth and roll slightly toward the underside of the leaf. One to three apparently perfect (containing male and female parts) flowers, on stalks 1 to 4.2 mm (0.04 to 0.17 in) long, occur in clusters among the leaves. The greenish petals are inversely lance-shaped, about 2.2 to 2.5 mm (0.09 to 0.1 in) long, and also have margins fringed with hairs. At maturity, the fruits are black elliptic-shaped drupes, about 6 mm (0.2 in) long. This species is distinguished from others of the genus by the shape, length, and width of the leaves, length of the petals, and number of flowers per cluster (Wagner *et al.* 1990).

Historically, *Myrsine linearifolia* was known from nine scattered locations on Kauai: Olokele Valley, Kalualea, Kalalau Valley and Kahuamaa Flat, Limahuli-Hanakapiai Ridge, Koaie Stream, Pohakuao, Namolokama Summit Plateau, and Haupū (HHP 1994L1, 1991L4, 1994L6, 1994L9). This species is currently known from six populations on State and private land: Kalalau Valley including Kahuamaa Flat above Kalalau, Limahuli-Hanakapiai Ridge, Wahiawa Drainage, Koaie Stream, Pohakuao, and Namolokama Summit Plateau (HHP 1994L2, 1994L3, 1994L5, 1994L7; HPCC 1991f5; Wood and Perlman 1993a; J. Lau, pers. comm. 1994). *Myrsine linearifolia* typically

grows in mesic to wet 'ohi'a forests that are sometimes co-dominant with 'olapa or uluhe from 585 to 1,280 m (1,920 to 4,200 ft) elevation (HHP 1994L2, 1994L3, 1994L5, 1994L7; HPCC 1991f5; Wood and Perlman 1993a; J. Lau and K. Wood, pers. comms. 1994). The largest population, located in Kalalau Valley, contains several hundreds of individuals (S. Perlman, pers. comm. 1994). The remaining five populations total about 100 plants; hence, approximately 1,000 to 1,500 individuals are known for the entire species. Plants growing in association with this species include 'ahakea, 'aiea, alani, *Eurya sandwicensis* (anini), kopiko, *Lysimachia* sp., and native ferns.

Competition with alien plants such as daisy fleabane, lantana, prickly Florida blackberry, strawberry guava, thimbleberry, and air plant, and habitat degradation by ungulates such as pigs and goats are major threats to *Myrsine linearifolia* (HPCC 1991f1 to 1991f5, 1993f; J. Lau, S. Perlman, and K. Wood, pers. comms. 1994).

Hillebrand (1888) described *Phyllostegia knudsenii* from a specimen collected by Knudsen in the 1800s. He chose the specific epithet to honor the collector.

Phyllostegia knudsenii, a member of the mint family (Lamiaceae), is an erect, perennial herb or vine. The opposite leaves are limp, ovate, faintly pubescent, 11.5 to 18 cm (4.5 to 7 in) long, and 5.1 to 9 cm (2 to 3.5 in) wide. Flowers are borne in groups of two to four along a flower stalk 4 to 6.5 cm (1.6 to 2.6 in) long. The corolla is 6 to 8 mm (0.2 to 0.3 in) long. The fruits are four black fleshy nutlets in each flower and are 1.5 to 2 mm (0.06 to 0.8 in) long. This species differs from others in this genus in its specialized flower stalk. It differs from the closely related *Phyllostegia floribunda* in often having four flowers per group (Hillebrand 1888, HPCC 1993j, Sherff 1935, Wagner *et al.* 1990).

Until 1993, *Phyllostegia knudsenii* was only known from the type collection made in the 1800s, from the woods of Waimea (HHP 1991a, Hillebrand 1888, Sherff 1935, Wagner *et al.* 1990). In 1993, botanists at NTBG rediscovered one individual of this species in Koaie Canyon. This species is found in 'ohi'a lowland mesic forest at 865 m (2,840 ft) elevation. Associated species include olomea, *Cyrtandra kauaiensis* (ulunahale), *Cyrtandra paludosa* (moa), *Elaeocarpus bifidus* (kalia), *Cryptocarya mannii* (holio), *Doodia kunthiana*, *Selaginella arbuscula*, lama, *Zanthoxylum dipetalum* (a'e), *Pittosporum* sp.

(ho'awa), *Pouteria sandwicensis* ('ala'a), and *Pritchardia minor* (loulu) (HPCC 1993j; S. Perlman, pers. comm. 1994).

Major threats to *Phyllostegia knudsenii* include habitat degradation by pigs and goats; competition with alien plant species such as pipili, Hilo grass, lantana, and air plant; and a risk of extinction from naturally occurring events (e.g., landslides) and reduced reproductive vigor due to the small number of individuals in the only known population (HPCC 1993j).

Phyllostegia wawrana was described by Sherff (1934) from a collection made in the 1800s. Sherff chose the specific epithet to honor the collector, Dr. Heinrich Wawra.

Phyllostegia wawrana, a member of the mint family, is a perennial vine that is woody toward the base and has long, crinkly hairs along the stem. The leaves are opposite, ovate, and covered with hairs, especially along the veins of the lower surface. The leaves are 10.5 to 20 cm (4.1 to 7.8 in) long and 4 to 11 cm (1.6 to 4.3 in) wide. Flowers are borne in groups of four to six along a leafy flower stalk with one or two short lateral branches. Each of these lateral branches has a pair of leaves at the base. The corolla tube is about 10 mm (0.03 in) long, with an upper lip about 2 mm (0.08 in) long. The fruits are four greenish-black nutlets in each flower and are about 2 mm (0.8 in) long. This species may be related to *Phyllostegia floribunda* and *Phyllostegia knudsenii*, but has a less specialized flower stalk (Degener 1946, Sherff 1934, Wagner *et al.* 1990).

Phyllostegia wawrana was reported from Hanalei in the 1800s and was last observed along Kokee Stream in 1926, until 1993 when NTBG botanists found two populations on State-owned land. Currently there are a total of 20–30 individuals in the Makaleha Mountains and five or six in Honopu Valley (HHP 1991b1, 1991b2; HPCC 1993k1, 1993k2; Sherff 1934, 1935; Wagner *et al.* 1990; D. Ragone, *in litt.* 1995). This species grows in 'ohi'a-dominated forest with either 'olapa or uluhe as codominant species. Associated species include *Diplazium sandwichianum*, 'ohelo, kanawao, kolea, kopiko, *Dubautia knudsenii* (na'ena'e), *Scaevola procera* (naupaka kuahiwi), *Gunnera* sp., *Pleomele aurea* (hala pepe), *Claoxylon sandwicense* (po'ola), *Elaphoglossum* sp., 'ala 'ala wai nui, manono, hapu'u, 'ama'u, ho'awa, 'uki, and *Syzygium sandwicensis* ('ohi'a ha) (HPCC 1993k1, 1993k2).

The major threats to *Phyllostegia wawrana* include degradation of habitat by feral pigs and competition with alien plant species such as thimbleberry,

Passiflora mollissima (banana poka), prickly Florida blackberry, *Melastoma candidum*, fireweed, and daisy fleabane (HPCC 1993k1, 1993k2).

St. John described *Pritchardia napaliensis* based upon a specimen collected by Charles Christensen on Kauai in 1976 (St. John 1981). He named this plant for the Na Pali Coast of Kauai where it was first collected.

Pritchardia napaliensis, a member of the palm family (Arecaceae), is a small palm with about 20 leaves and an open crown. The palm ranges from 4 to 6 m (13 to 20 ft) tall and has a slender trunk measuring 18 to 20 cm (7 to 8 in) in diameter. The green leaf blades are about 85 cm (33.5 in) long and are almost flat (irrespective of the longitudinal folds). The lower leaf surface is covered with elliptic, pale, thin, flexible, and somewhat translucent scales with fringed margins. Upon maturity, the leaves are almost smooth and the leaf segments are lax, flexible, and droop with increasing age. The flowers are arranged in branched clusters about 14 cm (5.5 in) long which are equal or shorter in length than the leaf stalks. Each flower is associated with a small, bristly bract. Bracts associated with the flowers or flower stalks are sparsely and inconspicuously coated with scales which are usually lost at maturity. The black fruits are 1.7 to 2.3 cm (0.7 to 0.9 in) long, 1.4 to 1.8 cm (0.6 to 0.7 in) in diameter, and inversely egg-shaped. This species is distinguished from others of the genus that grow on Kauai by having about 20 flat leaves with pale scales on the lower surface that fall off with age, inflorescences with hairless main axes, and globose fruits less than 3 cm (1.2 in) long (Read and Hodel 1990).

Pritchardia napaliensis is known from three locations on the island of Kauai on State-owned land: Hoolulu and Waiahuakua valleys in the Hono O Na Pali NAR and Alealau in Kalalau Valley (within or close to the boundaries of Hono O Na Pali NAR and Na Pali Coast State Park) (HHP 1994m1, 1994m2; K. Wood, pers. comm. 1994). This species is not known to occur anywhere else (HHP 1994m1, 1994m2). *Pritchardia napaliensis* typically grows in a wide variety of habitats ranging from lowland dry to mesic forests to montane wet forests dominated by lama and sometimes, kukui, 'ohi'a, and uluhe from 150 to about 1,160 m (500 to about 3,800 ft) elevation (HHP 1994m1, 1994m2; HPCC 1990c1, 1990c2, 1991g; S. Perlman and K. Wood, pers. comms. 1994). The largest population in Hoolulu Valley contains between 60 and 80 plants and the two other populations each contain three or fewer plants, giving

a total of fewer than 90 known individuals for this species (HHP 1994m1, 1994m2; HPCC 1991g; S. Perlman and K. Wood, pers. comms. 1994). Several associated plant species besides those mentioned above include hala pepe, kopiko, *Cordyline fruticosa* (ti), *Cheirodendron trigynum* ('olapa), and *Ochrosia* sp. (holei) (HHP 1994m1, 1994m2; HPCC 1990c1, 1990c2, 1991g).

Major threats to *Pritchardia napaliensis* include habitat degradation and/or grazing by goats and pigs; seed predation by rats; competition with the alien plants air plant, daisy fleabane, lantana, *Psidium guajava* (common guava), and possibly ti; and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of remaining populations and individuals (HPCC 1990c1, 1990c2, 1991g; Donald Hodel, Univ. of California and County of Los Angeles Cooperative Extension, *in litt.* 1995).

Pritchardia viscosa was first described by Rock in 1921, based on a specimen he collected on Kauai a year earlier (Beccari and Rock 1921). The specific epithet refers to the very viscous inflorescence, calyx, and corolla.

Pritchardia viscosa, a member of the palm family, is a small palm 3 to 8 m (10 to 26 ft) tall. The lower surface of the leaf blades is silvery grey and covered with small scales. The inflorescences are about the same length as the leaf stalks and consist of one to three loosely branched panicles, each about 15 to 20 cm (6 to 8 in) long. The flowers occur in two opposite rows and are extremely sticky and shiny. The elliptic, pear-shaped fruit are up to 4 cm (1.6 in) long and about 2.5 cm (1 in) wide. This species differs from others of the genus that grow on Kauai by the degree of hairiness of lower surface of the leaves and main axis of the flower cluster, and length of the flower cluster (Read and Hodel 1990).

Historically, *Pritchardia viscosa* was known only from the 1920 collection from Kalihiwai Valley on the island of Kauai (HHP 1994n2). It was not seen again until 1990, when naturalist John Obata and NTBG botanist Ken Wood observed it in the same general area as Rock's type locality off the Powerline Road at 510 m (1,680 ft) elevation on State land (HHP 1994n1; Obata, pers. comm. 1991; S. Perlman, pers. comm. 1994). This population of one juvenile and two mature plants comprise the only known extant individuals; three additional plants from this population were destroyed by Hurricane 'Iniki in 1992. The plants are found in an 'ohi'a-uluhe lowland wet forest associated with plant species including 'aiea,

'ahakea, hame, hapu'u, and kopiko (S. Perlman, pers. comm. 1994).

Strawberry guava and alien grasses such as Hilo grass are major threats to *Pritchardia viscosa* because these alien plants are effective competitors for space, light, nutrients, and water. Rats are known to eat the fruit of *Pritchardia viscosa* and are, therefore, a serious threat to the reproductive success of this species (S. Perlman, pers. comm. 1994). At least one of the remaining mature trees has been damaged by spiked boots used either by a botanist or seed collector to scale these trees (Hodel, *in litt.* 1995; Mehrhoff, *in litt.* 1994). Also, because of the small numbers of individuals in the only known population, this species is susceptible to extinction because a single naturally occurring event (e.g., a hurricane) could destroy all remaining plants.

In 1895, Heller collected a plant specimen on Kauai that Sherff (1943) later named *Schiedea helleri* in honor of its collector. Listed as possibly extinct in the current treatment of the family (Wagner *et al.* 1990), *Schiedea helleri* was recently collected on Kauai by botanists from NTBG (HPCC 1993g).

Schiedea helleri, a member of the pink family, is a vine. The stems, smooth below and minutely hairy above, are probably prostrate and at least 0.15 m (0.5 ft) long with internodes at least 4 to 15 cm (1.6 to 6 in) long. The opposite leaves are somewhat thick and range from 10 to 14 cm (4 to 5.5 in) long and 4.5 to 6 cm (1.8 to 2.4 in) wide. The leaves are triangular, egg-shaped to heart-shaped, conspicuously three-veined, and nearly hairless to sparsely covered with short, fine hairs, especially along the margins. The perfect flowers occur in loose, open branched clusters, each branch being 20 to 26 cm (8 to 10.2 in) long. The flower contains three styles and probably ten stamens. The fruits are capsules, about 3 to 3.4 mm (0.12 to 0.13 in) long. This species differs from others of the genus that grow on Kauai by its viney habit (Wagner *et al.* 1990).

Schiedea helleri was originally known only from a single location above Waimea, at Kaholuamano on the island of Kauai, collected 100 years ago (HHP 1994a). In 1993, this species was discovered on a steep wall above a side stream off Mohihi Stream, approximately 5.6 km (3.5 mi) north of the original location (HPCC 1993g). The only known population consists of 30 to 40 mature individuals found on a steep cliff in closed 'ohi'a-uluhe montane wet forest on State-owned land, within or close to the Alakai Wilderness Preserve, at approximately 1,070 m (3,500 ft) elevation (HPCC 1993g; S. Perlman,

pers. comm. 1994). Other native plants growing in association with this population include hapu'u, kanawao, 'olapa, *Cyanea hirtella* (haha), *Dianella sandwicensis* ('uki'uki), and *Viola wailenalenae* (HPCC 1993g). The federally endangered *Poa sandwicensis* is also found here (M. Brueggemann, *in litt.* 1994).

Competition with the noxious alien plant prickly Florida blackberry and a risk of extinction from naturally occurring events and/or reduced reproductive vigor, due to the small number of extant individuals in the only known population, are serious threats to *Schiedea helleri* (HPCC 1993g). Pigs have not yet been reported from this drainage, but pose a potential threat since they are found in nearby areas (M. Brueggemann, *in litt.* 1994).

Robert Hobdy collected a specimen of *Schiedea membranacea* on Kauai in 1969. St. John (1972) later described and named the taxon. The specific epithet refers to the membranous texture of the leaves.

Schiedea membranacea, a member of the pink family, is a perennial herb. The unbranched, fleshy stems rise upwards from near the base and are somewhat sprawling. They are 0.5 to 1 m (1.6 to 3.3 ft) long with internodes 6 to 12 cm (2.4 to 4.7 in) long. During dry seasons, the plant dies back to a woody, short stem at or beneath the ground surface. The oppositely arranged leaves, 13 to 20 cm (5 to 8 in) long and 5 to 8 cm (2 to 3.2 in) wide, are broadly elliptic to egg-shaped, generally thin, have five to seven longitudinal veins, and are sparsely covered with short, fine hairs. The perfect flowers have no petals, are numerous, and occur in large branched clusters. The inflorescences are about 25 to 27 cm (10 to 10.6 in) long. The purple, lance-shaped sepals are about 2 mm (0.08 in) long and have thin, dry, membranous margins. The flowers contain three to five styles and probably ten stamens. The capsular fruits, 2.5 to 3 mm (0.1 to 0.12 in) long, are purple at the apex. This species differs from others of the genus that grow on Kauai by having five- to seven-nerved leaves and an herbaceous habit (Wagner *et al.* 1990).

Schiedea membranacea is known from six current populations on the western side of the island of Kauai: Mahanaloa-Kuia, Paaiki, Kalalau, Nualolo, Wainiha and Waiialae valleys on State (including Kuia NAR and Na Pali Coast State Park) and privately owned land (HHP 1994p1 to 1994p3; Wood and Perlman 1993a; S. Perlman and K. Wood, pers. comms. 1994). This species is not known to have occurred at any other locations. Although the

number of plants of this species remaining in Paaiki Valley is not known, about 200 to 250 individuals are known in the other five populations (HHP 1994p1 to 1994p3; S. Perlman and K. Wood, pers. comms. 1994). This species is typically found on cliffs and cliff bases in a wide variety of mesic to wet habitats between 520 and 1,160 m (1,700 and 3,800 ft) elevation. The vegetation ranges from open to closed lowland to montane shrubland to forest communities with either a variety of canopy and understory species or dominated by kukui, mamaki, or 'ohi'a (HHP 1994p1 to 1994p3; HPCC 1990d1 to 1990d3, 1991h, 1993h; S. Perlman, pers. comm. 1994).

Habitat degradation by feral ungulates (mule deer, goats, and pigs); competition with the alien plant species daisy fleabane, lantana, prickly Florida blackberry, thimbleberry, strawberry guava, *Ageratina adenophora* (Mauia pamakani), *A. riparia* (Hamakua pamakani), and banana poka; and landslides are the primary threats to *Schiedea membranacea* (CPC 1990; HPCC 1990d1 to 1990d3, 1991h, 1993h; Wood and Perlman 1993a; M. Brueggemann, *in litt.* 1994; S. Perlman, pers. comm. 1994).

Mann and Brigham first collected a specimen of *Schiedea stellarioides* in the mountains of Kauai between 1864 and 1865. Benedict Hochreutner (1925) and Sherff (1943, 1945, 1954) described several varieties of this species, characterized only by slight differences in leaf shape and size, that are not recognized in the current treatment of the family (Wagner *et al.* 1990).

Schiedea stellarioides, a member of the pink family, is a slightly erect to prostrate subshrub 0.3 to 0.6 m (1 to 2 ft) tall with branched stems and internodes generally 3.5 to 6.5 cm (1.4 to 2.5 in) long. The opposite leaves are very slender to oblong-elliptic, 2.7 to 8.2 cm (1.1 to 3.2 in) long, 0.2 to 1.3 cm (0.1 to 0.5 in) wide, and one-veined. The perfect flowers lack petals and occur in open branched clusters. The inflorescence ranges from 15 to 32 cm (6 to 12.6 in) long. The flower stalks are 7 to 10 mm (0.28 to 0.4 in) long and the narrowly egg-shaped sepals are 2.9 to 3.3 mm (0.11 to 0.13 in) long. The flowers contain ten stamens, three styles, and a two-lobed nectary. The capsular fruits are 2.2 to 3.4 mm (0.09 to 0.13 in) long and contain tiny, dark brown, circular to kidney-shaped, slightly wrinkled seeds. This species is distinguished from others of the genus that grow on Kauai by the number of veins in the leaves, shape of the leaves, presence of a leaf stalk, length of the

flower cluster, and shape of the seeds (Wagner *et al.* 1990).

Historically, *Schiedea stellarioides* was known from the sea cliffs of Hanakapiai Beach, Kaholuamano-Opaewela region, the ridge between Waialae and Nawaimaka valleys, and Haupu Range on the island of Kauai (HHP 1994q1 to 1994q3). This species is now known only from the ridge between Waialae and Nawaimaka valleys on State land, just 0.8 km (0.5 mi) northwest of the Kaholuamano-Opaewela region (HHP 1994q4). This population of approximately 500 to 1,000 individuals is found on steep slopes in a closed koa-'ohi'a lowland to montane mesic forest between 610 and 1,120 m (2,000 and 3,680 ft) elevation (HHP 1994q4, HPCC 1993i). The plants are scattered in an approximately 2 km (1.25 mi) by 0.3 km (0.2 mi) area. Associated plant species include 'a'ali'i, alani, 'uki'uki, *Bidens cosmoides* (po'ola nui), *Mariscus* sp., and *Styphelia tameiameia* (pukiaue) (HHP 1994q4).

The primary threats to this species include habitat degradation by feral ungulates (pigs and goats), direct destruction of plants by goats, competition with the alien plants molasses grass and prickly Florida blackberry, and a risk of extinction of the one remaining population from naturally occurring events (HPCC 1993i; S. Perlman, pers. comm. 1994).

Forbes collected a specimen of *Viola kauaensis* var. *wahiawaensis* on Kauai in 1909. In 1920, he described the variety, naming it for Wahiawa Bog where it was first collected.

Viola kauaensis var. *wahiawaensis*, a member of the violet family (Violaceae), is a perennial herb with upward curving or weakly rising, hairless, lateral stems about 10 to 50 cm (4 to 20 in) long. The kidney- to heart-shaped leaves are usually 2 to 5 cm (0.8 to 2 in) long and 3.5 to 6 cm (1.4 to 2.4 in) wide, and widely spaced. The toothed leaf blades are unlobed or rarely three-lobed, hairless or covered with a few minute hairs, with a broadly wedge-shaped base. The solitary flowers are borne in the leaf axils. Two types of flowers are present. One is self-pollinating and does not open, while the other opens and requires cross-pollination. The flowers that open have hairless petals which are white on the upper surface and purple or blue to white on the lower surface. These petals are narrowly spatula-shaped, the upper petals measuring about 15 to 19 mm (0.6 to 0.7 in) long, the lateral ones about 18 to 23 mm (0.7 to 0.9 in) long, and the lower ones about 18 to 23 mm (0.7 to 1 in) long. The non-opening flowers usually occur on short lateral stems. Their greenish petals are

hairless, the upper ones being three-lobed and about 1 to 1.6 mm (0.04 to 0.06 in) long. The fruit is a deeply lobed capsule 8 to 13 mm (0.3 to 0.5 in) long. Two varieties of this species are recognized, both occurring on Kauai: var. *kauaensis* and var. *wahiawaensis*. Variety *wahiawaensis* is distinguished by having broadly wedge-shaped leaf bases, whereas var. *kauaensis* has heart-shaped to truncate leaf bases. The species is distinguished from others of the genus by its non-woody habit, widely spaced leaves, and by having two types of flowers: conspicuous, open flowers and smaller, unopened flowers (Wagner *et al.* 1990).

Viola kauaensis var. *wahiawaensis* is known only from the Wahiawa Mountains of Kauai on privately owned land (HHP 1994r, Lorence and Flynn 1991). This taxon is not known to have occurred beyond its current range. Fewer than 100 individuals are known to remain in Kanaele Swamp (often referred to as Wahiawa Bog), an open bog surrounded by low scrub of 'ohi'a, uluhe, and 'ohi'a ha at about 640 m (2,100 ft) elevation. Another eight plants are on a nearby ridge between Mount Kapalaoa and Mount Kahili in wet shrubland dominated by uluhe-*Diplopterygium pinnatum* ground cover, with scattered 'ohi'a and *Syzygium* sp., at about 865 m (2,840 ft) elevation (HHP 1994r; Lorence and Flynn 1991; K. Wood, pers. comm. 1994).

The primary threats to *Viola kauaensis* var. *wahiawaensis* are a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of existing populations and individuals, habitat degradation through the rooting activities of feral pigs, and competition with alien plants such as *Juncus planifolius* and *Pterolepis glomerata* (HHP 1994r; Lorence and Flynn 1991; K. Wood, pers. comm. 1994).

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, threatened, or extinct in the United States. This report, designated as House Document No. 94-51, was presented to Congress on January 9, 1975. In that document, *Hibiscus waimeae* ssp. *hannerae* (as *H. waimeae*), *Kokia kauaiensis*, *Myrsine linearifolia* (as *Myrsine linearifolia* var. *linearifolia*), *Phyllostegia knudsenii*, and *Viola kauaensis* var. *wahiawaensis* were considered to be endangered. *Delissea rivularis* and *Schiedea membranacea*

were considered to be threatened. On July 1, 1975, the Service published a notice in the Federal Register (40 FR 27823) of its acceptance of the Smithsonian report as a petition within the context of section 4(c)(2) (now section 4(b)(3)) of the Act, and giving notice of its intention 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, including all of the above taxa considered to be endangered. 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). Fourteen of the species in this proposal (including synonymous taxa) were at one time or another considered either 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 were not 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 was not currently available. *Schiedea membranacea* and *Kokia kauaiensis* were considered category 2 species in all notices of review prior to the February 28, 1996, Federal Register notice which discontinued the designation of categories for candidate species. In the 1980 and 1985 notices,

Myrsine linearifolia (as *M. linearifolia* var. *linearifolia*), *Phyllostegia knudsenii*, and *Viola kauaensis* var. *wahiawaensis* were considered category 1 species. In the 1990 and 1993 notices, *Myrsine linearifolia* and *Viola kauaensis* var. *wahiawaensis* were moved to category 2 status. *Phyllostegia knudsenii* was considered category 3A in the 1990 notice. Category 3A species were those for which the Service has persuasive evidence of extinction. *Delissea rivularis* was considered a category 2 species in the 1980 and 1985 notices, but was believed to be extinct and considered category 3A in the 1990 notice. In the 1985 notice, *Alsinidendron viscosum*, *Schiedea helleri*, and *Schiedea stellarioides* were considered category 1*, and were moved to category 3A in the 1990 notice. Category 1* species were those which were possibly extinct. *Cyanea recta* and *Phyllostegia wawrana* were considered category 3A species in the 1990 notice. Because new information indicates their current existence and provides support for listing, the above seven taxa have been included in this final rule. *Hibiscus waimeae* ssp. *hannerae* (as *H. waimeae*) was considered category 3C in the 1980 and 1985 notices. Category 3C species were those proven to be more abundant or widespread than previously believed and/or were not subject to any identifiable threat. In the 1990 and 1993 notices, this subspecies was considered a category 2 species, along with *Pritchardia napaliensis* and *Pritchardia viscosa*. *Alsinidendron lychnoides* and *Cyrtandra cyaneoides* were considered category 2 species in the 1993 notice. Current information suggests that the numbers and distribution are sufficiently restricted and threats sufficient for the above nine species, as well as *Cyanea remyi* and the recently discovered *Hibiscadelphus woodii*, to warrant listing. Seventeen of the taxa were considered proposed endangered and *Cyanea recta* and *Myrsine linearifolia* proposed threatened in the 1996 notice, since the proposed listing rule had already been published.

Section 4(b)(3)(B) of the Act requires the Secretary to make findings on petitions that present substantial information indicating that the petitioned action may be warranted within 12 months of their receipt. Section 2(b)(1) of the 1982 amendments

further requires all petitions pending on October 13, 1982, be treated as having been newly submitted on that date. On October 13, 1983, the Service found that the petitioned listing of these taxa was warranted, but precluded by other pending listing actions, in accordance with section 4(b)(3)(B)(iii) of the Act; notification of this finding was published on January 20, 1984 (49 FR 2485). Such a finding requires the Service to consider the petition as having been resubmitted, pursuant to section 4(b)(3)(C)(i) of the Act. The finding was reviewed annually in October of 1984 through 1993. Publication of the proposed rule constituted the final 12-month finding for these taxa.

On September 25, 1995, the Service published in the Federal Register (60 FR 49359) a proposal to list 17 plant taxa as endangered and 2 plant taxa as threatened, from the island of Kauai. This proposal was based primarily on information supplied by the Hawaii Heritage Program, National Tropical Botanical Garden, and observations of botanists and naturalists. Based on comments received in response to the proposal (see Comments and Recommendations, below), the Service now determines 17 taxa to be endangered and 2 taxa to be threatened, from the island of Kauai, with the publication of this rule.

Summary of Comments and Recommendations

In the September 25, 1995, proposed rule and associated notifications, all interested parties were requested to submit factual reports or information that might contribute to the development of a final rule. The public comment period ended on Nov. 24, 1995. Appropriate State agencies, county governments, Federal agencies, scientific organizations, and other interested parties were contacted and requested to comment. A newspaper notice inviting public comment was published in the "Kauai Times" on October 18, 1995, which invited general public comment. Four letters of comment were received. No requests for public hearings were received. Three letters supported the listing of these taxa from Kauai and two of these letters provided additional biological information for four taxa. This information has been incorporated into

this final rule. One letter suggested listing *Pritchardia napaliensis* as threatened rather than endangered based on observations made over 20 years ago. However, current distribution, population, and threat information supports the designation of endangered status for *Pritchardia napaliensis*.

The Service also solicited the expert opinions of three appropriate and independent specialists regarding pertinent scientific or commercial data and assumptions relating to the taxonomy, population models, and supportive biological and ecological information for these 19 species. No responses were received.

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that *Alsinidendron lychnoides* (Hillebr.) Sherff (kuawawaenohu), *Alsinidendron viscosum* (Mann) Sherff (NCN), *Cyanea remyi* Rock (haha), *Cyrtandra cyaneoides* Rock (mapele), *Delissea rivularis* (Rock) Wimmer ('oha), *Hibiscadelphus woodii* Lorence and Wagner (hau kuahiwi), *Hibiscus waimeae* ssp. *hannerae* Heller (koki'o ke'oke'o), *Kokia kauaiensis* (Rock) Degener & Duvel (koki'o), *Labordia tinifolia* var. *wahiawaensis* St. John (kamakahala), *Phyllostegia knudsenii* Hillebr. (NCN), *Phyllostegia wawrana* Sherff (NCN), *Pritchardia napaliensis* St. John (loulou), *Pritchardia viscosa* Rock (loulou), *Schiedea helleri* Sherff (NCN), *Schiedea membranacea* St. John (NCN), *Schiedea stellarioides* Mann (lauhilihi), *Viola kauaensis* var. *wahiawaensis* Forbes (nani wai'ale'ale) should be classified as endangered species and that *Cyanea recta* (Wawra) Hillebr. (haha) and *Myrsine linearifolia* Hosaka (kolea) should be classified as threatened 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. 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 these 19 taxa are summarized in Table 1.

TABLE 1.—SUMMARY OF THREATS

Species	Alien mammals				Alien plants	Substrate loss/hurricane	Human impacts	Limited numbers*	Other
	Deer	Goats	Pigs	Rats					
<i>Alsinidendron lychnoides</i>			X		X	X	X	X1,3	Slugs. White-eye.
<i>Alsinidendron viscosum</i>		X	X		X	X	P	X1,3	
<i>Cyanea recta</i>		X	X	X	X	X	P		
<i>Cyanea remyi</i>		X	X	X	X			X1	
<i>Cyrtandra cyaneoides</i>			P	P	X	X		X1	
<i>Delissea rivularis</i>			X	P	X	X		X1,3	
<i>Hibiscadelphus woodii</i>		X	X		X	X		X1,2	
<i>Hibiscus waimeae</i> ssp. <i>hannerae</i>			X		X	X		X1	
<i>Kokia kauaiensis</i>	X	X		X	X	X		X1	
<i>Labordia tinifolia</i> var. <i>wahiawaensis</i>			X		X	X	X	X1,3	
<i>Myrsine linearifolia</i>		X	X		X				
<i>Phyllostegia knudsenii</i>		X	X		X	X		X1,2	
<i>Phyllostegia wawrana</i>			X		X			X1,3	
<i>Pritchardia napaliensis</i>		X	X	X	X			X1,3	
<i>Pritchardia viscosa</i>				X	X	X	X	X1,2	
<i>Schiedea helleri</i>			P		X		P	X1,3	
<i>Schiedea membranacea</i>	X	X	X		X	X			
<i>Schiedea stellarioides</i>		X	X		X			X1	
<i>Viola kauaensis</i> var. <i>wahiawaensis</i>			X		X			X1,3	

KEY

X=Immediate and significant threat.

P=Potential threat.

*=No more than 100 individuals and/or no more than 5 populations.

1=No more than 5 populations.

2=No more than 10 individuals.

3=No more than 100 individuals.

These factors and their application to the 19 plant taxa in this rule are as follows:

A. *The present or threatened destruction, modification, or curtailment of its habitat or range.* The habitats of the plants included in this final rule have undergone extreme alteration because of past and present land management practices, including deliberate alien animal and plant introductions, agricultural development, and recreational use. Natural disturbances such as storms and landslides also destroy habitat and can have a significant effect on small populations of plants. Destruction and modification of habitat by introduced animals and competition with alien plants are the primary threats facing these 19 taxa (See Table 1).

When Polynesian immigrants settled in the Hawaiian Islands, they brought with them water-control and slash-and-burn systems of agriculture and encouraged plants that they introduced to grow in valleys. Their use of the land resulted in erosion, changes in the composition of native communities, and a reduction of biodiversity (Cuddihy and Stone 1990, HHP 1990b, Kirch 1982, Wagner *et al.* 1985). Hawaiians settled and altered many areas of Kauai including areas in which some of the taxa in this final rule grew (Department of Land and Natural Resources (DLNR) 1981a; HHP 1990a, 1990b). Many

forested slopes were denuded in the mid-1800s to supply firewood to whaling ships, plantations, and island residents. Native plants were undoubtedly affected by this practice. Also, sandalwood and tree fern harvesting occurred in many areas, changing forest composition and affecting native species (Cuddihy and Stone 1990).

Beginning with Captain James Cook in 1792, early European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii. The 1848 provision for land sales to individuals allowed large-scale agricultural and ranching ventures to begin. So much land was cleared for these enterprises that climatic conditions began to change, and the amount and distribution of rainfall were altered (Wenkam 1969). Plantation owners supported reforestation programs which resulted in many alien trees being introduced in the hope that the watershed could be conserved. Beginning in the 1920s, water collection and diversion systems were constructed in upland areas to irrigate lowland fields, and this undoubtedly destroyed individuals and populations of native plants. The irrigation system also opened new routes for the invasion of alien plants and animals into native forests (Cuddihy and Stone 1990,

Culliney 1988, Wagner *et al.* 1990, Wenkam 1969).

Past and present activities of introduced alien mammals are the primary factor altering and degrading vegetation and habitats on Kauai. Feral ungulates trample and eat native vegetation and disturb and open areas. This causes erosion and allows the entry of alien plant species (Cuddihy and Stone 1990, Wagner *et al.* 1990). Sixteen taxa in this final rule are directly threatened by habitat degradation resulting from introduced ungulates: 15 taxa are threatened by pigs, ten by goats, and two by deer.

The pig (*Sus scrofa*) is originally native to Europe, northern Africa, Asia Minor, and Asia. European pigs, introduced to Hawaii by Captain James Cook in 1778, became feral and invaded forested areas, especially wet and mesic forests and dry areas at high elevations. They are currently present on Kauai and four other islands, and inhabit rain forests and grasslands. Pig hunting is allowed on all islands either year-round or during certain months, depending on the area (DLNR n.d.-a, n.d.-b, n.d.-c, 1990). While rooting in the ground in search of the invertebrates and plant material they eat, feral pigs disturb and destroy vegetative cover, trample plants and seedlings, and threaten forest regeneration by damaging seeds and seedlings. They disturb soil and cause erosion, especially on slopes. Alien

plant seeds are dispersed on their hooves and coats as well as through their digestive tracts, and the disturbed soil is fertilized by their feces, helping these plants to establish. Pigs are a major vector in the spread of banana poka and strawberry guava, and enhance populations of common guava, Hamakua pamakani, Maui pamakani, and prickly Florida blackberry, all of which threaten one or more of the taxa (Cuddihy and Stone 1990, Medeiros *et al.* 1986, Scott *et al.* 1986, Smith 1985, Stone 1985, Tomich 1986, Wagner *et al.* 1990).

Feral pigs pose an immediate threat to one or more populations of 15 of the taxa in this final rule. All known populations of the following taxa are threatened by feral pigs: *Alsinidendron viscosum*, *Delissea rivularis*, *Hibiscadelphus woodii*, *Hibiscus waimeae* ssp. *hannerae*, *Labordia tinifolia* var. *wahiawaensis*, *Phyllostegia knudsenii*, *Phyllostegia wawrana*, and *Schiedea stellarioides*. Populations of other taxa threatened by feral pigs are: the Alakai Wilderness and Keanapuka populations of *Alsinidendron lychnoides*; the Makaleha Mountains population of *Cyanea recta*; the Makaleha Mountains and Wahiawa Mountains populations of *Cyanea remyi*; the Wahiawa Mountains population of *Myrsine linearifolia*; the Kalalau Valley population of *Pritchardia napaliensis*; three of the six populations of *Schiedea membranacea* at Kalalau Valley, Nualolo, and Waialae Valley; and the Wahiawa Mountains population of *Viola kauaensis* var. *wahiawaensis*. Pigs also constitute a potential threat to the only known population of *Schiedea helleri* off Mohihi Stream, the Pohakuao and Kalalau cliffs populations of *Myrsine linearifolia*, and the Wainiha Valley populations of *Cyanea recta* and *Cyrtandra cyaneoides*. Habitat degradation reported to occur in areas near these populations, if not controlled, may become a problem for these populations (HHP 1990a, 1992, 1994b7, 1994i1, 1994i3; HPCC 1990a, 1991a2, 1991d, 1991f1, 1991f3, 1991f4, 1992a, 1993a1, 1993c1, 1993e, 1993j, 1993k1, 1993k2; Lorence and Flynn 1991, 1993b; Wood and Perlman 1993a; M. Bruegmann, *in litt.* 1994; T. Flynn, J. Lau, D. Lorence, S. Perlman, and K. Wood, pers. comms. 1994).

The goat (*Capra hircus*), a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. Currently populations exist on Kauai and four other islands. On Kauai, feral goats have been present in drier, more rugged areas since the 1820s and they still occur in Waimea Canyon and along the Na Pali

Coast, as well as in the drier perimeter of Alakai Swamp and even in its wetter areas during periods with low rainfall. Goats are managed in Hawaii as a game animal, but many herds populate inaccessible areas where hunting has little effect on their numbers (HHP 1990c). Goat hunting is allowed year-round or during certain months, depending on the area (DLNR n.d.-a, n.d.-b, n.d.-c, 1990). Goats browse on introduced grasses and native plants, especially in drier and more open ecosystems. Feral goats eat native vegetation, trample roots and seedlings, cause erosion, and promote the invasion of alien plants. They are able to forage in extremely rugged terrain and have a high reproductive capacity (Clarke and Cuddihy 1980, Cuddihy and Stone 1990, Culliney 1988, Scott *et al.* 1986, Tomich 1986, van Riper and van Riper 1982).

Although many of the plants in this final rule survive on steep cliffs inaccessible to goats, the original range of these plants was probably much larger. These species are now vulnerable to the long-term, indirect effects of goats, such as large-scale erosion (Corn *et al.* 1979). The habitats of many of the 19 plants were damaged in the past by goats, and these effects are still apparent in the form of alien vegetation and erosion. One or more populations of ten of the taxa in this final rule are currently threatened by direct damage from feral goats, such as trampling of plants and seedlings and erosion of substrate (Clarke and Cuddihy 1980, Culliney 1988, Scott *et al.* 1986, van Riper and van Riper 1982).

The only known populations of *Hibiscadelphus woodii*, *Phyllostegia knudsenii*, and *Schiedea stellarioides* are threatened by goats. Populations of other taxa threatened by goats include: the Waialae and Nawaimaka Valley populations of *Alsinidendron viscosum*, the Makaleha Mountains populations of *Cyanea recta* and *Cyanea remyi*, four of the five populations (Kalalau Valley, Koaie Stream, Mahanaloa Valley, and Pohakuao Valley) of *Kokia kauaiensis*, the Kalalau cliffs and Namolokama Summit plateau populations of *Myrsine linearifolia*, the largest population of *Pritchardia napaliensis* at Hoolulu Valley, and three of the six populations (Kalalau Valley, Mahanaloa-Kuia Valley, and Waialae Valley) of *Schiedea membranacea* (HHP 1994j5, 1994j6; HPCC 1990b3, 1990c2, 1991f5, 1991h, 1993a1, 1993a2, 1993f, 1993i; Lorence and Flynn 1993b; Wood and Perlman 1993a; J. Lau, D. Lorence, S. Perlman, K. Wood, pers. comms. 1994).

Individuals of mule deer (*Odocoileus hemionus*), native from western North

America to central Mexico, were brought to Kauai from Oregon in the 1960s for game hunting and have not been introduced to any other Hawaiian island. Mule deer were introduced, in part, to provide another animal for hunting, since the State had planned to reduce the number of goats on Kauai because they were so destructive to the landscape (Kramer 1971). About 400 animals are known in and near Waimea Canyon, with some invasion into Alakai Swamp in drier periods. Mule deer, legally hunted during only one month each year, trample native vegetation and cause erosion by creating trails and removing vegetation (Cuddihy and Stone 1990, DLNR 1985, Tomich 1986). They are a threat to the Mahanaloa-Kuia Valley and Nualolo populations of *Schiedea membranacea* and the Paai and Kuia Valley populations of *Kokia kauaiensis* (M. Bruegmann, *in litt.* 1994; S. Perlman, pers. comm. 1994).

Substrate loss due to agriculture, grazing animals (especially goats), hikers, and vegetation change results in habitat degradation and loss. This particularly affects plant populations on cliffs or steep slopes, such as the Koaie Stream population of *Kokia kauaiensis* (HHP 1994j6).

B. *Overutilization for commercial, recreational, scientific, or educational purposes.* Unrestricted collecting for scientific or horticultural purposes and excessive visits by individuals interested in seeing rare plants are potential threats to all of the taxa, but especially to *Hibiscadelphus woodii*, *Phyllostegia knudsenii*, and *Pritchardia viscosa*, each of which has only one or two populations and fewer than five individuals. Collection of whole plants or reproductive parts of any of these three species could adversely impact the gene pool and threaten the survival of the species. Some taxa, such as *Alsinidendron lychnoides*, *Alsinidendron viscosum*, *Cyanea recta*, *Labordia tinifolia* var. *wahiawaensis*, *Pritchardia viscosa*, and *Schiedea helleri* have populations close to trails or roads and are thus easily accessible to collectors and, therefore, are potentially threatened by overcollection (Flynn and Lorence 1992; HHP 1994b1, 1994d8, 1994h1, 1994n1; HPCC 1991e2, 1993g; T. Flynn, pers. comm. 1994). At least one of the three remaining *Pritchardia viscosa* individuals has been damaged by spiked boots used to scale those trees and collect seeds and/or reference material (Hodel, *in litt.* 1995; Mehrhoff, *in litt.* 1994).

Many of the plants in this final rule occur in recreational areas used for hiking, camping, and hunting. Tourism is a growing industry in Hawaii, and as

more people seek recreational activities, more human contact with rare native plants is likely. People can transport or introduce alien plants through seeds on their footwear, cause erosion, trample plants, and start fires (Corn *et al.* 1979). *Alsinidendron lychnoides* and *Labordia tinifolia* var. *wahiawaensis* have populations near trails and are considered to be immediately threatened by recreational use of the areas in which they occur (HHP 1994b1; HPCC 1991e2, 1992a).

C. Disease or predation. Browsing damage by goats has been verified for *Cyanea recta* and *Cyanea remyi* (Lorence and Flynn 1993b). Goats have directly destroyed individuals of *Schiedea stellarioides* (S. Perlman, pers. comm. 1994). The remaining species are not known to be unpalatable to goats or deer and, therefore, predation is a probable threat where those animals have been reported, potentially affecting eight additional taxa: *Alsinidendron viscosum*, *Hibiscadelphus woodii*, *Kokia kauaiensis*, *Myrsine linearifolia*, *Phyllostegia knudsenii*, *Pritchardia napaliensis*, *Schiedea membranacea*, and *Schiedea stellarioides* (HHP 1994j5, 1994j6; HPCC 1990b3, 1990c2, 1991f5, 1991h, 1993a1, 1993f, 1993i, 1993j; Wood and Perlman 1993a; J. Lau, D. Lorence, S. Perlman, K. Wood, pers. comms. 1994). The lack of seedlings of many of the taxa and the occurrence of individuals of several taxa only on inaccessible cliffs may indicate that browsing mammals, especially goats, have restricted the distribution of these plants (HPCC 1991c; Wood and Perlman 1993a; D. Lorence and K. Wood, pers. comms. 1994).

Of the four species of rodents that have been introduced to the Hawaiian Islands, the species with the greatest impact on the native flora and fauna is probably *Rattus rattus* (black or roof rat), that now occurs on all the main Hawaiian Islands around human habitations, cultivated fields, and forests. Black rats and to a lesser extent *Mus musculus* (house mouse), *Rattus exulans* (Polynesian rat), and *R. norvegicus* (Norway rat) eat the fruits of some native plants, especially those with large, fleshy fruits. Many native Hawaiian plants produce fruit over an extended period of time, thus producing a prolonged food supply for rodent populations. Black rats strip bark from some native plants, and eat the fleshy stems and fruits of plants in the bellflower and African violet families (Cuddihy and Stone 1990; Tomich 1986; J. Lau, pers. comm. 1994). Rat damage to the stems of species of *Cyanea* has been reported in the Makaleha Mountains, Waioli Valley, and at the

base of Mount Waialeale, and poses a threat to the populations of *Cyanea recta* and *Cyanea remyi* that occur there (HPCC 1991a1; Lorence and Flynn 1993a; L. Mehrhoff, *in litt.* 1994; S. Perlman, pers. comm. 1994). It is probable that rats eat the fruits of species such as *Cyrtandra cyaneoides* and *Delissea rivularis* (C. Russell, *in litt.* 1994). Rats threaten the only known population of *Pritchardia viscosa*, two of three populations of *Pritchardia napaliensis*, and one population of *Kokia kauaiensis* by predation of their flowers or fruit (HPCC 1990b1, 1990c2; S. Perlman and K. Wood, pers. comms. 1994).

Little is known about the predation of certain rare Hawaiian plants by slugs. Indiscriminate predation by slugs on plant parts of *Cyanea remyi* has been observed by field botanists (Mehrhoff, *in litt.* 1994; S. Perlman, pers. comm. 1994). The effect of slugs on the decline of this and related species is unclear, although slugs may pose a threat by feeding on the stems and fruit, thereby, reducing the vigor of the plants and limiting regeneration.

Japanese white-eye (*Zosterops japonicus*) was introduced to the island of Oahu from eastern Asia in 1930, and has since spread to all of the main Hawaiian Islands. It is currently the most abundant bird in Hawaii (Pratt *et al.* 1989). Japanese white-eye has been observed piercing the corollas of *Hibiscadelphus woodii*, presumably to rob nectar (Lorence and Wagner 1995).

D. The inadequacy of existing regulatory mechanisms. Hawaii's Endangered Species Act states—"Any species of aquatic life, wildlife, or land plant that has been determined to be an endangered species pursuant to the [Federal] Endangered Species Act shall be deemed to be an endangered species under the provisions of this chapter . . ." (Hawaii Revised Statutes (HRS), sect. 195D-4(a)). Therefore, Federal listing will automatically invoke listing under Hawaii State law, which prohibits taking of listed plants in the State and encourages conservation by State agencies (HRS, sect. 195D-4 and 5).

None of the 19 taxa in this final rule are listed by the State. Eight taxa have populations on privately owned land. *Labordia tinifolia* var. *wahiawaensis* and *Viola kauaiensis* var. *wahiawaensis* are found exclusively on private land. At least one population of each of the other 17 taxa occurs on State land. Fourteen taxa have one or more populations in State parks, NARs, or the Alakai Wilderness Preserve, which have rules and regulations for the protection of resources (DLNR 1981b; HRS, sects. 183D-4, 184-5, 195-5, and 195-8). The

opportunity for improved enforcement of these rules and regulations would result from Federal listing.

One or more populations of each of the 19 taxa is 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, among other purposes, are regarded as necessary for the protection of endemic biological resources and the maintenance or enhancement of the conservation of natural resources (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 State laws. Requests for amendments to district boundaries or variances within existing classifications can be made by government agencies and private landowners (HRS, sect. 205-4). Before decisions about these requests are made, the impact of the proposed reclassification on "preservation or maintenance of important natural systems or habitat" (HRS, sects. 205-4, 205-17) as well as the maintenance of natural resources is required to be taken into account (HRS, sects. 205-2, 205-4). Before any proposed land use that will occur on State land, is funded in part or whole by county or State funds, or will occur within land classified as 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, also implements these other State regulations protecting the plants.

State laws relating to the conservation of biological resources allow for the acquisition of land as well as the development and implementation of programs concerning the conservation of biological resources (HRS, sect. 195D-5(a)). The State also may enter into agreements with Federal agencies to administer and manage any area required for the conservation, management, enhancement, or protection of endangered species (HRS, sect. 195D-5(c)). Funds for these

activities could be made available under section 6 of the Act (State Cooperative Agreements). The Hawaii DLNR is mandated to initiate changes in conservation district boundaries to include "the habitat of rare native species of flora and fauna within the conservation district" (HRS, sect. 195D-5.1).

Twelve of the taxa in this final rule are threatened by seven plants considered by the State of Hawaii to be noxious weeds. The State has provisions and funding available for eradication and control of noxious weeds on State and private land in conservation districts and other areas (HRS, chapt. 152; Hawaii Department of Agriculture (DOA) 1981, 1991).

Despite the existence of various State laws and regulations that protect Hawaii's native plants, their enforcement is difficult due to limited funding and personnel. Listing of these 19 plant taxa therefore reinforces and supplements the protection available under the State Act and other laws. The Federal Endangered Species Act also provides additional protection to these 19 taxa. For example, for species listed as endangered, it would be a violation of the Act for any person to remove, cut, dig up, damage, or destroy any such plant in knowing violation of State law or regulation or in the course of any violation of a State criminal trespass law.

E. Other natural or manmade factors affecting its continued existence. The small numbers of populations and individuals of most of these taxa increase the potential for extinction from naturally occurring events. The limited gene pool may depress reproductive vigor, or a single human-caused or natural environmental disturbance could destroy a significant percentage of the individuals or the only known extant population. Seven of the taxa, *Delissea rivularis*, *Hibiscadelphus woodii*, *Labordia tinifolia* var.

wahiawaensis, *Phyllostegia knudsenii*, *Pritchardia viscosa*, *Schiedea helleri*, and *Schiedea stellarioides*, are known only from a single population. Nine other taxa are known from only two to five populations (See Table 1). Twelve of the taxa are estimated to number no more than 100 known individuals (See Table 1). Three of these taxa, *Hibiscadelphus woodii*, *Phyllostegia knudsenii*, and *Pritchardia viscosa*, number fewer than 10 individuals.

One or more species of almost 30 introduced plants directly threaten all 19 of the taxa. The original native flora of Hawaii consisted of about 1,000 species, 89 percent of which were endemic. Of the total native and

naturalized Hawaiian flora of 1,817 species, 47 percent were introduced from other parts of the world and nearly 100 species have become pests (Smith 1985, Wagner *et al.* 1990). Naturalized, introduced species compete with native plants for space, light, water, and nutrients (Cuddihy and Stone 1990). Some of these species were brought to Hawaii by various groups of people, including the Polynesian immigrants, for food or cultural reasons. Plantation owners, alarmed at the reduction of water resources for their crops caused by the destruction of native forest cover by grazing feral animals, supported the introduction of alien tree species for reforestation. Ranchers intentionally introduced pasture grasses and other species for agriculture, and sometimes inadvertently introduced weed seeds as well. Other plants were brought to Hawaii for their potential horticultural value (Cuddihy and Stone 1990, Scott *et al.* 1986, Wenkam 1969).

Two shrubs in the genus *Ageratina* have naturalized in the Hawaiian Islands and are classified as noxious weeds by the State (DOA 1981). *Ageratina adenophora* (Maui pamakani), naturalized in dry areas to wet forests on Kauai and also classified as a noxious weed by the Federal government (7 CFR 360), threatens the Kalalau Valley population of *Schiedea membranacea* (Wood and Perlman 1993a). *Ageratina riparia* (Hamakua pamakani), naturalized in disturbed, dry to mesic areas and wet forests on Kauai, is a threat to the same population of *Schiedea membranacea* (Wood and Perlman 1993a). *Blechnum occidentale* (blechnum fern), probably accidentally introduced from tropical America, has naturalized in mesic forests on most of the main Hawaiian Islands (Degener 1932; J. Lau, pers. comm. 1994). *Blechnum* fern poses a threat to the Waioli Valley population of *Cyanea recta* (Lorence and Flynn 1993a; T. Flynn, pers. comm. 1994).

Classified as a noxious weed by the State of Hawaii, *Clidemia hirta* (Koster's curse) is an aggressive shrub found in mesic to wet forests on at least five islands in Hawaii (Almeda 1990, DOA 1981). It is a threat to the Waioli Valley populations of *Cyanea recta* and the Limahuli Valley population of *Hibiscus waimeae* ssp. *hannerae* (HHP 1992, 1994i1; HPCC 1991d; Lorence and Flynn 1993a, 1993b; J. Lau and K. Wood, pers. comms. 1994). *Cordyline fruticosa* (ti) is a shrub brought to Hawaii by the Polynesian immigrants. Its original range is unknown, but in Hawaii it is now naturalized on all the main islands except Kahoolawe in *Pandanus tectorius* (hala) forest and

mesic valleys and forests, sometimes forming dense stands (Wagner *et al.* 1990; J. Lau, pers. comm. 1994). The Hoolulu Valley population of *Pritchardia napaliensis* may compete for space with ti (HHP 1994m1).

Crassocephalum crepidioides, an annual herb native to tropical Africa, is naturalized in dry areas to wet forest on Kauai and four other islands. This weed has been considered a pest in Hawaii since 1966, and is a threat to the Waioli Valley population of *Cyanea recta* (Haselwood and Motter 1983; Lorence and Flynn 1993a; K. Wood, pers. comm. 1994). *Deparia petersenii* is a perennial fern capable of forming a thick groundcover (J. Lau, pers. comm. 1994). The Makaleha Mountains populations of *Cyanea recta* and *Cyrtandra cyaneoides* compete for space with this fern (Lorence and Flynn 1993b). *Drymaria cordata* (pipili), a pantropical annual herb, is naturalized in shaded, moist sites on Kauai and four other islands (Wagner *et al.* 1990). Pipili threatens the Makaleha Mountains population of *Cyrtandra cyaneoides* and the only known population of *Phyllostegia knudsenii* (HPCC 1993j, Lorence and Flynn 1993b).

Erechtites valerianifolia (fireweed) is an annual herb native from Mexico to Brazil and Argentina. It is naturalized on all of the main Hawaiian Islands except Niihau and Kahoolawe, and is found in disturbed, relatively wet areas. This weed threatens the Makaleha Mountains and Waioli Valley populations of *Cyanea recta*, the Makaleha Mountains and Wahiawa Mountains populations of *Cyanea remyi*, and the Makaleha Mountains populations of *Cyrtandra cyaneoides* and *Phyllostegia wawrana* (HPCC 1993k2; Lorence and Flynn 1991, 1993a, 1993b; Wagner *et al.* 1990; K. Wood, pers. comm. 1994). Brought to Hawaii as a cultivated herbaceous plant, *Erigeron karvinskianus* (daisy fleabane) is naturalized in wetter areas of Kauai and three other islands (Wagner *et al.* 1990). An invasion of daisy fleabane on the Kalalau cliffs threatens *Schiedea membranacea*, *Myrsine linearifolia*, and the only population of *Hibiscadelphus woodii*. Daisy fleabane also threatens the Alealau population of *Pritchardia napaliensis* and the Honopu Valley population of *Phyllostegia wawrana* (HPCC 1990d1, 1991c, 1993f, 1993k1; Lorence and Wagner 1995; K. Wood, pers. comm. 1994).

Juncus planifolius is a perennial herb native to South America, New Zealand, and Australia and is naturalized in open, disturbed, moist areas in forest edges and bogs (Wagner *et al.* 1990). Found on Kauai and four other islands,

Juncus planifolius threatens the population of *Viola kauaensis* var. *wahiawaensis* in the Wahiawa Bog (Lorence and Flynn 1991; K. Wood, pers. comm. 1994). *Kalanchoe pinnata* (air plant) is an herb which occurs on all the main islands except Niihau and Kahoolawe, especially in dry to mesic areas (Wagner *et al.* 1990). The Paaiki Valley and Kuia populations of *Kokia kauaensis*, the only known population of *Phyllostegia knudsenii*, the Pohakuao population of *Myrsine linearifolia*, and the Alealau and Hoolulu Valley populations of *Pritchardia napaliensis* are threatened by competition with air plant (HPCC 1991g, 1993j; M. Brueggemann, *in litt.* 1994; K. Wood, pers. comm. 1994).

Lantana camara (lantana), brought to Hawaii as an ornamental plant, is an aggressive, thicket-forming shrub which can now be found on all of the main islands in mesic forests, dry shrublands, and other dry, disturbed habitats (Wagner *et al.* 1990). One or more populations of each of the following species are threatened by lantana: *Alsinidendron viscosum*, *Cyanea recta*, *Hibiscus waimeae* ssp. *hannerae*, *Kokia kauaensis*, *Myrsine linearifolia*, the only known population of *Phyllostegia knudsenii*, *Pritchardia napaliensis*, and *Schiedea membranacea* (HHP 1990a, 1994i3, 1994j1, 1994j3 to 1994j6, 1994m2; HPCC 1990a, 1990b1, 1990c2, 1991d, 1993a1, 1993j; Lorence and Flynn 1993b; S. Perlman and K. Wood, pers. comms. 1994). *Melastoma candidum* is a member of a genus in which all species have been classified as noxious weeds by the State of Hawaii (DOA 1992). This species is naturalized in mesic to wet areas on Kauai and Hawaii and threatens the Makaleha Mountains populations of *Cyanea recta*, *Cyanea remyi*, and *Phyllostegia wawrana* (Almeda 1990, HPCC 1993k2, Lorence and Flynn 1993b).

Passiflora mollissima (banana poka), a woody vine, poses a serious problem to mesic forests on Kauai and Hawaii by covering trees, reducing the amount of light that reaches trees as well as understory, and causing damage and death to trees by the weight of the vines. Animals, especially feral pigs, eat the fruit and distribute the seeds (Cuddihy and Stone 1990, Escobar 1990). Banana poka is classified as a noxious weed by the State (DOA 1992) and threatens the Nualolo population of *Schiedea membranacea* and the Honopu Valley population of *Phyllostegia wawrana* (HPCC 1993k1; K. Wood, pers. comm. 1994). *Passiflora ligularis* (sweet granadilla) was first collected in Hawaii in 1909, and has since spread to mesic and wet areas of Kauai, Oahu, Lanai,

and Hawaii (Escobar 1990). This taxon threatens *Kokia kauaensis* (M. Brueggemann, *in litt.* 1994).

Two small tree species, *Psidium cattleianum* (strawberry guava) and *Psidium guajava* (common guava), were brought to Hawaii and have become widely naturalized on all the main islands, forming dense stands in disturbed areas. Strawberry guava, found in mesic and wet forests, develops into stands in which few other plants grow, physically displacing natural vegetation and greatly affecting Hawaiian plants, many of which are narrowly endemic taxa. Pigs depend on strawberry guava for food and, in turn, disperse the plant's seeds through the forests (Smith 1985, Wagner *et al.* 1990). Strawberry guava is considered to be the greatest weed problem in Hawaiian rain forests and is known to pose a direct threat to all remaining plants of *Pritchardia viscosa*, the Wahiawa Mountains populations of *Cyanea remyi* and *Labordia tinifolia* var. *wahiawaensis*, the Paaiki population of *Kokia kauaensis*, the Wahiawa Drainage population of *Myrsine linearifolia*, and the Mahanaloa-Kuia population of *Schiedea membranacea* (HPCC 1991f3, 1991f4, 1992c; Lorence and Flynn 1991, 1993b; Smith 1985; M. Brueggemann, *in litt.* 1994; T. Flynn and S. Perlman, pers. comms. 1994). Common guava invades disturbed sites, forming dense thickets in dry, mesic, and wet forests (Smith 1985, Wagner *et al.* 1990). Common guava threatens the Hoolulu Valley population of *Pritchardia napaliensis* (HHP 1994m1, HPCC 1990c2). *Pterolepis glomerata*, an herb or subshrub locally naturalized in mesic to wet disturbed sites on Kauai, Oahu, and Hawaii, threatens the Wahiawa Bog population of *Viola kauaensis* var. *wahiawaensis* (Lorence and Flynn 1991; K. Wood, pers. comm. 1994).

Rubus argutus (prickly Florida blackberry), an aggressive alien species in disturbed mesic to wet forests and subalpine grasslands on Kauai and three other islands, is considered a noxious weed by the State of Hawaii (DOA 1981, Smith 1985, Wagner *et al.* 1990). Prickly Florida blackberry threatens the only known populations of *Schiedea helleri*, *Schiedea stellarioides*, and *Delissea rivularis*, the Alakai Wilderness and Keanapuka populations of *Alsinidendron lychnoides*, the Waialae-Nawaimaka population of *Alsinidendron viscosum*, the Koaie Stream and Pohakuao populations of *Myrsine linearifolia*, the Honopu Valley population of *Phyllostegia wawrana*, and the Nualolo population of *Schiedea membranacea* (HHP 1994b6; HPCC

1992a, 1993a1, 1993a2, 1993g, 1993i; 1993k1; J. Lau, S. Perlman, K. Wood, pers. comms. 1994). *Rubus rosifolius* (thimbleberry), native to Asia, is naturalized in disturbed mesic to wet forest on all of the main Hawaiian Islands. This shrub threatens the three largest populations of *Cyanea recta* in Wainiha Valley, Makaleha Mountains, and Waioli Valley; the Wahiawa Mountains and Waioli Valley populations of *Cyanea remyi*; the Makaleha Mountains population of *Cyrtandra cyaneoides*; the Limahuli Valley population of *Hibiscus waimeae* ssp. *hannerae*; the Mahanaloa-Kuia Valley junction population of *Kokia kauaensis*; the Limahuli-Hanakapiai Ridge population of *Myrsine linearifolia*; the Makaleha Mountains population of *Phyllostegia wawrana*; and the Mahanaloa-Kuia Valley population of *Schiedea membranacea* (HHP 1992, 1994i1, 1994j3; HPCC 1990d2, 1991d, 1991f2, 1992c, 1993c2, 1993k2; Lorence and Flynn 1991, 1993a, 1993b; S. Perlman and K. Wood, pers. comms. 1994).

Triumfetta semitriloba (Sacramento bur) is a subshrub now found on four Hawaiian Islands and considered to be a noxious weed by the State of Hawaii (DOA 1981, Wagner *et al.* 1990). Sacramento bur threatens the Koaie Stream population of *Kokia kauaensis* (HPCC 1990b3). *Youngia japonica* (Oriental hawksbeard) is an annual herb native to southeast Asia and now is a common weed in disturbed moist and shaded sites, as well as intact wet forests, on most of the main Hawaiian Islands (Wagner *et al.* 1990). The Waioli Valley population of *Cyanea recta* is threatened by this weed (Lorence and Flynn 1993a).

Several hundred species of grasses have been introduced to the Hawaiian Islands, many for animal forage. Of the approximately 100 grass species that have become naturalized, 3 species threaten 8 of the 19 d plant taxa. *Melinis minutiflora* (molasses grass), a perennial grass brought to Hawaii for cattle fodder, is now naturalized in dry to mesic, disturbed areas on most of the main Hawaiian Islands. The mats it forms smother other plants and fuel more intense fires than would normally affect an area (Cuddihy and Stone 1990, O'Connor 1990, Smith 1985). The largest populations of *Alsinidendron viscosum* and *Schiedea stellarioides*, in Waialae-Nawaimaka Valley, are threatened by molasses grass (HPCC 1993a1, 1993a2, 1993i). The perennial grass *Paspalum conjugatum* (Hilo grass), naturalized in moist to wet, disturbed areas on most Hawaiian Islands, produces a dense ground cover, even on

poor soil, and threatens the Makaleha Mountains population of *Cyanea recta*, *Cyanea remyi*, *Cyrtandra cyaneoides*, the only known population of *Phyllostegia knudsenii*, and the Powerline Road population of *Pritchardia viscosa* (HHP 1992; HPC 1993j; Lorence and Flynn 1993b; J. Lau and S. Perlman, pers. comms. 1994). *Sacciolepis indica* (Glenwood grass), an annual or perennial grass naturalized on five islands in Hawaii in open, wet areas, threatens the Waioli Valley and Makaleha Mountains populations of *Cyanea recta* (HHP 1992; Lorence and Flynn 1993a, 1993b; J. Lau and K. Wood, pers. comms. 1994).

Erosion, landslides, and rock slides 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 with limited numbers and/or narrow ranges, such as: the two largest populations of *Cyanea recta*; the Makaleha Mountains and upper Waioli Valley populations of *Cyrtandra cyaneoides*, each of which has only one individual; the only populations of *Delissea rivularis*, *Phyllostegia knudsenii*, and *Hibiscadelphus woodii*; and the largest population of *Schiedea membranacea* (HPC 1990d2, 1991c, 1993c1, 1993j; Lorence and Flynn 1993a, 1993b; Lorence and Wagner 1995; Mehrhoff, *in litt.* 1994; J. Lau and K. Wood, pers. comms. 1994). This process is often exacerbated by human disturbance and land use practices (See Factor A).

In September 1992, Hurricane 'Iniki struck the Hawaiian Islands and caused extensive damage, especially on the island of Kauai. Many forest trees were destroyed, opening the canopy and thus allowing the invasion of light-loving alien plants, which are a threat to the continued existence of many of the d taxa. Over three-fourths of all known *Labordia tinifolia* var. *wahiawaensis* plants were destroyed as a result of the hurricane-force winds and substrate subsidence caused by the hurricane (S. Perlman, pers. comm. 1994). One plant of *Alsinidendron lychnoides*, half of one population of *Hibiscus waimeae* ssp. *hannerae*, and half of the known individuals of *Pritchardia viscosa* were destroyed by the hurricane (M. Brueggemann, *in litt.* 1994; S. Perlman, pers. comm. 1994). Damage by future hurricanes could further decrease the already reduced numbers and reduced habitat of most of the 19 taxa in this final rule.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by

these species in determining to make this rule final. Based on this evaluation, this rulemaking will list 17 of these plant taxa as endangered (*Alsinidendron lychnoides*, *Alsinidendron viscosum*, *Cyanea remyi*, *Cyrtandra cyaneoides*, *Delissea rivularis*, *Hibiscadelphus woodii*, *Hibiscus waimeae* ssp. *hannerae*, *Kokia kauaiensis*, *Labordia tinifolia* var. *wahiawaensis*, *Phyllostegia knudsenii*, *Phyllostegia wawrana*, *Pritchardia napaliensis*, *Pritchardia viscosa*, *Schiedea helleri*, *Schiedea membranacea*, *Schiedea stellarioides*, and *Viola kauaensis* var. *wahiawaensis*) and two taxa as threatened (*Cyanea recta* and *Myrsine linearifolia*). Sixteen of the taxa either number no more than about 100 individuals or are known from five or fewer populations. The 17 taxa listed as endangered are threatened by one or more of the following: habitat degradation and/or predation by feral pigs, feral goats, rats, and deer; competition from alien plants; substrate loss; human impacts; and lack of legal protection or difficulty in enforcing laws that are already in effect. Small population size and limited distribution make these species particularly vulnerable to extinction and/or reduced reproductive vigor from naturally occurring events. Because these 17 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.

Although populations of *Cyanea recta* and *Myrsine linearifolia* are threatened by predation (by rats and/or goats), habitat modification by pigs and goats, and competition with alien plant species, the wider distribution of populations through a relatively large area and greater numbers of individual plants reduce the likelihood that these species will become extinct in the near future. For these reasons, *Cyanea recta* and *Myrsine linearifolia* are not now in immediate danger of extinction throughout all or a significant portion of their ranges. However, both species are likely to become endangered in the foreseeable future if the threats affecting these species are not curbed. As a result, *Cyanea recta* and *Myrsine linearifolia* are designated threatened species.

Critical habitat is not being designated for the 19 taxa included in this rule, for reasons discussed in the "Critical Habitat" section below.

Critical Habitat

Critical habitat is defined in section 3 of the Act as: (i) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological

features (I) essential to the conservation of the species and (II) that may require special management consideration or protection and; (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures needed to bring the species to the point at which listing under the Act is no longer necessary.

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time a species is determined to be endangered or threatened. Service regulations (50 CFR 424.12(a)(1)) state that designation of critical habitat is not prudent when one or both of the following situations exist—(1) The species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of threat to the species, or (2) such designation of critical habitat would not be beneficial to the species. As discussed under Factor B of the summary of factors affecting the species section, these taxa are threatened by overcollection, due to low population size. The publication of precise maps and descriptions of critical habitat in the Federal Register and local newspapers as required in designation of critical habitat would increase the degree of threat to these plants from take or vandalism and, therefore, could contribute to their decline and increase enforcement problems. The listing of these taxa as endangered or threatened publicizes the rarity of the plants and, thus, can also make these plants attractive to curiosity seekers or collectors of rare plants.

All involved parties and the major landowners have been notified of the location and importance of protecting the habitat of these taxa. Protection of the habitats of these plants will be addressed through the recovery process and through the section 7 consultation process as necessary. At present, the Service is not aware of any Federal activity within the currently known habitats of these plants. The Service finds that designation of critical habitat for these 19 taxa is not prudent at this time. Such a designation would increase the degree of threat from vandalism, collecting, or other human activities and is unlikely to aid in the conservation of these taxa. In addition, designation of critical habitat would provide no benefits beyond those that these species would receive by virtue of their being

listed as endangered or threatened species.

Available Conservation Measures

Conservation measures provided to plant taxa listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Recognition through listing results in public awareness and 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 requirements for 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 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 the 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 consultation with the Service. None of the 19 taxa occur on Federal lands and no known Federal activities occur within the present known habitat of these 19 plant taxa.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened plants. With respect to the 19 plant taxa in this rule, the prohibitions of section 9(a)(2) of the Act, implemented by 50 CFR 17.61, apply. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to import or export any listed plant species; transport such species in interstate or foreign commerce in the course of a commercial activity; sell or offer for sale in interstate or foreign commerce; or to remove and reduce to possession any such species from areas under Federal jurisdiction. In addition, it is illegal to maliciously damage or destroy any endangered plant from areas under Federal jurisdiction; or remove, cut, dig up, damage, or destroy any endangered species on any other area in knowing violation of any State law or

regulation or in the course of any violation of a State criminal trespass law. Section 4(d) of the Act allows for the provision of such protection to threatened species through regulation. This protection may apply to these taxa in the future if regulations are promulgated. Seeds from cultivated specimens of threatened plants are exempt from these prohibitions provided that their containers are marked "Of Cultivated Origin." Certain exceptions to the prohibitions apply to agents of the Service and State conservation agencies.

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

It is the policy of the Service, published in the Federal Register on July 1, 1994, (59 FR 34272) to identify to the maximum extent practicable at the time a species is listed those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of the listing on proposed and ongoing activities within the species' range. Eighteen of the 19 taxa in this final rule are located on State lands. The Service is not aware of any otherwise legal activities being conducted by the public on State lands that will be affected by this listing and result in a violation of section 9. Six of the listed taxa (*Hibiscadelphus woodii*, *Hibiscus waimeae* ssp. *hanneriae*, *Kokia kauaiensis*, *Myrsine linearifolia*, *Pritchardia napaliensis*, and *Pritchardia viscosum*) may be of horticultural interest, though none are currently in commercial trade. Intrastate commerce (commerce within a State) is not prohibited under the Act. However, interstate and foreign commerce (sale or offering for sale across State or international boundaries), will require a Federal endangered species permit. (Endangered species may be advertised for sale provided the advertisement contains a statement that no sale may be consummated until a permit has been obtained from the Service.)

Questions regarding whether specific activities will constitute a violation of section 9 of the Act should be directed to the Pacific Islands Ecoregion Manager (see ADDRESSES section). 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, Endangered Species Permits, 911 N.E. 11th Avenue, Portland, Oregon 97232-4181 (telephone: 503/231-6241; facsimile: 503/231-6243).

Hawaii State Law

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

National Environmental Policy Act

The Fish and Wildlife Service has determined that Environmental Assessments and Environmental Impact Statements, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the Federal Register on October 25, 1983 (48 FR 49244).

Required Determinations

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

References Cited

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

Author

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

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

Accordingly, the Service hereby amends 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						
FLOWERING PLANTS:							
<i>Alsiniidendron lychnoides.</i>	Kuawawaenuhu	U.S.A.(HI)	Caryophyllaceae—Pink	E	590	NA	NA
<i>Alsiniidendron viscosum.</i>	None	U.S.A.(HI)	Caryophyllaceae—Pink	E	590	NA	NA
<i>Cyanea recta</i>	Haha	U.S.A.(HI)	Campanulaceae—Bellflower	T	590	NA	NA
<i>Cyanea remyi</i>	Haha	U.S.A.(HI)	Campanulaceae—Bellflower	E	590	NA	NA
<i>Cyrtandra cyaneoides.</i>	Mapele	U.S.A.(HI)	Gesneriaceae—African violet	E	590	NA	NA
<i>Delissea rivularis</i>	'Oha	U.S.A.(HI)	Campanulaceae—Bellflower	E	590	NA	NA
<i>Hibiscadelphus woodii.</i>	Hau kuahiwi	U.S.A.(HI)	Malvaceae—Mallow	E	590	NA	NA
<i>Hibiscus waimeae</i> ssp. <i>hannerae.</i>	Koki'o ke'oke'o	U.S.A.(HI)	Malvaceae—Mallow	E	590	NA	NA
<i>Kokia kauaiensis</i>	Koki'o	U.S.A.(HI)	Malvaceae—Mallow	E	590	NA	NA
<i>Labordia tinifolia</i> var. <i>wahiawaensis.</i>	Kamakahala	U.S.A.(HI)	Loganiaceae—Logania	E	590	NA	NA
<i>Myrsine linearifolia.</i>	Kolea	U.S.A.(HI)	Myrsinaceae—Myrsine	T	590	NA	NA
<i>Phyllostegia knudsenii.</i>	None	U.S.A.(HI)	Lamiaceae—Mint	E	590	NA	NA
<i>Phyllostegia wawrana.</i>	None	U.S.A.(HI)	Lamiaceae—Mint	E	590	NA	NA
<i>Pritchardia napaliensis.</i>	Loulu	U.S.A.(HI)	Arecaceae—Palm	E	590	NA	NA
<i>Pritchardia viscosa.</i>	Loulu	U.S.A.(HI)	Arecaceae—Palm	E	590	NA	NA
<i>Schiedea helleri</i>	None	U.S.A.(HI)	Caryophyllaceae—Pink	E	590	NA	NA
<i>Schiedea membranacea.</i>	None	U.S.A.(HI)	Caryophyllaceae—Pink	E	590	NA	NA

Species		Historic range	Family	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
<i>Schiedea stellarioides</i>	None	U.S.A.(HI)	Caryophyllaceae—Pink	E	590	NA	NA
<i>Viola kauaensis</i> var. <i>wahiawaensis</i>	Nani wai'ale'ale	U.S.A.(HI)	Violaceae—Violet	E	590	NA	NA

Dated: September 24, 1996.
 John G. Rogers,
 Acting Director, Fish and Wildlife Service.
 [FR Doc. 96-25558 Filed 10-09-96; 8:45 am]
 BILLING CODE 4310-55-P

50 CFR Part 17

RIN 1018-AD50

Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Twenty-five Plant Species From the Island of Oahu, Hawaii

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The U.S. Fish and Wildlife Service (Service) determines endangered status pursuant to the Endangered Species Act of 1973, as amended (Act), for 25 plant taxa—*Chamaesyce herbstii* ('akoko), *Chamaesyce rockii* ('akoko), *Cyanea acuminata* (haha), *Cyanea humboldtiana* (haha), *Cyanea koolauensis* (haha), *Cyanea longiflora* (haha), *Cyanea st.-johnii* (haha), *Cyrtandra dentata* (ha'iwale), *Cyrtandra subumbellata* (ha'iwale), *Cyrtandra viridiflora* (ha'iwale), *Delissea subcordata* ('oha), *Eragrostis fosbergii* (No common name (NCN)), *Gardenia mannii* (nanu), *Labordia cyrtandrae* (kamakahala), *Lepidium arbuscula* ('anaunau), *Lobelia gaudichaudii* ssp. *koolauensis* (NCN), *Lobelia monostachya* (NCN), *Melicope saint-johnii* (alani), *Myrsine juddii* (kolea), *Phyllostegia hirsuta* (NCN), *Phyllostegia kaalaensis* (NCN), *Pritchardia kaalae* (loulu), *Schiedea kealiae* (NCN), *Trematolobelia singularis* (NCN), and *Viola oahuensis* (NCN). All 25 taxa are endemic to the island of Oahu, Hawaiian Islands. The 25 plant taxa and their habitats have been variously affected or are currently threatened by one or more of the following—competition, predation, or habitat degradation from alien species; human impacts; fire; and natural disasters. This

rule implements the Federal protection provisions provided by the Act for these plant taxa.

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

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

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

SUPPLEMENTARY INFORMATION:

Background

Chamaesyce herbstii, *Chamaesyce rockii*, *Cyanea acuminata*, *Cyanea humboldtiana*, *Cyanea koolauensis*, *Cyanea longiflora*, *Cyanea st.-johnii*, *Cyrtandra dentata*, *Cyrtandra subumbellata*, *Cyrtandra viridiflora*, *Delissea subcordata*, *Eragrostis fosbergii*, *Gardenia mannii*, *Labordia cyrtandrae*, *Lepidium arbuscula*, *Lobelia gaudichaudii* ssp. *koolauensis*, *Lobelia monostachya*, *Melicope saint-johnii*, *Myrsine juddii*, *Phyllostegia hirsuta*, *Phyllostegia kaalaensis*, *Pritchardia kaalae*, *Schiedea kealiae*, *Trematolobelia singularis*, and *Viola oahuensis* are endemic to the island of Oahu, Hawaiian Islands.

The island of Oahu is formed from the remnants of two large shield volcanoes, the younger Koolau volcano on the east and the older Waianae volcano to the west (Department of Geography 1983). Their original shield volcano shape has been lost as a result of extensive erosion, and today these volcanoes are called mountains or ranges, and consist of long, narrow ridges. The Koolau Mountains were built by eruptions that took place primarily along a northwest-trending rift zone (Macdonald *et al.* 1983) and formed a range now approximately 60 kilometers (km) (37 miles (mi)) long (Foote *et al.* 1972). Median annual rainfall for the Koolau Mountains varies from 130 to 640

centimeters (cm) (50 to 250 inches (in.)), most of which is received at higher elevations along the entire length of the windward (northeastern) side (Taliaferro 1959).

Nineteen of the plant taxa in this final rule occur in the Koolau Mountains—*Chamaesyce rockii*, *Cyanea acuminata*, *Cyanea humboldtiana*, *Cyanea koolauensis*, *Cyanea longiflora*, *Cyanea st.-johnii*, *Cyrtandra dentata*, *Cyrtandra subumbellata*, *Cyrtandra viridiflora*, *Delissea subcordata*, *Gardenia mannii*, *Labordia cyrtandrae*, *Lobelia gaudichaudii* ssp. *koolauensis*, *Lobelia monostachya*, *Melicope saint-johnii*, *Myrsine juddii*, *Phyllostegia hirsuta*, *Trematolobelia singularis*, and *Viola oahuensis*. The vegetation communities of the Koolau Mountains, especially in the upper elevations to which many of the plant taxa in this final rule are restricted, are primarily lowland mesic and wet forests dominated by *Metrosideros polymorpha* ('ohi'a) and/or other tree or fern taxa. However, the vegetation now covering the Koolau Mountain Range is mostly alien. The majority of the remaining native vegetation is restricted to steep valley head walls and inaccessible summit ridges. The windswept ridges are very steep and are characterized by grasses, ferns, and low-growing, stunted shrubs (Gagne and Cuddihy 1990).

The Waianae Mountains were built by eruptions that took place primarily along three rift zones. The two principal rift zones run in a northwestward and south-southeastward direction from the summit and a lesser one runs to the northeast. The range is approximately 64 km (40 mi) long. The caldera lies between the north side of Makaha Valley and the head of Nanakuli Valley (MacDonald *et al.* 1983). The Waianae Mountains are in the rain shadow of the parallel Koolau Mountains and except for Mt. Kaala, the highest point on Oahu (1,225 meters (m)) 4,020 feet (ft)), receive much less rainfall (Wagner *et al.* 1990). The median annual rainfall for the Waianae Mountains varies from 51 to 190 cm (20 to 75 in) with only the small summit area of Mt. Kaala