

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018-AB69

Endangered and Threatened Wildlife and Plants; Endangered Status for 11 Plant Species From the Koolau Mountain Range, Island of Oahu, HI

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 11 plant species: *Chamaesyce deppeana* ('akoko); *Cyanea truncata* (haha); *Cyrtandra crenata* (ha'iwale); *Cyrtandra polyantha* (ha'iwale); *Eugenia koolauensis* (nioi); *Hesperomannia arborescens* (no common name (NCN)); *Lobelia oahuensis* (NCN); *Lycopodium nutans* (wawae'iole); *Melicope lydgatei* (alani); *Rollandia crispa* (NCN); and *Tetraplasandra gymnocarpa* ('ohe'ohe). All but five of the taxa are or were endemic to the Koolau Mountain Range on the island of Oahu, Hawaiian Islands; the exceptions are or were found on the islands of Kauai, Molokai, Lanai, Maui, and/or in the Waianae Mountains of Oahu, as well as the Koolau Mountains. The 11 plant taxa and their habitats have been variously affected or are currently threatened by one or more of the following: Habitat degradation by trampling and/or predation by wild, feral, or domestic animals (pigs, goats, cattle, rats, slugs); competition for space, light, water, and nutrients by naturalized, introduced vegetation; habitat loss from fires; trampling due to military training exercises; and recreational activities. Due to the small number of existing individuals and their very narrow distributions, these taxa are subject to a danger of extinction from stochastic events and/or from reduced reproductive vigor. This final rule implements the Federal protection provisions provided by the Act.

DATES: This rule takes effect April 27, 1994.

ADDRESSES: The complete file for this final rule is available for public inspection, by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Pacific Islands Office, 300 Ala Moana Boulevard, room 6307, P.O. Box 50167, Honolulu, Hawaii 96850.

FOR FURTHER INFORMATION CONTACT: Robert P. Smith, at the above address (808/541-2749).

SUPPLEMENTARY INFORMATION:**Background**

Chamaesyce deppeana, *Cyanea truncata*, *Cyrtandra crenata*, *Cyrtandra polyantha*, *Eugenia koolauensis*, *Hesperomannia arborescens*, *Lobelia oahuensis*, *Lycopodium nutans*, *Melicope lydgatei*, *Rollandia crispa*, and *Tetraplasandra gymnocarpa* are either endemic to or have their largest or best known populations in the Koolau Mountain Range on the eastern side of the island of Oahu, Hawaii. Five of these taxa are or were known from regions other than the Koolau Mountains. *Eugenia koolauensis* was historically known from the island of Molokai. *Hesperomannia arborescens* is known also from the islands of Molokai and Maui. It is extirpated on the island of Lanai. *Lycopodium nutans* once grew on the island of Kauai but is now found only in the Koolau Mountains of Oahu. *Lobelia oahuensis* and *Tetraplasandra gymnocarpa* are restricted to the island of Oahu, including the Koolau Mountains and one population of each species in the Waianae Mountains.

The island of Oahu was 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 37 miles (mi) (60 kilometers (km)) long (Foote *et al.* 1972). Median annual rainfall for the Koolau Mountains varies from 50 to 250 inches (in) (130 to 640 centimeters (cm)), most of which is received at higher elevations along the entire length of the windward (northeastern) side (Taliaferro 1959).

The vegetation communities of the Koolau Mountains, especially in the upper elevations to which many of the 11 plant taxa are restricted, are primarily lowland mesic and wet forests dominated by *Metrosideros polymorpha* ('ohi'a) and/or other tree or fern taxa. Much of the Koolau Mountain Range is vegetated with alien plant taxa. Most of the remaining native vegetation is restricted to steep valley headwalls 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 land that supports these 11 plant taxa is owned by the City and County of Honolulu, the State of Hawaii (including land classified as natural area reserve and forest reserve), the Federal government, and various private parties. Plants on Federal land are located on the boundary of Schofield Barracks Military Reservation, under the jurisdiction of the U.S. Army, and Lualualei Naval Reserve, under the jurisdiction of the U.S. Navy. Populations of five taxa grow on land leased by the U.S. Army from private parties and the State.

Discussion of the 11 Plant Taxa

P.E. Boissier (1862) described *Euphorbia deppeana* based on a 1835 collection by Ferdinand Deppe that had been erroneously labelled as being from California (Millspaugh 1916; Sherff 1941, 1944). Otto and Isa Degener and Leon Croizat accepted the elevation of the section *Chamaesyce* to the generic level and published the necessary combinations for the Hawaiian taxa (Croizat 1943; Degener and Croizat 1936a, 1936b, 1937; Koutnik 1987; Koutnik and Huft 1990). Other names by which *Chamaesyce deppeana* has been known are *Anisophyllum californicum* (Koutnik 1987), *Chamaesyce festiva* (Degener and Croizat 1936b), *Euphorbia festiva* (Sherff 1936), and *E. pauciflora* (Koutnik and Huft 1990).

Chamaesyce deppeana, a member of the spurge family (Euphorbiaceae), is an erect subshrub up to 4 feet (ft) (1.2 meters (m)) tall with fuzzy branches. The hairless leaves, generally oval-shaped and often notched at their tips, are between 0.2 and 0.8 in (5 and 20 millimeters (mm)) long and 0.2 and 0.5 in (5 and 12 mm) wide; they are arranged in two opposite rows along the stem. The leaf margins are usually toothed, rarely toothless. The small, petalless flower clusters (cyathia), 0.06 to 0.1 in (1.5 to 3 mm) wide, are borne singly in the leaf axils (point between the stem and leaf stalk) and produce small capsules about 0.1 in (2 mm) long. Seeds have not been observed. This species is distinguished from others in the genus by the following combination of characters: leaves arranged in two rows on opposite sides of the branches; leaves glabrous; leaf apex notched; leaf margin toothed; and cyathia width (Boissier 1862, Koutnik and Huft 1990, Sherff 1936).

Historically, *Chamaesyce deppeana* was known only from southern Oahu. Because the few collections that were made were collected prior to the 20th

century, it was thought to be extinct (Koutnik and Huft 1990). In 1986, Joel Lau and Sam Gon of The Nature Conservancy of Hawaii (TNCH) rediscovered *C. deppeana* on State land in the southern Koolau Mountains of Oahu in Nuuanu Pali Wayside State Park near the Pali Lookout, a popular tourist attraction (Hawaii Heritage Program (HHP) 1991a). About 50 to 100 individuals grow near there, with such plant taxa as 'ohi'a, *Bidens sandvicensis* (ko'oko'olau), *Casuarina equisetifolia* (common ironwood), and *Phyllanthus distichus* (pamakani mahu) (Hawaii Plant Conservation Center (HPCC) 1990a; Joel Lau, TNCH, John Obata and Steve Perlman, HPCC, pers. comms., 1991). The most visible and accessible plants, comprising about 30 percent of the population, are confined to a 200 square foot (sq ft) (20 sq m) area, portions of which extend to within 15 ft (5 m) of the Pali Lookout parking lot (HHP 1991a). The remaining plants are scattered on an adjacent steep, exposed, windswept slope growing with grasses and shrubs (HHP 1991a; J. Lau, pers. comm., 1991). This population is found at an elevation of approximately 1,000 ft (300 m) (Center for Plant Conservation (CPC) 1989b, HHP 1991a, HPCC 1990a, Koutnik and Huft 1990). The major threats to the single known population of *Chamaesyce deppeana* are competition for water, space, light, and nutrients with various alien plant taxa (common ironwood, *Paspalum conjugatum* (Hilo grass), and *Schinus terebinthifolius* (Christmas berry)), and stochastic extinction due to the limited number of individuals and restricted range. Fire and impact by humans threaten the species as well.

Cyanea truncata was first collected on the Punaluu Valley Trail in 1911 by Joseph Rock and was placed by him in the genus *Rollandia* (Rock 1913). On further examination, Rock (1917) transferred the species to the closely related genus *Cyanea* because of its free staminal column. Charles N. Forbes (1916) described and named a specimen from Waiahole Valley *C. juddii*, which Rock later reduced to synonymy under *C. truncata* (Rock 1919). Harold St. John (1939) recognized this taxon at the varietal level and published the combination *C. truncata* var. *juddii*. In 1987, St. John, questioning the validity of the characters used to delineate the genus *Cyanea*, transferred all taxa of *Cyanea* to another closely related genus, *Delissea* (St. John 1987, St. John and Takeuchi 1987). Few botanists have accepted St. John's taxonomy for this group; the majority continue to recognize the genus *Cyanea*, and the

latest revision of the genus recognizes only *C. truncata* (Lammers 1990). The specific epithet refers to the plant's occasionally truncate leaf base.

Cyanea truncata, of the bellflower family (Campanulaceae), is an unbranched or sparsely branched shrub covered with small sharp prickles. The oval leaves, which are widest above the middle, are 8 to 24 in (22 to 60 cm) long and 4 to 10 in (10 to 26 cm) wide, and are lined with hardened teeth along the margins. The upper surface of the leaf is hairless; the lower surface is hairy, has sparse projections, and is pale green. Clusters of 8 to 40 white flowers with magenta stripes are produced on horizontal or hanging stalks between 2 and 12 in (5 to 28 cm) long. Each slightly curved flower is 1.3 to 1.7 in (32 to 42 mm) long and about 0.3 in (7 mm) wide and has spreading corolla lobes that are one-fourth to one-half as long as the flower. The fruits are round orange berries about 0.4 in (9 mm) long that contain many tiny seeds. *Cyanea truncata* is distinguished from other members of this genus by the length of the flower cluster stalk and the size of the flowers and flower lobes (Degener 1932a; Forbes 1916; Lammers 1990; Rock 1913, 1919; St. John 1939).

Historically, *Cyanea truncata* was known from Punaluu, Waikane, and Waiahole in the northern Koolau Mountains of Oahu (HHP 1991b2 to 1991b4). These sites have not been recently surveyed due to their inaccessibility, but it is known that suitable habitat is present. One population of at least two individuals was known to exist in "Hidden Valley," a drainage northwest of Kaaawa Valley that terminates at Kaaawa Point in the Koolau Range (HHP 1991b1, Rock 1962); however, that population was destroyed by feral pigs (CPC 1989a, 1989b, 1990). In 1991, John Obata of HPCC discovered 20 immature lobelioids growing on private land along a gully floor further upstream from the site of the destroyed *C. truncata* population (HPCC 1991a; J. Obata, pers. comm., 1991). This was thought to be the only known population of this species. An individual from this sterile population was salvaged from pig-damaged areas in 1991 and this individual flowered on June 22, 1993. This individual turned out to be *Rollandia crispa* (not *C. truncata*). A site visit in July 1993 determined that all of the plants previously thought to be *C. truncata* were actually *R. crispa*. No individuals of *C. truncata* were located, though it is possible that juvenile plants could be found in the valley floor (Loyal Mehrhoff, U.S. Fish and Wildlife Service, pers. comm., 1993).

Cyanea truncata typically grows on windward slopes in mesic to wet forests at elevations between 800 and 1,300 ft (240 and 400 m) (HHP 1991b1, Lammers 1990). Associated plant taxa include *Hibiscus arnottianus* (koki'o ke'oke'o), *Diospyros sandvicensis* (lama), 'ohi'a, *Aleurites moluccana* (kukui), *Cyrtandra propinqua* (ha'iwale), *Neraudia melastomifolia* (ma'aloa), *Pisonia umbellifera* (papala kepa), and *Piper methysticum* ('awa) (HPCC 1991a; Wagner et al. 1990; J. Lau and J. Obata, pers. comms., 1991; L. Mehrhoff, pers. comm., 1993). The major threats to *Cyanea truncata* are habitat degradation and predation by feral pigs, competition with invasive alien plant taxa (*Clidemia hirta* (Koster's curse) and *Psidium cattleianum* (strawberry guava)), and stochastic extinction and/or reduced reproductive vigor due to the small number of remaining individuals.

Cyrtandra crenata was first described by Harold St. John and William Storey (1950) from a specimen that they had collected on the Waikane-Schofield Trail. The specific name refers to the rounded teeth of the leaf margin (St. John 1966).

Cyrtandra crenata, a member of the African violet family (Gesneriaceae), is a shrub 3 to 7 ft (1 to 2 m) tall with few branches. The leaves are arranged in whorls of three, tufted at the end of branches; they are generally elliptic or lance-shaped, 4.7 to 11 in (12 to 28 cm) long and 1.6 to 3.1 in (4 to 8 cm) wide, and have toothed margins. The upper leaf surface is generally hairless and has a wrinkled texture; the lower surface has only sparse hairs. Dense clusters of three to seven white flowers, covered with thick brown hair, arise from the leaf axils. The calyx is bilaterally symmetrical, with the three upper lobes somewhat longer than the two lower lobes. The curved, funnel-shaped flowers, about 0.9 in (24 mm) long and 0.2 in (4 mm) wide, develop into fleshy ellipsoid berries about 0.7 in (1.8 cm) long that contain numerous tiny seeds. The berries, as well as various other plant parts, are covered with short-stalked, brownish, hemispherical glands. *C. crenata* is distinguished from other species in the genus by the combination of its three-leaf arrangement, bilaterally symmetrical calyx, and brownish, hemispherical glands (St. John 1966, St. John and Storey 1950, Wagner et al. 1990).

Historically, *Cyrtandra crenata* was known from Waikane Valley along the Waikane-Schofield Trail in the Koolau Mountains (HHP 1991c1, St. John 1966, St. John and Storey 1950). It now remains below that trail, about 0.5 mi (0.8 km) from its historical location, at

the boundary of private and State lands (HHP 1991c2). This population has not been observed since 1947 and although the number of remaining individuals is not known, it is thought to be very low. This species typically grows in ravines or gulches in mesic to wet forests between elevations of 1,250 and 2,400 ft (380 and 730 m) with associated plant taxa such as 'ohi'a, *Dicranopteris linearis* (uluhe), and *Machaerina angustifolia* ('uki) (Wagner et al. 1990; S. Perlman, pers. comm., 1991). The primary threat to this species is stochastic extinction and/or reduced reproductive vigor due to the species' restricted range and the small number of individuals that are thought to exist.

On the basis of a collection by Wilhelm Hillebrand, C.B. Clarke (1883) described *Cyrtandra polyantha*, choosing the specific epithet to refer to the many-flowered clusters (St. John 1966). A description of *C. triflora* by Hillebrand (1888) is believed to be, in part, a description of *C. polyantha* (Wagner et al. 1990).

Cyrtandra polyantha, a member of the African violet family, is an unbranched or few-branched shrub 3 to 10 ft (1 to 3 m) in height. Its leathery, elliptic, unequal leaves are 2 to 6.3 in (5 to 16 cm) long and 0.7 to 2 in (1.8 to 5.2 cm) wide and attached oppositely along the stems. The upper surface of the leaves is conspicuously wrinkled and usually hairless, with the lower surface moderately to densely covered with pale brown hairs. Seven to 12 flowers are grouped in branched clusters in the leaf axils. The white petals, fused to form a cylindrical tube about 0.5 in (12 mm) long, emerge from a radially symmetrical calyx, 0.2 in (5 mm) long, that is cleft from one-half to two-thirds its length. Each calyx lobe, narrowly triangular in shape, is sparsely hairy on the outside and hairless within. The fruits are white oval berries about 0.6 in (1.6 cm) long that contain many seeds about 0.02 in (0.5 mm) long. *Cyrtandra polyantha* is distinguished from other species in the genus by the texture and hairiness of the leaf surfaces and the length, shape, and degree of cleft of the calyx. This species differs from *C. crenata* by the lack of short-stalked glands and by its leathery leaves, opposite leaf arrangement, and radially symmetrical calyx (Clarke 1883, St. John 1966, Wagner et al. 1990).

Historically, *Cyrtandra polyantha* was known from the Kaihihi region and from Kulepiamea Ridge above Niu Valley on the leeward (southwest) side of the southern Koolau Mountains (HHP 1991d2, 1991d3; St. John 1966). Two populations, located farther south on Kuliouou summit ridge and at the

northwest head of Hahaione Valley (HHP 1991d1, 1991d4), are approximately 1 mi (1.6 km) apart on private and State land. One of the populations has not been visited within the past 50 years; it is not known how many individuals remain. The most recently observed population, last seen in 1953, consists of one individual. The total number of extant individuals is not known, although only a few are believed to remain on ridges of disturbed mesic valleys in 'ohi'a forests at elevations between 1,600 to 2,000 ft (490 and 610 m) (HHP 1991d1, 1991d2, 1991d4). *Cyrtandra polyantha* probably grows in association with 'uki, uluhe, *Broussaisia arguta* (kanawao), *Coprosma foliosa* (pilo), and *Psychotria* (kopiko), taxa commonly found in the 'ohi'a-dominated forests of the Koolau Mountains (S. Perlman, pers. comm., 1991). The primary threat to *C. polyantha* is stochastic extinction and/or reduced reproductive vigor due to the small number of remaining individuals and their restricted distribution.

Eugenia koolauensis was first described by Otto Degener (1932b) from a specimen that he and K.K. Park collected from Kaipapau Valley in the Koolau Mountains; it is named after its type locality. In 1957, Kenneth Wilson and Joseph Rock described a new species, *E. molokaiensis*, based upon a collection made by Rock in 1918 from Maunaloa on the island of Molokai (Wilson 1957). Current classification synonymizes the two species (Wagner et al. 1990).

Eugenia koolauensis, a member of the myrtle family (Myrtaceae), is a small tree or shrub between 7 and 23 ft (2 and 7 m) tall with branch tips covered with dense brown hairs. The leathery, oval or elliptic leaves, 0.8 to 2 in (2 to 5 cm) long and 0.4 to 1.3 in (1 to 3.3 cm) wide, are densely hairy on the lower surface and have margins that curve under the leaves. One or two flowers grow from the leaf axils on stalks 0.04 to 0.3 in (1 to 8 mm) long. The hypanthium (basal portion of the flower) is cone-shaped, about 0.1 in (3 mm) long, and hairy. The four sepals of unequal length that comprise the hypanthium are attached to a circular nectary disk (fleshy, nectar-producing structure). The four white petals, which are oval or elliptic and 0.2 to 0.3 in (4 to 8 mm) long, enclose numerous white stamens and are also attached to the nectary disk. The fruits are fleshy, yellow to red, oval berries, 0.3 to 0.8 in (0.8 to 2 cm) long, that usually contain one round seed. *Eugenia koolauensis* is one of two species in the genus that are native to Hawaii. It differs from the other species in having leaves that are densely hairy

on the lower surface and leaf margins that curve under the leaves (Degener 1932b, Wagner et al. 1990, Wilson 1957).

Eugenia koolauensis was historically known from Maunaloa on western Molokai and from Kaipapau Valley, Hanaimoa and Kahawainui gulches, and a gully southeast of Kahuku on Oahu (HHP 1991e1, 1991e2, 1991e4, 1991e6, 1991e7; Wilson 1957). This species is no longer believed to be extant on the island of Molokai because the region where the first two individuals were found has been converted to pineapple fields (CPC 1990). On Oahu, five populations now remain on State and private land in Papali Gulch, the north fork of Kamananui Stream, in the regions of Pupukea and Paumalu in the northern Koolau Mountains, and at Hawaiioloa, a disjunct population in the southeastern Koolau Mountains (Garnett 1990; HHP 1991e3, 1991e5, 1991e8; HPCC 1991b1, 1991b2; J. Obata and S. Perlman, pers. comms., 1991). A total of fewer than 60 individuals of this species remain in dry gulches and ridges in mesic forests dominated by 'ohi'a and/or lama at 350 to 1,000 ft (100 to 300 m) in elevation (HHP 1991e3, 1991e5, 1991e8; Wagner et al. 1990). Other associated plant taxa include *Myrsine lessertiana* (kolea), *Nestegis sandwicensis* (olopua), *Pleomele halapepe* (hala pepe), and *Psydrax odoratum* (alaha'e) (HHP 1991e5 to 1991e8; HPCC 1991b1, 1991b2; J. Lau, pers. comm., 1991). Habitat degradation by feral pigs and competition with alien plant taxa (Christmas berry, Koster's curse, strawberry guava, *Lantana camara* (lantana)) are the major threats to *Eugenia koolauensis*. The limited numbers of this species make it vulnerable to stochastic extinction and/or reduced reproductive vigor due to the small number of individuals and limited gene pool.

The first specimen of *Hesperomannia* was collected by Horace Mann, Jr. on the summit of the island of Lanai in 1864 (Brigham 1868, Degener 1932c). Asa Gray (1865) named the genus after its discoverer and also gave it the specific name *arborescens* for its tree-like habit (Brigham 1868). Other names which refer to this species are *H. bushiana* (Degener 1935), *H. swezeyi* (Degener 1933), and *H. bushiana* var. *fosbergii* (Degener 1937). According to Warren L. Wagner and others (1990), the last treatment of *Hesperomannia* (Carlquist 1957), which designates three subspecies (subspecies *arborescens*, *bushiana*, and *swezeyi*) based on leaf shape, achene (dry, one-seeded fruit) size, and number of heads, does not seem to delimit geographical or

ecological entities, and therefore these subspecies do not warrant formal recognition.

Hesperomannia arborescens is a small shrubby tree of the aster family (Asteraceae) that usually stands 5 to 16 ft (1.5 to 5 m) tall. Its typically hairless leaves, 4 to 8 in (10 to 20 cm) long and 1 to 3 in (3 to 8 cm) wide, range from oval to lance-shaped and are about two to four times as long as they are wide. The flower heads, which are about 2.4 in (6 cm) long, are either erect or ascending, and grow singly or in clusters of 2 to 10. They grow on thick fuzzy stalks 0.2 to 0.6 in (4 to 15 mm) long and about 0.1 in (3 mm) in diameter. The involucre (set of bracts) that surrounds each flower head is between 0.8 and 1.4 in (2 and 3.5 cm) high, the longest individual bracts growing to 1.1 in (2.8 cm). The yellow to yellowish brown florets that comprise each head are about 0.9 to 1.2 in (2.4 to 3 cm) long and develop into 0.5 in (1.3 cm) long achenes (dry, one-seeded, fruits) topped with yellowish brown or purple-tinged bristles. This member of an endemic Hawaiian genus differs from other *Hesperomannia* species in having the following combination of characters: Erect to ascending flower heads; thick flower head stalks; and usually hairless and relatively narrow leaves (Brigham 1868; Carlquist 1957; Degener 1932c, 1933, 1935; Gray 1865; Hillebrand 1888; Marticorena and Parra 1975; Rock 1913; Wagner *et al.* 1990).

Hesperomannia arborescens was formerly known from locations on three islands: Kaiholena and Kukui on Lanai; Pelekunu Trail on Molokai; and scattered populations throughout the Koolau Mountains, from Koolauloa and Pupukea at its northern extreme to Konahuanui at the southern end (Forbes 1920; HHP 1991f1 to 1991f10, 1991f12 to 1991f16, 1991f22). This species is now known from 18 populations totalling fewer than 70 plants on the islands of Oahu, Molokai, and Maui. On Oahu, 15 populations, which total about 50 to 60 individuals, have been observed since 1958 on private, Honolulu City and County, State, and Federal lands at a few disjunct locations over a distance of about 27 mi (43 km). Locations include: upslope of Kahuku, Laie, and Malaekahana; along Poamoho Trail above Poamoho Stream; along Waikane-Schofield Trail near the ridge summit; at Kipapa Gulch; on Halawa Ridge; and upper Palolo Valley to Niu Valley (HHP 1991f1, 1991f3, 1991f5, 1991f7, 1991f8, 1991f10, 1991f17 to 1991f21, 1993a1 to 1993a4; HPCC 1990b1; Marticorena and Parra 1975; Derral Herbst, U.S. Fish and Wildlife Service, and S. Perlman, pers. comms.,

1991). The Waikane-Schofield population occurs on the boundary of State (Ewa Forest Reserve) and Federal (Schofield Barracks Military Reservation) lands. On Molokai, one population of three individuals was found on State land in Olokui Natural Area Reserve (NAR) (HHP 1991f11; HPCC 1991c; S. Perlman, pers. comm., 1991). A recent discovery in 1989 by Joel Lau of TNCH extends this species' range to the island of Maui, where two colonies totalling three individuals were discovered about 0.3 mi (0.5 km) apart on State land in West Maui NAR between Lanilili and Keahikauo (HHP 1991f23; HPCC 1990b2; J. Lau and S. Perlman, pers. comms., 1991).

Hesperomannia arborescens, often found on slopes or ridges in association with 'ohi'a, olopuu, uluhe, *Antidesma platyphyllum* (hame), kopiko, *Syzygium*, and common *Melicope* species, typically grows in lowland wet forests and occasionally in scrub vegetation between 1,200 and 2,500 ft (360 and 750 m) in elevation (HHP 1991; HHP 1991f1 to 1991f3, 1991f5 to 1991f10, 1991f13 to 1991f18, 1991f20, 1991f22, 1991f23, 1993a1 to 1993a4; HPCC 1991c; Wagner *et al.* 1990; J. Lau, pers. comm., 1991). The Molokai population grows in lamaanu and/or 'ohi'a-dominated lowland mesic forest habitat within the same elevational range (HHP 1991f11; HPCC 1991c). The major threats to *Hesperomannia arborescens* are habitat degradation by feral pigs and goats, competition with alien plant taxa (Hilo grass, Koster's curse, strawberry guava, *Tibouchina herbacea*), fire, and impact by humans. Stochastic extinction and/or reduced reproductive vigor due to this species' limited numbers are significant threats as well.

Lobelia oahuensis, named by Rock (1918, 1919) for the island on which the type specimen was collected, was transferred to the genus *Neowimmeria* by the Degeners in 1974; a genus not accepted by current authorities (Lammers 1990).

Lobelia oahuensis, a member of the bellflower family, is a stout, erect, unbranched shrub 3 to 10 ft (1 to 3 m) tall. The elliptic leaves, which are 16 to 24 in (40 to 60 cm) long and 1.6 to 2.4 in (4 to 6 cm) wide, are typically stalkless and form a very dense rosette at the end of the stem. The upper surface of the leaves is hairless and the lower surface is covered with rather coarse grayish or greenish hairs. The inflorescence is branched 3 to 5 times from its base, with each erect spike 3 to 5 ft (0.1 to 1.5 m) tall and comprised of 50 to 200 flowers. Each flower measures 1.7 to 1.8 in (42 to 45 mm) long and about 0.2 in (5 mm) wide, with a 1.2 in

(3 cm) long bract just below it. The linear calyx lobes are about 0.6 in (16 mm) long and 0.1 in (3 mm) wide. The fruits are hairy, oval capsules 0.4 to 0.7 in (10 to 17 mm) long and about 0.4 in (9 mm) wide that contain numerous brownish seeds. *Lobelia oahuensis* differs from other members of the genus in having the following combination of characters: Erect stems 3 to 10 ft (1 to 3 m) long; dense rosettes of leaves at the end of stems; lower leaf surfaces covered with coarse grayish or greenish hairs; and flowers 1.7 to 1.8 in (42 to 45 mm) long (Lammers 1990; Rock 1918, 1919; St. John and Hosaka 1935).

Historically, *Lobelia oahuensis* was known from Kahana Ridge, Kipapa Gulch, and the southeastern Koolau Mountains of Oahu (HHP 1991g1, 1991g4 to 1991g7; St. John and Hosaka 1935). Nine populations totalling between 100 and 200 individuals are located on private and State land or on the boundary of private, State, City and County, and Federal lands. *Lobelia oahuensis* grows on steep slopes along Koolau Mountain ridgetops from Waikane and Halawa to Mount Olympus and the summit ridges above Kuliouou and Waimanalo, a distance of about 17 mi (27 km) (HHP 1991g1 to 1991g3, 1991g6, 1991g8 to 1991g10; HPCC 1991d; J. Obata and S. Perlman, pers. comms., 1991). Ken Wood of HPCC and Joel Lau of TNCH recently discovered a single mature individual of *L. oahuensis* on the boundary between State land and Schofield Barracks Military Reservation, extending the distribution of this species to the Waianae Mountain Range of Oahu (J. Lau and Kenneth Wood, HPCC, pers. comms., 1993). These nine populations are located between elevations of 2,800 and 3,000 ft (850 and 920 m) on summit cliffs in cloudswep wet forests or in areas of low shrub cover that are frequently exposed to heavy wind and rain (HHP 1991g1 to 1991g3, 1991g6 to 1991g10; HPCC 1991d; Lammers 1990). Associated plant taxa include 'ohi'a, uluhe, 'uki, *Cheirodendron trigynum* (olapa), *Dubautia laxa* (na'ena'e pua meleleme), and *Labordia hosakana* (kamakahala) (HHP 1991g1, 1991g2, 1991g7, 1991g8, 1991g10; HPCC 1991d; J. Obata, pers. comm., 1991). The noxious alien plant Koster's curse is the primary threat to *Lobelia oahuensis* because it effectively competes with this species for water, space, light, and nutrients.

Lycopodium nutans was described by William D. Brackenridge in 1854 from a specimen collected from the "high mountains" of Oahu by Charles Wilkes, commander of the U.S. Exploring Expedition of 1840 on which

Brackenridge was the horticulturist (Ollgaard 1989). The specific epithet is probably in reference to the species' "nodding" or pendant spikes. Other names by which this species has been known include *Huperzia nutans*, *Lycopodium phyllanthus* var. *nutans*, and *Urostachys nutans*, which are not accepted by current authorities (Ollgaard 1989).

Lycopodium nutans is an erect or pendulous herbaceous epiphyte (plant growing above ground on other plants) of the clubmoss family (Lycopodiaceae). Its stiff, light green branches, 10 to 16 in (25 to 40 cm) long and about 0.2 in (6 mm) thick, are covered with stiff, flat, leathery leaves, 0.5 to 0.6 in (12 to 16 mm) long and about 0.1 in (2.5 mm) wide that overlap at acute angles. The leaves are arranged in six rows and arise directly from the branches. The branches end in thick, 2.8 to 5.1 in (7 to 13 cm) long fruiting spikes that are unbranched or branch once or twice, and taper toward a downward-curving tip. Bracts on the fruiting spikes, between 0.1 and 0.2 in (3 to 5 mm) long, are densely layered and conceal the spore capsules. This species can be distinguished from others of the genus in Hawaii by its epiphytic habit, simple or forking fruiting spikes, and larger and stiffer leaves (Degener 1934, Hillebrand 1888, Wagner and Wagner 1987).

Historically, *Lycopodium nutans* was known from the island of Kauai and from scattered locations in the Koolau Mountains of Oahu bounded by Kaluanui Valley to the north, Paalaa to the west, and Mount Tantalus to the south (HHP 1991h1 to 1991h9; Skottsberg 1936). This species is now known from only two sites within its historical range: Kaluanui Valley; and along Waikane-Schofield Trail on Oahu. One population, located on State land, was described as "scarce" when last observed in 1965 (HHP 1991h3). The other population, located about 5 mi (8 km) away on the boundary of State (Ewa Forest Reserve) and Federal lands (Schofield Barracks Military Reservation), grew in "several places" according to its collector in 1961 (HHP 1991h4).

Two individuals of this population were observed in 1993 by Joel Lau, TNCH (HHP 1993b1, 1993b2). The entire species totals fewer than 50 known individuals. *Lycopodium nutans* grows on tree trunks, usually on open ridges and slopes in 'ohi'a-dominated wet forests and occasionally mesic forests (HHP 1991h5 to 1991h7, Hosaka 1937) between 2,000 and 3,500 ft (600 and 1,070 m) in elevation (Robinson 1914, Selling 1946). The vegetation in those areas typically includes kanawao,

uluhe, 'uki, *Hibiscus* sp., hame, and kopiko (HHP 1993b1, 1993b2; S. Perlman, pers. comm., 1991). The primary threat to *L. nutans* is stochastic extinction and/or reduced reproductive vigor because of the small number of remaining individuals and limited distribution. Additional threats to *L. nutans* are the noxious alien plants Koster's curse and strawberry guava.

Hillebrand (1888) described *Pelea lydgatei* based on a collection by John M. Lydgate from Palolo Valley, Oahu. In an action not accepted by other taxonomists, Emmanuel Drake del Castillo (1890) transferred the species to the genus *Evodia*. In 1944, St. John described two new species, *P. descendens* and *P. semitermata*, which he later determined were synonymous (St. John 1979). Current authorities, however, do not accept St. John's species as being sufficiently different from *P. lydgatei* to maintain them as distinct taxa. Thomas G. Hartley and Benjamin C. Stone (1989, Stone *et al.* 1990, Wagner *et al.* 1990) synonymized the genus *Pelea* with *Melicope*, resulting in the present combination.

Melicope lydgatei is a small shrub of the citrus family (Rutaceae) that has leaves arranged oppositely or in threes. The glossy, papery leaves, which are 1.6 to 5.1 in (4 to 13 cm) long and 0.6 to 2.6 in (1.5 to 6.5 cm) wide, vary from lance-shaped to oblong. Flowers are usually functionally unisexual, with both unisexual and bisexual flowers growing on the same plant. Its aromatic, greenish white flowers are about 0.2 to 0.3 in (4 to 7 mm) long and arise singly or in clusters of two or three. The four-lobed capsules, which have sections fused for one-fourth to one-third their length, are between 0.6 and 0.9 in (14 and 22 mm) wide, and contain one or two glossy black seeds, about 0.2 in (5 mm) long, in each section. Both the exocarp and endocarp (outermost and innermost layers of the fruit wall, respectively) are hairless. The species' leaf arrangement (opposite or in groups of three), the amount of fusion of the fruit sections, and the hairless exocarp and endocarp distinguish it from others in the genus (Hillebrand 1888; St. John 1944, 1979; Stone 1969; Wagner *et al.* 1990).

Melicope lydgatei was formerly known throughout the Koolau Mountains of Oahu from Hauula to Kahana, Kipapa Gulch to Waimano, and Kalihi Valley to Wailupe Valley (HHP 1991i1 to 1991i8, 1991i10 to 1991i12, 1993c). Only three populations totalling fewer than 10 individuals, distributed over a 7.5 mi (12 km) distance, remain within its historical range: Along Poamoho Trail near the boundary of

State (Ewa Forest Reserve) and private lands; along Manana Trail, growing on State land in Ewa Forest Reserve; and along Peahinaia Trail on private lands (HHP 1991i9, 1991i13, 1993c). This species typically grows in association with *Acacia koa* (koa), 'ohi'a, uluhe, kopiko, and *Bobea elatior* ('ahakea lau nui) on open ridges in mesic forests and occasionally in wet forests at elevations between 1,350 and 1,800 ft (410 and 550 m) (HHP 1991i2, 1991i4 to 1991i6, 1991i8 to 1991i10, 1991i12, 1991i13, 1993c; Stone *et al.* 1990). The primary threat to *M. lydgatei* is stochastic extinction and/or reduced reproductive vigor because the few individuals that remain are restricted in distribution.

In 1826, Charles Gaudichaud-Beaupre described *Rollandia crispa* from a fragmentary specimen of a leaf he collected. Gaudichaud-Beaupre probably assigned it the specific epithet based on the crisp or crimped leaf margin (Rock 1919). Names to which this species have been referred are *Lobelia crispa* (Endlicher 1836), *R. crispa* var. *muricata* (Rock 1919), *R. grandifolia* (Hillebrand 1888), and the illegitimate name, *Cyanea rollandia* (Gray 1861).

Rollandia crispa, a member of the bellflower family, is an unbranched shrub with leaves clustered at the ends of succulent stems. The broad oval leaves, 12 to 30 in (30 to 75 cm) long and 3.5 to 6.3 in (9 to 16 cm) wide, have undulating, smooth or toothed leaf margins. Each leaf is on a stalk 0.3 to 1.6 in (0.8 to 4 cm) long. Clusters of three to eight fuzzy flowers grow on stalks 0.8 to 1.2 in (2 to 3 cm) long, with each flower borne on a stalk 0.4 to 0.8 in (1 to 2 cm) long. The calyx lobes are oval or oblong, 0.2 to 0.5 in (6 to 12 mm) long, and often overlapping at their base. The fused petals, 1.6 to 2.4 in (4 to 6 cm) long and fuzzy, are pale magenta with darker longitudinal stripes. The fruits are spherical berries 0.4 in (1 cm) in diameter, that contain many minute, dark seeds. *Rollandia crispa* is distinguished from other species in this endemic Hawaiian genus by its leaf shape, distinct calyx lobes, and the length of the flowers and stalks of flower clusters (de Candolle 1839, Hillebrand 1888, Lammers 1990, Rock 1919, Wawra 1873).

Historically, *Rollandia crispa* was known from scattered locations throughout the upper elevations of the Koolau Mountains of Oahu from Kaipapau Valley to the north to Waialae Iki Ridge to the southeast (HHP 1991j1 to 1991j15, 1991j17 to 1991j19; Skottsberg 1926). This species is now known from State and private lands in Hidden Valley (26 plants), Palolo Valley

(1 plant), Kapakahi Gulch (1 plant), and Pia Valley (1 plant) (HHP 1991j8, 1991j16, 1991j17; HPCC 1990c; Lammers 1990; D. Herbst, J. Obata, K. Nagata, B.P. Bishop Museum, S. Perlman, pers. comms., 1991; L. Mehrhoff, pers. comm., 1993). The four populations are scattered over a distance of about 19 mi (31 km). Three of the populations contain a single, mature, flowering individual. The other population (Hidden Valley) contains 7 mature, flowering plants and 19 juvenile plants, giving a total of fewer than 30 individuals for the entire species. *Rollandia crispa* is found in habitats ranging from steep, open mesic forests to gentle slopes or moist gullies of closed wet forests, at elevations between 600 and 2,400 ft (185 and 730 m) (HHP 1991j2, 1991j5, 1991j8, 1991j9, 1991j12, 1991j13, 1991j16; HPCC 1990c). Associated plant taxa include ke'oke'o, *Cyanea acuminata* (haha), *Microsorium spectrum* (NCN), common *Cyrtandra* species, *Pisonia*, *Touchardia latifolia* (olona), and the introduced strawberry guava, 'awa, kukui, and *Cordyline fruticosa* (ti) (HHP 1991j8, 1991j16; J. Obata, pers. comm., 1991; L. Mehrhoff, pers. comm., 1993). The major threats to *R. crispa* are habitat alteration and predation by feral pigs, competition with noxious alien plant taxa (Koster's curse and strawberry guava), and stochastic extinction and/or reduced reproductive vigor due to the small number of remaining individuals, their limited gene pool, and restricted distribution.

Based on a specimen collected by Lydgate in Niu Valley on Oahu, Hillebrand described *Pterotropia gymnocarpa*, the specific epithet referring to its entirely free and naked (lacking a covering) fruit (Hillebrand 1888). Sherff (1952) renamed the species *Tetraplasandra gymnocarpa* and split the species into four varieties (varieties *pupukeensis*, *leptocarpa*, *megalocarpa*, and *gymnocarpa*) (Sherff 1952, 1953) that are considered synonymous in the latest treatment of the genus (Lowrey 1990). Other names by which this species has been known include *Pterotropia gymnocarpa* var. *pupukeensis* (Degener 1938), *Heptapleurum gymnocarpum* (Drake del Castillo 1890), and *Dipanax gymnocarpa* (Heller 1897).

Tetraplasandra gymnocarpa, a member of the ginseng family (Araliaceae), is a tree 8 to 33 ft (2.5 to 10 m) tall, either hairless or with fuzzy, short-lived hairs on the young leaves and flower clusters. The leaves are 12 to 22 in (30 to 55 cm) long with 7 to 21 leathery, oval to elliptic leaflets per leaf. Each leaflet is 2.8 to 7.1 in (7 to 18 cm)

long and 1.2 to 3.1 in (3 to 8 cm) wide, and is folded upward along the midvein. The flowers are usually arranged in threes or in an umbrella-shaped arrangement. Petals are 0.2 to 0.3 in (4 to 8 mm) long and usually number 5 or 6 per flower, with an equal number of stamens. The ovary, which usually has 3 or 4 sections, appears placed atop the receptacle (base of the flower) in a superior position, due to the expansion of the ovary disk (outgrowth of the receptacle) and the reduction of the hypanthium (basal portion of the flower). Fruits are purplish, oval or top-shaded drupes, 0.2 to 0.5 in (6 to 12 mm) long, that enclose a papery endocarp and single seeds.

Tetraplasandra gymnocarpa is distinguished from all other species in the genus in that its ovary appears fully superior (Degener 1938; Degener and Degener 1962a, 1962b; Hillebrand 1888; Lowrey 1990; Sherff 1952, 1955).

Tetraplasandra gymnocarpa was historically known from Punaluu, Waikakalaua Gulch, Mount Olympus, and the region between Niu and Wailupe, all in the Koolau Mountains of Oahu (Degener 1938; HHP 1991k3, 1991k12 to 1991k14). Fifteen populations are now scattered along the summit ridges of the Koolau Mountains over a distance of 28 mi (45 km), from the region of Paumalu at the northern extreme to Kuliouou and Waimanalo at the southeasternmost point (HHP 1991k1, 1991k2, 1991k4 to 1991k11, 1991k15 to 1991k18, 1993c1, 1993d2; HPCC 1991e; S. Perlman, pers. comm., 1991). One population in the Waianae Mountains, located on Palikea ridge on the border of Federal and private lands, was last visited in 1954; it is not known whether it still exists (HHP 1991k8). Most populations contain between one and six individuals, giving a total of fewer than 40 individuals for the entire species. However, because *T. gymnocarpa* is difficult to distinguish from other species when infertile, the total number of individuals may be as high as "a few hundred" (J. Obata, pers. comm., 1991). *Tetraplasandra gymnocarpa* is typically found on windswept summit ridges or in gullies in wet or sometimes mesic forests between elevations of 820 and 2,790 ft (250 and 850 m) with such associated plant taxa as 'ohi'a, olapa, uluhe, kopiko, *Labordia tinifolia* (kamakahala), and *Myrsine fosbergii* (kolea) (HHP 1991k1, 1991k2, 1991k4 to 1991k7, 1991k9, 1991k11, 1991k14, 1991k15, 1991k17, 1991k18, 1993d1; HPCC 1991e; Lowrey 1990). The major threats to *T. gymnocarpa* are competition with the alien plant taxon Koster's curse,

feral pigs, and reduced reproductive vigor due to the limited gene pool because of the small number of extant individuals.

Previous Federal Action

Federal action on these plants began as a result of section 12 of the Act, 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, *Cyrtandra crenata*, *Cyrtandra polyantha*, *Hesperomannia arborescens* (as *H. arborescens* ssp. *bushiana* and ssp. *swezeyi*), *Lobelia oahuensis*, *Melicope lydgatei* (as *Pelea lydgatei* and *P. descendens*), and *Tetraplasandra gymnocarpa* (as *T. gymnocarpa* var. *pupukeensis*) were considered to be endangered. *Huperzia nutans* (as *Lycopodium nutans*) was considered to be threatened, and *Chamaesyce deppeana* (as *Euphorbia deppeana*) and *Eugenia koolauensis* (as *Eugenia molokaiana*) were considered to be extinct. On July 1, 1975, the Service published a notice in the *Federal Register* (40 FR 27823) of its acceptance of the Smithsonian report as a petition within the context of section 4(c)(2) (now section 4(b)(3)) of the Act, and giving notice of its intention to review the status of the plant species 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 or threatened or thought to be extinct. The list of 1,700 plant species 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 updated notices of review for plants on December 15, 1980 (45 FR 82479), September 27, 1985 (50 FR 39525), and February 21, 1990 (55 FR 6183). In at least one of these notices, eight of the species (including synonymous taxa) that had been in the 1976 proposed rule were treated as category 1 candidates for Federal listing. Category 1 species are those for which the Service has on file substantial information on biological vulnerability and threats to support preparation of listing proposals. Other than *Chamaesyce deppeana* (as *Euphorbia deppeana*), *Huperzia nutans* (as *Lycopodium nutans*), *Melicope lydgatei* (as *Pelea lydgatei* and *P. descendens*) and *Tetraplasandra gymnocarpa* (as *T. gymnocarpa* var. *pupukeensis*), all the aforementioned species that were either proposed as endangered or threatened or thought to be extinct in the June 16, 1976, proposed rule were considered category 1 candidates in all three notices of review. *Melicope lydgatei* (as *Pelea lydgatei* and *P. descendens*), a category 1 species in the 1980 and 1985 notices, was conferred category 1* status in the 1990 notice. Category 1* species are those which are possibly extinct; however, because new information regarding this species' existence has become available, it was proposed for listing. In the 1980 and 1985 notices, *Huperzia nutans* (as *Lycopodium nutans*) was considered a category 2 species and *Chamaesyce deppeana* (as *Euphorbia deppeana*) a category 3A species. Category 2 species are those for which there is some evidence of vulnerability, but for which there are not enough data to support listing proposals at the time. Category 3A species are those for which the Service has persuasive evidence of extinction. For those two species, because new information provided support for listing or indicated their current existence, they were conferred category 1 status in the 1990 notice. *Tetraplasandra gymnocarpa* var. *pupukeensis* appeared as a category 3B species in the 1980 and 1985 notices; in

the 1990 notice, it was considered synonymous with *T. gymnocarpa*, a category 1 species. Category 3B species are those which, on the basis of current taxonomic understanding, do not represent distinct taxa meeting the Act's definition of "species." *Cyanea truncata* and *Rollandia crispa* first appeared in the 1990 notice, as a category 1 species.

Section 4(b)(3)(B) of the Act requires the Secretary to make findings on petitions that present substantial information indicating 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 species 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 submitted, pursuant to section 4(b)(3)(C)(i) of the Act. The finding was reviewed in October of 1984, 1985, 1986, 1987, 1988, 1989, 1990, and 1991. Publication of the proposal constituted the final one-year finding for these 11 plant taxa.

On October 14, 1992, the Service published in the *Federal Register* (57 FR 47028) a proposal to list 11 plant taxa from the Koolau Mountain Range, island of Oahu, as endangered. This proposal was based primarily on information supplied by the Hawaii Heritage Program, the Hawaii Plant Conservation Center, and observations by botanists and naturalists. The Service now determines 11 species primarily from the Koolau Mountain Range to be endangered with the publication of this rule.

Summary of Comments and Recommendations

In the October 14, 1992, 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 December 14, 1992. 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 "Honolulu Advertiser" on October 23, 1992. Only one letter of comment was received, from a conservation organization, supporting the listing of these taxa from the Koolau Mountain Range, island of Oahu, but raising no specific issues.

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that *Chamaesyce deppeana* (Boiss.) Millsp. ('akoko), *Cyanea truncata* (Rock) Rock (haha), *Cyrtandra crenata* St. John and Storey (ha'iwale), *Cyrtandra polyantha* C.B. Clarke (ha'iwale), *Eugenia koolauensis* Degener (nioi), *Hesperomannia arborescens* A. Gray (no common name (NCN)), *Lobelia oahuensis* Rock (NCN), *Lycopodium nutans* Brack. (wawae'iole), *Melicope lydgatei* (Hillebr.) Hartley and Stone (alani), *Rollandia crispa* Gaud. (NCN), and *Tetraplasandra gymnocarpa* (Hillebr.) Sherff ('ohe'ohe) should be classified as endangered species. Procedures found at section 4(a)(1) of the Endangered Species Act (16 U.S.C. 1533 et seq.) and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act were followed. Threats to the 11 plant taxa are summarized in Table 1. 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). These factors and their application to the 11 plant taxa in this rule are as follows:

TABLE 1.—SUMMARY OF THREATS

Species	Alien animals			Alien plants	Fire	Human impacts	Limited Nos.*
	Pigs	Goats	Rodents				
<i>Chamaesyce deppeana</i>				X	X	X	X1,3
<i>Cyanea truncata</i>	X		P	X	P		X1,2
<i>Cyrtandra crenata</i>			P		P	P	X1,2
<i>Cyrtandra polyantha</i>			P		P	P	X1,2
<i>Eugenia koolauensis</i>	X			X	P	P	X1,3
<i>Hesperomannia arborescens</i>	X	X		X	X	X	X ³
<i>Lobelia oahuensis</i>	P		P	X		P	
<i>Lycopodium nutans</i>				X	P	P	X1,3
<i>Melicope lydgatei</i>					P	P	X1,2

TABLE 1.—SUMMARY OF THREATS—Continued

Species	Alien animals			Alien plants	Fire	Human impacts	Limited Nos.*
	Pigs	Goats	Rodents				
<i>Rollandia crista</i>	X	.....	P	X	P	P	X ^{1,3}
<i>Tetraplasandra gymnocarpa</i>	X	.....	.....	X	P	P	X ³

X = Immediate and significant threat.

P = Potential threat.

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

¹No more than 5 populations.

²No more than 10 individuals.

³No more than 100 individuals.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The native vegetation of the Koolau Mountains and adjacent areas has undergone extreme alterations because of past and present land management practices, including deliberate alien plant and animal introductions, agricultural development, military use, and recreational use (Cuddihy and Stone 1990, Wagner *et al.* 1985). Degradation of habitat by feral pigs and competition with alien plants are considered the greatest present threats to the 11 plant taxa in this final rule.

Feral pigs (*Sus scrofa*) have been in the Koolau Mountains for about 150 years and are known to be one of the major modifiers of wet forest habitats (Stone 1985). Pigs damage the native vegetation by rooting and trampling the forest floor, which encourages the spread of alien plant taxa that are better able to exploit the newly tilled soils than are native taxa (Cuddihy and Stone 1990, Stone 1985). Feral pigs also feed on the starchy interior of tree ferns (*Cibotium*) and other succulent-stemmed plants (See Factor C). The last known population of three individuals of *Cyanea truncata* in Hidden Valley was destroyed in recent years by feral pigs (CPC 1989a, 1989b, 1990; HHP 1991b1). The continued impact of pigs poses an immediate and severe threat to any plants of *Cyanea truncata* that may remain (L. Mehrhoff, pers. comm., 1993). Habitat degradation and predation of *Rollandia crista* by pigs has been observed at the Hidden Valley population (L. Mehrhoff, pers. comm., 1993). Feral pigs are known to frequent regions of the Koolau Mountains and threaten to destroy the habitat of *Eugenia koolauensis*, *Hesperomannia arborescens*, *Lobelia oahuensis*, *Rollandia crista*, and *Tetraplasandra gymnocarpa* (HHP 1991f10, 1991g5, 1991j16, 1993a3, 1993d2; HPCC 1990b1, 1990c; K. Nagata and S. Perlman, pers. comms., 1991). The only population of *Hesperomannia arborescens* on Maui is

threatened by pigs as well (HHP 1991f23, HPCC 1990b2).

Goats (*Capra hircus*) have become established on the island of Molokai as well as other major Hawaiian islands (Kauai, Maui, and Hawaii) (Cuddihy and Stone 1990, van Riper and van Riper 1982). Goats are managed in Hawaii as a game animal, but are able to forage in extremely rugged terrain and populate inaccessible areas where hunting has little effect on their numbers (Culliney 1988, HHP 1990). Feral goats eat native vegetation, trample roots and seedlings, cause erosion, and promote the invasion of alien plants. On Molokai, goats degrade dry forests at low elevations and they are expanding their range (Cuddihy and Stone 1990; J. Lau, pers. comm., 1991). Goats browse on introduced and native plants, especially in dry, open ecosystems similar to that found between Wailau and Waiehu on the island of Molokai. In 1989, it was observed that numerous goats occupied the Wailau-Waiehu area and threatened the survival of the only population of *Hesperomannia arborescens* on the island (HHP 1991f11). Although there is no longer a large feral goat population on Oahu, the effects of the goat trade in the early 1820s, which allowed goats to proliferate without being confined by fences, and resultant damage by goats to the native flora have permanently altered Oahu's native ecosystems (Cuddihy and Stone 1990, Culliney 1988, Tomich 1986). Today, little of the original forests of the Koolau Mountains remain (Wagner *et al.* 1985).

Like goats, cattle (*Bos taurus*) were once abundant on Oahu. Because of past restrictions on hunting, widespread ranching, and ineffective confinement of the animals, the goat and cattle population boomed and spread to many parts of the island (Culliney 1988). The impact of cattle on the native vegetation was similar to that described for goats (Cuddihy and Stone 1990, Scott *et al.* 1986, Tomich 1986). It was not until local land managers recognized the extent of destruction of native

vegetation by these animals that their numbers were controlled. However, by then much of the plant cover on cattle-grazing land on Oahu and other islands was already degraded. Such areas remained grassland for many years following the removal of cattle (Culliney 1988). Although not a current threat to the taxa in this rule, cattle that once roamed through the Koolau Mountains contributed to the reduction in the range of many native plants, probably including at least some of the 11 plant taxa.

Fire immediately threatens 2 of the 11 plant taxa (See Table 1) and poses a possible threat to 8 other taxa. Because Hawaii's native plants have evolved with only infrequent, naturally occurring episodes of fire (lava flows, infrequent lightning strikes), most species are not adapted to fire and are unable to recover well after recurring human-set fires. Alien plants are often more fire-adapted than native taxa and will quickly exploit suitable habitat after a fire (Cuddihy and Stone 1990). Species that grow in dry and mesic vegetation communities (including all of the 11 plant taxa except the wet forest and shrubland species, *Lobelia oahuensis*) may be susceptible to accidentally or maliciously set fires, especially near areas of habitation from which fires could easily spread. In the past 14 or 15 years, approximately 8 to 10 fires occurred in conservation districts under the jurisdiction of the Hawaii Division of Forestry and Wildlife in the low elevation slopes of the Koolau Mountains (Earl Pawn, State Division of Forestry and Wildlife, pers. comm., 1991). Although the fires were contained within small areas, the possibility remains for such fires to spread upslope into habitat occupied by the endangered species, especially during the dry summer months. Fires have been reported from dry and mesic regions in the Koolau Mountains, threatening *Hesperomannia arborescens* and *Chamaesyce deppeana* (HHP 1991a, 1991f1). A fire in the vicinity of the population spread fueled by alien and

naturalized grasses and brisk updrafts typical of the area, although the extent of the fire on Nuuanu Pali is not known.

Although the northern Koolau Mountains are mostly State or privately owned, large parcels are leased to the U.S. Army (Wagner *et al.* 1985). Military training exercises and ground maneuvers are occasionally conducted in those areas, especially along the summit ridges and in various locations above Kahuku. Because of the steep terrain, training areas are restricted to foot travel; tanks and other off-road vehicles are not utilized. Vehicles are only used on roads or trails (Alton Kanno, Environmental Management Office, U.S. Army Support Command, Hawaii, pers. comm., 1991), but the potential for affecting one population of *Hesperomannia arborescens* that grows along a jeep trail exists (HHP 1991f10). Trampling by ground troops associated with training activities could also affect other endangered species, including populations of *Eugenia koolauensis*, *Hesperomannia arborescens*, *Lobelia oahuensis*, *Lycopodium nutans*, *Melicope lydgatei*, and *Tetraplasandra gymnocarpa* that occur on land leased or owned by the Army (HHP 1991e3, 1991e8, 1991f1, 1991f10, 1991f17, 1991f20, 1991f21, 1991h4, 1991i9, 1991k4, 1991k6, 1991k9).

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 endangered species, but especially to *Cyanea truncata*, *Cyrtandra crenata*, *Cyrtandra polyantha*, and *Melicope lydgatei*, each of which has a total of 10 or fewer individuals. Any collection of whole plants or reproductive parts of any of these four species would cause an adverse impact on the gene pool and threaten the survival of the species. The proximity of approximately 30 percent of the known individuals of *Chamaesyce deppeana* to a major scenic lookout, some within 15 ft (5 m) of heavy pedestrian traffic, poses a threat to a significant proportion of the entire species (J. Lau and J. Obata, pers. comms., 1991). Its accessibility also may make the plants attractive to collectors. One population of *Hesperomannia arborescens* is located close to a trail and, thus, is easily accessible to visitors (HHP 1991f1). Populations of *Chamaesyce deppeana*, *Lobelia oahuensis*, and *Tetraplasandra gymnocarpa* are on the boundary of a game mammal hunting area and are

potentially threatened by trampling as hunters use the area (Buck 1991).

C. Disease and Predation

Disease is not known to be a significant threat to any of the endangered species. However, a tiny beetle, black twig borer (*Xylosandrus compactus*), is known to infest common taxa of *Melicope* in the Koolau Mountains (Davis 1970). Black twig borers burrow into branches and introduce a pathogenic fungus that kills twigs, reduces plant vigor, and often destroys entire plants. Populations of *Melicope lydgatei* that grow in the Koolau Mountains may be affected by these insects (Davis 1970, Hara and Beardsley 1979).

Of the ungulates introduced to Oahu, pigs have become the primary modifiers of wet forests in the Koolau Mountains. Not only do they destroy native vegetation through their rooting activities and dispersal of alien plant seed (See Factor A), but pigs also feed on plants, preferring the pithy interior of large tree ferns and fleshy-stemmed plants from the bellflower family (Stone 1985; Stone and Loope 1987; S. Perlman, pers. comm., 1991). Predation of *Cyanea truncata* and *Rollandia crispa* by pigs has been observed and is believed to be one of the primary causes of the decline or extirpation of populations (L. Mehrhoff, pers. comm., 1993). Although the Service lacks conclusive evidence of predation on the other fleshy-stemmed plant taxa in this final rule, none of them are known to be unpalatable to pigs. Predation is, therefore, a probable threat to *Lobelia oahuensis* in areas where pigs have been reported.

Predation of Hawaii's native vegetation by goats and the extensive damage caused by them have been well documented (Tomich 1986, van Riper and van Riper 1982). Although browsing by goats is not confirmed for the *Hesperomannia arborescens* population on Molokai, such activity probably occurs, owing to the large number of goats in the vicinity.

Two rat taxa, *Rattus rattus* (black rat) and *R. exulans* (Polynesian rat), and to a lesser extent other introduced rodents, eat large, fleshy fruits and strip the bark of some native plants (Cuddihy and Stone 1990, Tomich 1986, Wagner *et al.* 1985). Predation of plants in the bellflower and African violet families that have fleshy stems and fruits has been reported (J. Lau, pers. comm., 1991). Rats probably eat the fruits of *Cyanea truncata*, *Cyrtandra crenata*, *Cyrtandra polyantha*, *Lobelia oahuensis*, and *Rollandia crispa*, all of which produce fleshy fruits and stems

and grow in areas where rats occur (J. Lau and J. Obata, pers. comms., 1991).

Little is known about the predation of certain rare Hawaiian plants by slugs, particularly *Milax gagantes*, which is found in wet montane habitats (Howarth 1985). Indiscriminate predation by slugs on plant parts of *Lobelia oahuensis* and particularly the fruits of *Rollandia crispa* has been observed; field botanists believe that the effect of slugs on the decline of these and related taxa may be significant (S. Perlman, pers. comm., 1991). Slugs pose a serious threat to these two species because they chew through the stems and eat the fruit, reducing the vigor of the plant and limiting the number of seeds for germination.

D. The Inadequacy of Existing Regulatory Mechanisms

Of the 11 plant taxa in this final rule, a total of 8 have populations located on privately owned land, 10 on State land, and 4 on Federal land. One taxon is located exclusively on private land and one is found only on State land. No State laws or existing regulatory mechanisms at the present time effectively protect or prevent further decline of these plant taxa on private land. However, Hawaii 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, sec. 195D-5(a)). State regulations prohibit the removal, destruction, or damage of plants found on State lands. Despite the existence of State laws and regulations which give protection to Hawaii's native plants, their enforcement is difficult due to limited funding and personnel. Federal listing automatically invokes listing under Hawaii State law, which prohibits taking of endangered plants in the State and encourages conservation by State agencies (HRS, sec. 195D-4). Hawaii's Endangered Species Act states, "Any species of aquatic life, wildlife, or land plant that has been determined to be an endangered species pursuant to the (Federal) Endangered Species Act shall be deemed to be an endangered species under the provisions of this chapter * * *" (HRS, sec. 195D-4(a)). Further, the State 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, sec. 195D-5(c)). Funds for these activities could be made available under section 6 of the Federal Endangered Species Act (State Cooperative Agreements). Listing of

these 11 plant taxa reinforces and supplements the protection available under the State Endangered Species Act and other laws. The Federal Endangered Species Act also offers additional protection to these 11 plant taxa because it is a violation to remove, cut, dig up, damage, or destroy any such plant in an area not under Federal jurisdiction 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 number of populations and individuals of most of these taxa increases the potential for extinction from stochastic 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. Three of the plant taxa in this final rule, *Chamaesyce deppeana*, *Cyanea truncata*, and *Cyrtandra crenata*, are known from a single population. Five other taxa are known from only two to five populations (See Table 1). Ten of the 11 plant taxa are estimated to number no more than 100 known individuals. Four of those taxa, *Cyanea truncata*, *Cyrtandra crenata*, *Cyrtandra polyantha*, and *Melicope lydgatei*, are estimated to number no more than 10 individuals.

Eight of the 11 endangered plant taxa are threatened by competition with one or more alien plant taxa (See Table 1). Naturalized taxa compete with native plants for space, light, water, and nutrients (Cuddihy and Stone 1990). *Clidemia hirta* (Koster's curse), a noxious shrub first cultivated in Wahiawa on Oahu, spread to the Koolau Mountains prior to 1941, where it is now rapidly displacing native vegetation (Wagner *et al.* 1985). Koster's curse spread to the Waianae Mountains around 1970 and is now widespread throughout the southern half of that mountain range (Cuddihy and Stone 1990, Smith 1985, Wagner *et al.* 1985). This pest forms a dense understory, shading out other plants and hindering plant regeneration, and is considered the major alien plant threat in the Koolau Mountains (HHP 1987; Smith 1989; S. Perlman, pers. comm., 1991). At present, Koster's curse threatens *Cyanea truncata*, *Eugenia koolauensis*, *Hesperomannia arborescens*, *Lobelia oahuensis*, *Lycopodium nutans*, *Rollandia crispa*, and *Tetraplasandra gymnocarpa* (HHP 1993a1, 1993a2, 1993b2, 1993d1, 1993d2; HPCC 1990b1;

J. Lau, K. Nagata, J. Obata, and S. Perlman, pers. comms., 1991).

Tibouchina herbacea, a relative of Koster's curse, first became established on the island of Hawaii in the late 1970s and, by 1982, was collected in Lanilili on West Maui (Almeda 1990). Although the disruptive potential of this alien plant is not fully known, *Tibouchina herbacea* appears to be rapidly invading mesic and wet forests of Maui, and is considered the primary alien plant threat to the only population of *Hesperomannia arborescens* on that island (Cuddihy and Stone 1990; HPCC 1990b2; J. Lau, pers. comm., 1991).

Psidium cattleianum (strawberry guava) has become widely naturalized on all the main islands of Hawaii. Found in mesic and wet forests in the Koolau Mountains, strawberry guava develops into dense stands in which few other plants can grow, displacing natural vegetation. Strawberry guava is eaten by pigs that disperse the plant's seeds through the forest (Smith 1985, Wagner *et al.* 1985). *Cyanea truncata*, *Eugenia koolauensis*, *Hesperomannia arborescens*, *Lycopodium nutans*, and *Rollandia crispa* are seriously threatened by this pervasive weed (HHP 1991e8, 1991f1, 1991j16, 1993a4, 1993b1; HPCC 1991b1, 1991b2; K. Nagata, S. Perlman, pers. comms., 1991).

After escaping from cultivation, *Schinus terebinthifolius* (Christmas berry) became naturalized on most of the main Hawaiian Islands (Wagner *et al.* 1990) and is a pervasive threat in the Koolau Mountain Range. This fast-growing tree, distributed mainly by feral pigs and fruit-eating birds, is able to form dense thickets that displace other plants (Cuddihy and Stone 1990, Smith 1985, Stone 1985). It is now replacing the native vegetation of the Koolau Mountains and threatens to occupy the habitat of *Chamaesyce deppeana* and *Eugenia koolauensis* (HHP 1991e5, HPCC 1990a).

Lantana camara (lantana) is an aggressive thicket-forming shrub, brought to Hawaii as an ornamental, that has now become naturalized in mesic forests, dry shrublands, and other disturbed habitats (Smith 1989, Wagner *et al.* 1990). Lantana poses an immediate threat to a population of *Eugenia koolauensis* in the Koolau Mountains (HHP 1991e7).

Paspalum conjugatum (Hilo grass) is one of several perennial grasses purposely introduced for cattle fodder that have become noxious weeds on Oahu as well as other Hawaiian islands (Cuddihy and Stone 1990, Scott *et al.* 1986, Tomich 1986). Hilo grass rapidly forms a dense ground cover in wet habitats from sea level to 6,600 ft (2,000

m) in elevation and competes with ferns and other native plants (Cuddihy and Stone 1990, Haselwood and Motter 1983, O'Connor 1990, Smith 1985). Its small hairy seeds are easily transported on humans and animals or carried by the wind through native forests. Hilo grass threatens *Chamaesyce deppeana* and *Hesperomannia arborescens* (S. Perlman, pers. comm., 1991).

Casuarina equisetifolia (common ironwood) is a large, fast-growing tree that reaches up to 65 ft (20 m) in height (Wagner *et al.* 1990). This large tree shades out other plants, takes up much of the available nutrients, and possibly releases a chemical agent that prevents other plants from growing beneath it (Neal 1965, Smith 1985). Like Hilo grass, common ironwood is becoming a significant component of the wet forest vegetation in Nuuanu Valley and poses a significant threat to *Chamaesyce deppeana* (HHP 1991a; HPCC 1990a; S. Perlman, pers. comm., 1991).

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by these taxa in determining to make this rule final. Based on this evaluation, this rulemaking will list these 11 plant taxa as endangered. Ten of the taxa in this final rule either number no more than about 100 individuals or are known from 5 or fewer populations. The 11 plant taxa are threatened by one or more of the following: Habitat degradation and/or predation by feral pigs and goats; competition for space, light, water, and nutrients by alien plants; habitat loss from fires; recreational activities; and predation by animals. Small population sizes and limited distributions make these plant taxa particularly vulnerable to extinction from reduced reproductive vigor or from stochastic events. Because these 11 plant 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.

Critical habitat is not being proposed for the 11 plant taxa included in this final rule, for reasons discussed in the "Critical Habitat" section of this rule.

Critical Habitat

Section 4(a)(3) of the Act, as amended, requires that, to the maximum extent prudent and determinable, the Secretary propose critical habitat at the time the species is proposed to be endangered or threatened. The Service finds that designation of critical habitat is not presently prudent for these 11 plant taxa. As discussed under Factor B in the "Summary of Factors Affecting the Species," the species face numerous

anthropogenic threats. The publication of precise maps and descriptions of critical habitat in the *Federal Register*, as required in a proposal for critical habitat, would increase the degree of threat to these plants from take or vandalism and, therefore, could contribute to their decline. The listing of these species as endangered publicizes the rarity of the plants and, thus, can make these plants attractive to researchers, 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 species. Protection of the habitat of the species will be addressed through the recovery process and through the Section 7 consultation process.

Therefore, the Service finds that designation of critical habitat for these species is not prudent at this time, because such designation would increase the degree of threat from vandalism, collecting, or other human activities.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Endangered Species Act provides for possible land acquisition and cooperation with the State and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against certain activities involving listed plants are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer informally with the Service on any action that is likely to jeopardize the continued existence of a proposed endangered species or result in destruction or adverse modification

of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service. Four endangered species grow on federally owned land and five species occur on land leased by the U.S. Army from the State and private parties. There are no other known Federal activities that occur within the present known habitat of these 11 plant species.

The Act and its implementing regulations found at 50 CFR 17.61, 17.62, and 17.63 for endangered plants set forth a series of general prohibitions and exceptions that apply to all endangered and threatened plant species. With respect to the 11 plant species, all prohibitions of section 9(a)(2) of the Act, implemented by 50 CFR 17.61, would apply. These prohibitions, in part, make it illegal with respect to any endangered plant for any person subject to the jurisdiction of the United States to import or export; transport in interstate or foreign commerce in the course of a commercial activity; sell or offer for sale in interstate or foreign commerce; remove and reduce to possession any such species from areas under Federal jurisdiction; maliciously damage or destroy any such species on any area under Federal jurisdiction; or remove, cut, dig up, damage, or destroy any such 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. Certain exceptions apply to agents of the Service and State conservation agencies. The Act and 50 CFR 17.62 and 17.63 also provide for the issuance of permits to carry out otherwise prohibited activities involving endangered plant species under certain circumstances. It is anticipated that few permits would ever be sought or issued because the species are not common in cultivation or in the wild.

Requests for copies of the regulations concerning listed plants and inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Ecological Services, Endangered Species Permits, 911 NE.

11th Avenue, Portland, Oregon 97232-4181 (503/231-6241; FAX 503/231-6243).

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment or Environmental Impact Statement, 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).

References Cited

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

Author

The primary authors of this final rule are Marie M. Bruegmann, Loyal A. Mehrhoff, and Joan M. Yoshioka, Ecological Services, Pacific Islands Office, U.S. Fish and Wildlife Service, 300 Ala Moana Boulevard, room 6307, P.O. Box 50167, Honolulu, Hawaii 96850 (808/541-2749).

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

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

PART 17—[AMENDED]

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

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

2. Section 17.12(h) is amended by adding the following, in alphabetical order under the families indicated, to the List of Endangered and Threatened Plants:

§ 17.12 Endangered and threatened plants.

* * * * *

(h) * * *

Species		Historical range	Status	When listed	Critical habitat	Special rules
Scientific name	Common name					
Araliaceae—Ginseng family:						
<i>Tetraplasandra gymnocarpa</i>	'Ohe'ohe	U.S.A. (HI)	E	536	NA	NA
Asteraceae—Aster family:						
<i>Hesperomannia arborescens</i>	None	U.S.A. (HI)	E	536	NA	NA
Campanulaceae—Bellflower family:						
<i>Cyanea truncata</i>	Haha	U.S.A. (HI)	E	536	NA	NA
<i>Lobelia oahuensis</i>	None	U.S.A. (HI)	E	536	NA	NA
<i>Rollandia crispa</i>	None	U.S.A. (HI)	E	537	NA	NA
Euphorbiaceae—Spurge family:						
<i>Chamaesyce deppeana</i>	'Akoko	U.S.A. (HI)	E	536	NA	NA
Gesneriaceae—African Violet family:						
<i>Cyrtandra crenata</i>	Ha'iwale	U.S.A. (HI)	E	536	NA	NA
<i>Cyrtandra polyantha</i>	Ha'iwale	U.S.A. (HI)	E	536	NA	NA
Lycopodiaceae—Clubmoss family:						
<i>Lycopodium nutans</i>	Wawae'iole	U.S.A. (HI)	E	536	NA	NA
Myrtaceae—Myrtle family:						
<i>Eugenia koolauensis</i>	Nioi	U.S.A. (HI)	E	536	NA	NA
Rutaceae—Citrus family:						
<i>Melicope lydgatei</i> (=Pelea 1.)	Alani	U.S.A. (HI)	E	536	NA	NA

Dated: February 28, 1994.
 Mollie H. Beattie,
 Director, Fish and Wildlife Service.
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