

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

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SPECIES		Historic range	Family	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
FLOWERING PLANTS							
Delissea undulata	None	U.S.A. (HI)	Campanulaceae	E	593	NA	NA

Dated: September 19, 1996.
 John G. Rogers,
 Acting Director, Fish and Wildlife Service.
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50 CFR Part 17

RIN 1018-AD49

Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Three Plant Species (*Cyanea dunbarii*, *Lysimachia maxima*, and *Schiedea sarmentosa*) from the Island of Molokai, 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 three plants: *Cyanea dunbarii* (haha), *Lysimachia maxima* (No common name (NCN)), and *Schiedea sarmentosa* (NCN). All three species are endemic to the island of Molokai, Hawaiian Islands. The three plant species 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; fire; and natural disasters. This rule implements the Federal protection and recovery provisions afforded by the Act for these three species.

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

ADDRESSES: The complete file for this rule is available for public inspection, by appointment, during normal business hours at the Pacific Islands Ecoregion Office, U.S. Fish and Wildlife Service, 300 Ala Moana Boulevard, Room 3108, P.O. Box 50088, Honolulu, Hawaii 96850.

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

SUPPLEMENTARY INFORMATION:

Background

Cyanea dunbarii, *Lysimachia maxima*, and *Schiedea sarmentosa* are endemic to the island of Molokai. This island, the fifth largest in the Hawaiian island chain, is approximately 61 kilometers (km) (38 miles (mi)) long, up to 16 km (10 mi) wide, and encompasses an area of about 688 square (sq) km (266 sq mi) (Foote *et al.* 1972, Plasch 1985). Three shield volcanoes make up most of the land mass of Molokai—West Molokai Mountain, East Molokai Mountain, and a volcano that formed Kalaupapa Peninsula (Department of Geography 1983). Molokai can also be divided into three major sections—the west Molokai section, comprising West Molokai Mountain; the central Molokai section or Hoolehua Plain formed between the two large mountain masses; and the east Molokai section, incorporating East Molokai Mountain and Kalaupapa Peninsula (Foote *et al.* 1972).

The taller and larger East Molokai Mountain rises 1,813 meters (m) (4,970 feet (ft)) above sea level (Walker 1990) and comprises roughly 50 percent of the island's land area. Topographically, the windward side of East Molokai differs from the leeward side. Precipitous cliffs line the northern windward coast with deep inaccessible valleys dissecting the coastline. The annual rainfall on the windward side is 200 to over 375 centimeters (cm) (75 to over 150 inches (in)), distributed throughout the year. The soils are poorly drained and high in organic matter. The gulches and valleys are usually very steep, but sometimes gently sloping (Foote *et al.* 1972). Much of the native vegetation on the northern part of East Molokai is intact because of its relative inaccessibility to humans and animals (Culliney 1988), although destructive ungulates have begun to enter the coastline in recent years (Joel Lau, Hawaii Heritage Program (HHP), pers. comm. 1990). *Lysimachia maxima* is found in windward wet forest.

Although Molokai's windward side receives most of the island's rainfall, some falls onto the upper slopes of the

leeward (southern) side, decreasing as elevation decreases, and resulting in diverse leeward communities, from wet forests to dry shrub and grasslands. The average annual rainfall on the leeward side of East Molokai is between 80 and 130 cm (30 and 50 in), mostly falling between November and April. The gently sloping to very steep topography of upland regions has predominantly well drained and medium-textured soils (Foote *et al.* 1972). *Cyanea dunbarii* and *Schiedea sarmentosa* are found in lowland mesic forest and dry shrubland on the leeward side of the island.

With the advent of cattle ranching and later pineapple cultivation, most of Molokai, particularly West Molokai and East Molokai's southern section, was converted to pasture land. The only remaining large tracts of native vegetation are found within the Molokai Forest Reserve on the upper elevation portions of East Molokai. All three plant species in this rule are restricted to this forest reserve (Culliney 1988). The land that supports these three plant species is owned by various private parties and the State of Hawaii (including forest reserves). The only known populations of *Lysimachia maxima* and *Schiedea sarmentosa* occur on privately owned land. The only known population of *Cyanea dunbarii* occurs on State land.

Discussion of the Three Species Included in This Final Rule

Cyanea dunbarii was first described by Joseph F. Rock, who named it in honor of the collector, L.M. Dunbar (Rock 1919). Harold St. John (1987a, St. John and Takeuchi 1987) merged *Cyanea* with *Delissea*, the genus with priority. Lammers (1990) retained both genera in the currently accepted treatment of the family.

Cyanea dunbarii, a member of the bellflower family (Campanulaceae), is a branched shrub 1.5 to 2 m (4.9 to 6.6 ft) tall. The oval to broadly elliptic leaves are 10 to 22 cm (3.9 to 8.7 in) long and 6 to 14 cm (2.4 to 5.5 in) wide, with irregularly lobed or cleft margins. The flowers are arranged in groups of six to eight on a stalk that is 3 to 7 cm (1.2 to 2.8 in) long. The corolla is white,

tinged or striped with pale lilac and 30 to 38 mm (1.2 to 1.5 in) long. The corolla is slightly curved, with spreading lobes three-fourths as long as the tube. This species is distinguished from others in this endemic Hawaiian genus by the lack of prickles on the stems and the irregularly lobed and cleft leaf margins (Lammers 1990).

Cyanea dunbarii was collected in 1918 at Waihanau and Waialae valleys, and was not observed again until 1992, when Joel Lau of HHP found it in Mokomoko Gulch (HHP 1993a1 to 1993a3, Rock 1919, Wimmer 1943). Approximately 15 to 20 mature plants are known from this population, which occurs on State-owned land within Molokai Forest Reserve, at an elevation of 685 m (2,250 ft) (HHP 1993a3; Loyal Mehrhoff, U.S. Fish and Wildlife Service, *in litt.*, 1994). *Cyanea dunbarii* is found in mesic to wet *Dicranopteris linearis* (uluhe)-*Metrosideros polymorpha* ('ohi'a) forest on moderate to steep slopes along a stream (HHP 1993a3; L. Mehrhoff, *in litt.* 1994). Associated species include *Perrottetia sandwicensis* (olomea), *Pipturus albidus* (mamaki), *Clermontia kakeana* (haha), *Cheirodendron trigynum* ('olapa), and *Freycinetia arborea* ('ie'ie) (L. Mehrhoff, *in litt.*, 1994). The major threats to *Cyanea dunbarii* are competition with the alien plants *Rubus rosifolius* (thimbleberry), *Commelina diffusa* (honohono), *Hedychium* sp. (ginger), and *Kalanchoe pinnata* (air plant); and a risk of extinction from naturally occurring events (such as landslides or flooding) and/or reduced reproductive vigor due to the small number of individuals in the only known population (HHP 1993a3; L. Mehrhoff, *in litt.* 1994). Rats (*Rattus* spp.) are a potential threat since they are known to be in the area and eat stems and fruits of other species of *Cyanea* (Cuddihy and Stone 1990). Axis deer (*Axis axis*) and pigs (*Sus scrofa*) are potential threats to this species, since they are known to occur in areas adjacent to the only known population (L. Mehrhoff, *in litt.*, 1994; Ed Misaki, The Nature Conservancy (TNC), pers. comm., 1991).

William Hillebrand considered a plant he collected in Pelekunu Valley in the 1800's to be a new variety of *Lysimachia hillebrandii* (Hillebrand 1888). In 1905, R. Knuth named Hillebrand's specimen *Lysimachia hillebrandii* var. *maxima* (Pax and Knuth 1905). St. John (1987b) elevated the variety to a species, *Lysimachia ternifolia*. Wagner *et al.* (1990) called this taxon *Lysimachia maxima*. An ongoing revision of the genus has determined that *L. ternifolia* is an invalidly published name and concurs

that *L. maxima* is the correct name for this species (Ken Marr, University of British Columbia, *in litt.* 1994).

Lysimachia maxima, a member of the primrose family (Primulaceae), is a sprawling shrub with reddish brown bark. The leaves, borne in groups of three along the stems, are oval with the broadest portion at the tip of the leaves. The leaves are 3.8 to 8 cm (1.5 to 3 in) long and 1.8 to 5 cm (0.7 to 2 in) wide. The upper surface of the leaves has a few scattered hairs when young and the lower surface is sparsely covered with long, soft, rusty hairs when young. The corolla is purplish-yellow, bell-shaped, and about 10 to 12 mm (0.4 to 0.5 in) long. This species is differentiated from others in this genus by the leaves borne in groups of three, the broadest portion of the leaf above the middle, and rusty hairs that disappear with maturity (Wagner *et al.* 1990).

Lysimachia maxima is only known from one population on the rim of Pelekunu Valley near Ohialele, on TNC's Pelekunu Preserve immediately adjacent to State-owned land managed as part of Kalaupapa National Historical Park (HHP 1991a, Hawaii Plant Conservation Center (HPCC) 1991a, Hillebrand 1888, Pax and Knuth 1905, Wagner *et al.* 1990). Approximately 20 to 40 individuals are currently known (L. Mehrhoff, *in litt.* 1994). This species occurs in 'ohi'a-uluhe montane wet forest at an elevation of 975 m (3,200 ft). Associated species include *Psychotria* sp. (kopiko), *Vaccinium* sp. (ohelo), *Hedyotis* sp. (manono), *Dubautia* sp. (na'ena'e), and *Ilex anomala* (kawa'u) (HPCC 1991a; L. Mehrhoff, *in litt.* 1994). The major threats to *Lysimachia maxima* are landslides and the 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 1991a; L. Mehrhoff, *in litt.* 1994). Pigs and goats are known from adjacent areas and pose a potential threat to this species (L. Mehrhoff, *in litt.* 1994).

In 1928, Otto Degener collected a plant on Molokai that E.E. Sherff (1946) later named *Schiedea sarmentosa*. *Schiedea sarmentosa* was included in *Schiedea menziesii* by Wagner *et al.* (1990). Warren Wagner and Stephen Weller, who are preparing a monograph of the genus, now consider *S. sarmentosa* to be a separate species (Warren Wagner, Smithsonian Institution, and Stephen Weller, University of California, Irvine, *in litt.* 1994).

Schiedea sarmentosa, a member of the pink family (Caryophyllaceae), is a many-branched shrub 30 to 45 cm (12

to 18 in) tall. The opposite leaves are slender and threadlike, 1.5 to 4.5 cm (0.6 to 1.8 in) long, and 0.5 to 1.5 mm (0.01 to 0.05 in) wide. The leaves are covered with dense, glandular hairs. There may be as many as 40 to 60 inflorescences on one plant, often with 50 to 100 flowers in each inflorescence. The flowers are female on some plants and bisexual on others. The green sepals are egg-shaped, 2 to 3 mm (0.07 to 0.12 in) long, and somewhat hairy. The staminodes (false stamens) are half as long as the sepals and two-branched at the tip. The fruits are oval capsules. This species differs from others in this endemic Hawaiian genus by its densely bushy habit, leaf width, hairiness, and staminode length (Sherff 1946; S. Weller and W. Wagner, *in litt.*, 1994).

Schiedea sarmentosa has been found in Kawela Gulch, Makolelau, and Onini Gulch (HHP 1991b, 1993b; HPCC 1991b, 1992; Sherff 1946; J. Lau, HHP, *in litt.* 1994). Currently, only two populations are known. One population at the boundary of TNC's Kamakou Preserve in Onini Gulch has approximately 30 individuals (HHP 1993b). The other population occurs on privately owned land in Makolelau, and consists of 4 subpopulations totaling approximately 300 to 400 individuals (Steve Perlman, HPCC, and S. Weller, pers. comms. 1994). Estimates of the total number of individuals have ranged up to 1,000 (J. Lau, HHP, pers. comm. 1994). An accurate count is somewhat difficult because this species is interspersed with *Schiedea lydgatei* (Steve Perlman, HPCC, and S. Weller, pers. comms. 1994). *Schiedea sarmentosa* is typically found on steep slopes in 'ohi'a-*Dodonaea viscosa* ('a'ali'i) lowland dry or mesic shrubland between 610 and 790 m (2,000 and 2,600 ft) elevation (HHP 1991b, 1993b; HPCC 1991b, 1992). Associated species include *Styphelia tameiameiae* (pukiawe), *Chenopodium oahuensis* ('aheahea), *Alyxia oliviformis* (maile), *Pleomele* sp. (hala pepe), and *Chamaesyce* sp. ('akoko) (HHP 1993b; HPCC 1991b, 1992). Major threats to *Schiedea sarmentosa* include feral goats and pigs, the alien plants *Melinis minutiflora* (molasses grass) and *Ricinus communis* (castor bean), and fire. The species is also threatened by a risk of extinction from naturally occurring events due to the low number of populations (J. Lau, *in litt.* 1994; S. Perlman, pers. comm. 1994).

Previous Federal Action

Federal government action on these plants began when the Service published a revised notice of review in the *Federal Register* (55 FR 6183) on February 21, 1990, of native plants

considered for listing under the Act. *Lysimachia maxima* (as *L. ternifolia*) and *Schiedea sarmentosa* (as *S. menziesii*) were included as Category 2 candidate species. Category 2 candidates 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 to support proposed rules. *Lysimachia maxima* (as *L. ternifolia*) and *Schiedea sarmentosa* (as *S. menziesii*) were also included as Category 2 candidates in the September 30, 1993 (58 FR 51144) notice of review. A proposed rule to list *Cyanea dunbarii*, *Lysimachia maxima* and *Schiedea sarmentosa* as endangered was published on October 2, 1995 (60 FR 51436) and the February 28, 1996 (61 FR 7596) notice of review listed all three species as proposed for endangered status.

Based on comments and recommendations received in response to the proposal (see Comments and Recommendations, below), the Service now determines these three plant species to be endangered with publication of this rule.

Summary of Comments and Recommendations

In the October 2, 1995 proposed rule and associated notifications, all interested parties were requested to submit factual reports or information that might contribute to the development of a final listing decision. The public comment period ended on December 1, 1995. Appropriate State agencies, county governments, Federal agencies, scientific organizations, and other interested parties were contacted and requested to comment. Newspaper notices inviting public comment were published in "The Garden Island" on October 19, 1995, the "Maui News" on October 20, 1995, the "Kauai Times" on October 18, 1995, the "Hawaii Tribune-Herald" on October 18, 1995, and the "Honolulu Advertiser" on October 20, 1995.

Comments were received from three parties. All three parties expressed support for the proposed listing. No additional information was offered.

Pursuant to the Service's policy on peer review (59 FR 34270), the expert opinions of three appropriate and independent specialists were also solicited regarding pertinent scientific or commercial data and assumptions relating to the taxonomy, population models, and supportive biological and ecological information for these three species. A response was received from one peer reviewer.

Summary of Factors Affecting the Species

Section 4 of the Endangered Species Act and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal lists. 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 *Cyanea dunbarii* Rock (haha), *Lysimachia maxima* (R. Knuth) St. John (NCN), and *Schiedea sarmentosa* Degener & Sherff (NCN) are as follows:

A. *The present or threatened destruction, modification, or curtailment of their habitat or range.* The habitats of the plants included in this 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 pose serious threats to one of the species in this rule and pose serious potential threats in the event that these introduced animals spread to portions of Molokai where the other species occur (See Table 1.).

When Polynesian immigrants settled in the Hawaiian Islands, they brought water-control and slash-and-burn systems of agriculture and encouraged plants that they introduced to grow in valleys. These land use practices resulted in erosion, changes in the composition of native communities, and a reduction of biodiversity (Cuddihy and Stone 1990, Kirch 1982, Wagner *et al.* 1985). Hawaiians settled and altered many areas of Molokai, including areas in which some of the species in this final rule grew. Many forested slopes were denuded in the mid-1800's to supply firewood to whaling ships, plantations, and island residents. Native plants were undoubtedly affected by these practices. 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 that resulted in many alien trees being introduced in the hope that the watershed could be conserved. Beginning in the 1920's, 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 in altering and degrading vegetation and habitats on Molokai. 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). While only one of the species in this rule is directly threatened by habitat degradation resulting from introduced ungulates, goats, deer, and pigs are known to occur in adjacent areas and pose a serious potential threat if they spread to the areas where the other two species occur.

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 Molokai and four other islands. On Molokai, feral goats degrade dry forests and are now invading the wetter regions along the northern coast of East Molokai (Stone 1985; J. Lau, pers. comm. 1990). Goats are managed in Hawaii as a game animal and goat hunting is allowed year-round or during certain months, depending on the area (Hawaii Department of Land and Natural Resources (DLNR) n.d.-a, n.d.-b, n.d.-c, 1988). Goats browse on introduced grasses and native plants, especially in drier and more open ecosystems. Feral goats 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 (Culliney 1988, Cuddihy and Stone 1990, Scott *et al.* 1986, Tomich 1986, van Riper and van Riper 1982). Although northeastern Molokai is considered one of the most remote and inaccessible places in the main Hawaiian islands, the vegetation

there is predominantly exotic (Culliney 1988). The replacement of native vegetation is attributed to the large number of goats. Due to their agility, goats are able to reach vegetation not usually accessible to other animals (Culliney 1988). Goats are a threat to the larger population of *Schiedea sarmentosa* and a potential threat to the only known population of *Lysimachia maxima*, since they may invade the area where this taxon occurs (L. Mehrhoff, *in litt.* 1994; S. Perlman, pers. comm. 1994).

The pig (*Sus scrofa*) is a species 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 Molokai 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, 1988). While rooting in the ground in search of the invertebrates and plant material to 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 feces (Cuddihy and Stone 1990, Scott *et al.* 1986, Stone 1985, Tomich 1986, Wagner *et al.* 1990). Feral pigs pose an immediate threat to *Schiedea sarmentosa* and a potential threat to *Cyanea dunbarii* and *Lysimachia maxima*. If not controlled, habitat degradation by pigs may become a significant problem to the only known populations of the latter two species (L. Mehrhoff, *in litt.* 1994; S. Perlman, pers. comm. 1994).

Of the ungulates that have become established on Molokai during the past 150 years, the axis deer (*Axis axis*) has probably had the greatest impact on the native vegetation. Eight axis deer, introduced to Molokai in 1868, increased to thousands of animals by the 1960's (Culliney 1988, Graf and Nichols 1966, Tomich 1986). By the turn of the century, these deer had occupied much of the dry to mesic lowland areas and were also found in the wet forests of East Molokai, where herds so damaged the vegetation that professional hunters were hired to control their numbers (Culliney 1988, Graf and Nichols 1966, van Riper and van Riper 1982). The native vegetation has suffered irreparable damage from overgrazing by these animals. Deer

degrade the habitat by trampling, consuming, and overgrazing vegetation, which removes ground cover, exposing the soil to erosional action (J. Lau, pers. comm. 1990). Alien plant species are then able to exploit the newly disturbed areas.

A large portion of the axis deer population on Molokai has been actively managed for recreational hunting by the Hawaii Division of Forestry and Wildlife since 1959. At present, five of the seven managed hunting areas on Molokai are within the Molokai Forest Reserve. Many areas lack maintained boundary fences that would prevent deer from entering more fragile habitats to the north (Cuddihy *et al.* 1982) and non-game areas to the east. Recently, axis deer have begun to enter the windward valleys and northern coastline of East Molokai where they were not previously observed (J. Lau, pers. comm. 1990). Axis deer have been observed in areas south of the only known population of *Cyanea dunbarii*, and pose a potential threat to this species (E. Misaki, pers. comm., 1991).

Although not a direct threat at present to the plant species in this rule, cattle (*Bos taurus*) ranching on Molokai has played a significant role over most of the past 150 years by reducing areas of native vegetation to vast pastures of alien grasses (Cuddihy and Stone 1990, Pekelo 1973, Stone 1985). In 1960, approximately 61 percent of Molokai's land area was devoted to grazing, primarily the lower elevation dry to mesic forests, shrublands, and grasslands of west and central Molokai (Baker 1961). Cattle degraded the habitat by trampling and feeding on vegetation, eventually opening up the ground cover and exposing the soil, increasing its vulnerability to erosion (Cuddihy and Stone 1990, Lindgren 1908, Pekelo 1973). Because of this alteration of vegetation, natural areas became limited to the upper elevation mesic to wet forests of East Molokai, where the State designated a single protected area—the Molokai Forest Reserve. One of the species in this rule is restricted to this forest reserve, which occupies about 30 percent of Molokai's land area (Baker 1961).

Substrate loss due to agriculture, grazing animals (especially goats), hikers, and alteration of vegetation results in habitat degradation and loss. This particularly affects plant populations vulnerable to landslides on cliffs or steep slopes, including all three species in this rule.

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 could seriously impact *Cyanea dunbarii* and *Lysimachia maxima*, both of which are known from single populations with less than 20 individuals each. Collection of whole plants or reproductive parts of these two species could threaten their survival. *Cyanea dunbarii* and *Schiedea sarmentosa* have populations close to trails or roads and are, thus, easily accessible to collectors. The three species are, therefore, potentially threatened by overcollection (HHP 1993a3; HPCC 1991b, 1992; J. Lau, *in litt.* 1994).

C. Disease or Predation. Browsing damage by goats and/or deer is a potential threat to the species in this rule in the event that these ungulates, present in areas adjacent to these species, invade the population sites (Cuddihy *et al.* 1982; J. Lau, *in litt.* 1994; E. Misaki, pers. comm. 1991).

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), which now occurs on all the main Hawaiian Islands around human habitations, in cultivated fields, and in dry to wet 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 their fruit over an extended period of time, and this produces a prolonged food supply that supports rodent populations. Black rats strip bark from some native plants. Rats are known to damage the stems and eat fruit of *Cyanea* species and are therefore a potential threat to *Cyanea dunbarii* (Cuddihy and Stone 1990; Tomich 1986).

D. The inadequacy of existing regulatory mechanisms. The only known population of *Lysimachia maxima* occurs on TNC's Pelekunu Preserve, and the two known populations of *Schiedea sarmentosa* occur on TNC's Kamakou Preserve. The only known population of *Cyanea dunbarii* occurs on State land, within Molokai Forest Reserve. All three of the species are located on land classified within conservation districts. 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. Activities permitted in conservation districts are chosen by considering how

best to make multiple use of the land (Hawaii Revised Statutes (HRS), sect. 205-2). Some uses, such as maintaining animals for hunting, are based on policy decisions, while others, such as preservation of endangered species, are mandated by both Federal and State laws. Requests for amendments to district boundaries or variances within existing classifications can be made by government agencies and private landowners (HRS, sect. 205-4). Before decisions about these requests are made, the impact of the proposed reclassification on "preservation or maintenance of important natural systems or habitats" (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(e), 205-4). However, the species in this rule are not presently protected as endangered species under the State's endangered species provisions, and, despite provisions for conserving endemic resources, individual rare species may be overlooked during consideration of other land use priorities.

Before any proposed change in land use occurs on State land, is funded in part or in whole by county or State funds, or will occur within lands classified as conservation districts, 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 intended to safeguard "the State's unique natural environmental characteristics" (HRS, sect. 344-3(1)). However, despite the existence of such State laws and regulations which give protection to Hawaii's native plants, their enforcement is difficult due to limited funding and personnel.

Listing of these three plant species will invoke the protection available under the State Endangered Species Act and supplement the protection available under other laws. For example, it is a violation of State law to take, possess, or export an endangered plant species (HRS sect. 195D-4(e)). In turn, pursuant to section 9(a)(2) of the Federal ESA, it will be a violation of the Act for any person to remove, cut, dig up, damage, or destroy any such plant(s) in knowing violation of State law or regulation or in the course of any violation of a State criminal trespass law. The lack of adequate resources to enforce State laws and regulations makes this provision particularly important.

In addition, State law contains provisions requiring consideration of endangered plants in certain State or county agency actions that would be triggered by listing under the Federal ESA (See Guidelines to "Protect endangered species of indigenous plants and animals." HRS, sect. 344-4(3)(A)). 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)). With the listing of these three species, 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).

E. *Other natural or manmade factors affecting their continued existence.* Six species of introduced plants directly threaten populations of one or more of the species in this rule. The original native flora of Hawaii consisted of about 1,000 species, 89 percent of which were endemic. Of the total of 1,817 species of native and naturalized Hawaiian flora, 47 percent were introduced from other parts of the world. Nearly 100 of these species have become pests (Smith 1985, Wagner *et al.* 1990). Naturalized, introduced species degrade the Hawaiian landscape and 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).

Rubus rosifolius (thimbleberry), native to Asia, is naturalized in disturbed mesic to wet forest on all of the main Hawaiian Islands (Wagner *et*

al. 1990). This shrub threatens the only known population of *Cyanea dunbarii* (L. Mehrhoff, *in litt.* 1994).

Kalanchoe pinnata (air plant) is an herb that occurs on all the main islands except Niihau and Kahoolawe, especially in dry to mesic areas (Wagner *et al.* 1990). Air plant is a threat to the only known population of *Cyanea dunbarii* (L. Mehrhoff, *in litt.* 1994).

Ricinus communis (castor bean) became naturalized in Hawaii prior to 1819. Castor bean is found on all the main islands of Hawaii in low elevation, dry, disturbed habitats (Wagner *et al.* 1990). Castor bean is a threat to the two populations of *Schiedea sarmentosa* (HPCC 1991b, 1992).

Two species of *Hedychium* (ginger) were introduced to Hawaii in the late 1800's, probably by Chinese immigrants. Both species escaped from cultivation and are found in lowland wet and mesic forests on most of the main Hawaiian islands. These large, vigorous herbs mainly reproduce vegetatively, forming very dense stands that exclude all other growth (Cuddihy and Stone 1990, Wagner *et al.* 1990). *Hedychium* threatens the only known population of *Cyanea dunbarii* (L. Mehrhoff, *in litt.* 1994).

Commelina diffusa (honohono) is an annual herb native to the Old World tropics. It has become widely naturalized and is found in disturbed mesic and wet forests and other disturbed sites on all of the main Hawaiian islands except Niihau and Kahoolawe (Wagner *et al.* 1990). This species is a threat to the only known population of *Cyanea dunbarii* (L. Mehrhoff, *in litt.* 1994).

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, one species threatens the two populations of *Schiedea sarmentosa*. *Melinis minutiflora* (molasses grass), a perennial grass first brought to Hawaii for cattle fodder and then planted for erosion control, is now naturalized in dry to mesic disturbed areas on most of the main Hawaiian Islands. The mats it forms smother other plants, essentially preventing seedling growth and native plant reproduction. As a fuel for fire, molasses grass intensifies the heat and carries the fire into areas with woody plants. Fire is a major threat to native plant species in dry to mesic habitats, especially on the leeward slopes of Molokai, where the largest population of *Schiedea sarmentosa* is located (J. Lau, *in litt.* 1994). The presence of molasses grass greatly enhances the potential and destructiveness of fires. For example, in

1988, a human-caused fire consumed roughly 38 sq km (15 sq mi) of shrubland and forest from the southern coastline of East Molokai to the southwest corner of Kamakou Preserve, about 3.5 mi (5.5 km) inland (E. Misaki, pers. comm. 1991). Molasses grass was the main carrier of that fire (E. Misaki, pers. comm. 1991). Molasses grass is able to spread prolifically after a fire and effectively competes with the few fire-adapted native plant species, creating a dense stand of alien grass where forests once stood. It is becoming a major problem in dry sites along the many leeward ridges of East Molokai (Bottenfield 1958, Cuddihy and Stone 1990, O'Connor 1990, Smith 1985).

The small numbers of populations and individuals of these species 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. Two of the species in this rule, *Cyanea dunbarii* and *Lysimachia maxima*, are known from only a single population. *Schiedea sarmentosa* is known from only two populations. *Cyanea dunbarii* is known from fewer than 20 individuals and *Lysimachia maxima* is known from fewer than 50 individuals.

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 species or populations with limited numbers and/or narrow ranges, including all three species in this rule. This process is often exacerbated by human disturbance and land use practices (See Factor A.).

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 final rule. Based on this evaluation, the preferred action is to list *Cyanea*

dunbarii, *Lysimachia maxima*, and *Schiedea sarmentosa* as endangered. All 3 species either number fewer than 50 individuals in 1 population or are known from only 2 populations. The three species are threatened by one or more of the following—competition from alien plants; potential habitat degradation and/or predation by feral pigs, feral goats, rats, and deer; fire; substrate loss; potential 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 three species are in danger of extinction throughout all or a significant portion of their ranges, they meet the definition of endangered as defined in the Act. Therefore, the determination of endangered status for these three species is warranted. A summary of the threats facing these taxa is presented in Table 1.

TABLE 1.—SUMMARY OF THREATS

Species	Alien mammals				Alien plants	Substrate loss	Human impacts	Fire	Limited numbers*
	Deer	Goats	Pigs	Rats					
<i>Cyanea dunbarii</i>	P	.....	P	P	X	X	P	.....	X1,2
<i>Lysimachia maxima</i> .....	.....	P	P	.....	.....	X	P	.....	X1,2
<i>Schiedea sarmentosa</i> .....	.....	X	X	.....	X	P	P	X	X1

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 100 individuals.

Critical habitat is not being proposed for the three species included in this rule, for reasons discussed in the "Critical Habitat" section of this rule.

Critical Habitat

Critical habitat is defined in section 3 of the Act as: (i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations 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 same time the species is listed. The Service finds that designation of critical habitat is not prudent for *Cyanea dunbarii*, *Lysimachia maxima*, and *Schiedea sarmentosa* at this time. 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 a designation of critical habitat would not be beneficial to the species. The three species have very low total populations and face anthropogenic threats (see Factor B). The publication of precise maps and

descriptions of critical habitat in the Federal Register would make these plants more vulnerable to incidents of collection and vandalism and, therefore, could contribute to the decline of these species and increase enforcement problems. The listing of these species as endangered also publicizes the rarity of these plants and, thus, can make these plants attractive to researchers, curiosity seekers, or collectors of rare plants.

The additional protection provided by the designation of critical habitat to a species is granted through section 7 of the Act. Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Section 7(a)(2) requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or

destroy or adversely modify its critical habitat. The three species in this rule are confined to small geographic areas, and each population is composed of so few individuals that the determinations for jeopardy to the species and adverse modification of critical habitat would be similar. Therefore, designation of critical habitat provides no benefits beyond those that these species would receive by virtue of their listing as endangered species, and would likely increase the risk of threat from collecting or other human activities.

All involved parties and the major landowners have been notified of the location of these species. Protection of the habitats of these species will be addressed through the recovery process and through the section 7 consultation process.

Available Conservation Measures

Conservation measures provided to plant species listed as endangered under the Endangered Species 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 protection required of Federal agencies and the prohibitions against certain activities involving listed plants are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a proposed 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 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 three species in this rule occurs on Federal lands and no known Federal

activities occur within the present known habitat of these three plant species. The Service has not pursued prelisting conservation agreements for the three plant species due to time and resource constraints.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered plant species. All 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, transport such species in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale such species in interstate or foreign commerce, or remove and reduce such species to possession from areas under Federal jurisdiction. In addition, for plants listed as endangered, the Act prohibits the malicious damaging or destruction on areas under Federal jurisdiction and the removal, cutting, digging up, damaging, or destroying of any such plants in knowing violation of any State law or regulation, including State criminal trespass law. Certain exceptions to the prohibitions apply to agents of the Service and State conservation agencies.

The Act and 50 CFR 17.62 and 17.63 also provide for the issuance of permits to carry out otherwise prohibited activities involving endangered plant species under certain circumstances. Such permits are available for scientific purposes and to enhance the propagation or survival of the species. It is anticipated that few permits would ever be sought or issued because the species in this rule are not common in cultivation or in the wild.

It is the policy of the Service (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 likely 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. The only known population of *Cyanea dunbarii* is found on a steep slope on State-owned land. The only known population of *Lysimachia maxima* and one population of *Schiedea sarmentosa* are found on steep slopes on land owned by TNC. The other population of *Schiedea sarmentosa* is found on steep slopes on privately owned land. Collection, damage, or destruction of these species on non-Federal lands would constitute a violation of section 9, if conducted in knowing violation of Hawaii State law or regulations, or in violation of State

criminal trespass law. The Service is not aware of any trade in these species or of any activities currently being conducted by the public that would be affected by this listing or result in violation of section 9 of the Act.

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 regarding 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: 503/231-2063; 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 * * *" (HRS, sect. 195D-4(a).) This Federal listing will automatically invoke listing under Hawaii State law. The State law prohibits taking of endangered species and encourages conservation by State agencies (HRS, sect. 195D-4, 195D-5).

National Environmental Policy Act

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

Required Determinations

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

References Cited

A complete list of all references cited herein is available upon request from

the Pacific Islands Ecoregion Office (see ADDRESSES section).

Author

The author of this final rule is Marie M. Brueggmann, Pacific Islands Ecoregion Office (see ADDRESSES section). Substantial data were contributed by HHP and Steve Perlman and Ken Wood of HPCC.

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 name	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
FLOWERING PLANTS							
* <i>Cyanea dunbarii</i>	* Haha	* U.S.A. (HI)	* Campanulaceae ...	E	* 594	NA	* NA
* <i>Lysimachia maxima</i>	* No common name	* U.S.A. (HI)	* Primulaceae	E	* 594	NA	* NA
* <i>Schiedea sarmentosa</i>	* No common name	* U.S.A. (HI)	* Caryophyllaceae ...	E	* 594	NA	* NA
*	*	*	*		*		*

Dated: September 23, 1996.
John G. Rogers,
Acting Director, Fish and Wildlife Service.
[FR Doc. 96–25554 Filed 10–9–96; 8:45 am]
BILLING CODE 4310–55–P

50 CFR Part 17

RIN 1018–AD25

Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Thirteen Plants From the Island of Hawaii, State of 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 13 plants: *Clermontia drepanomorpha* ('oha wai), *Cyanea platyphylla* (haha), *Hibiscadelphus giffardianus* (hau kuahiwi), *Hibiscadelphus hualalaiensis* (hau kuahiwi), *Melicope zahlbruckneri* (alani), *Neraudia ovata* (no common name (NCN)), *Phyllostegia racemosa* (kiponapona), *Phyllostegia velutina* (NCN), *Phyllostegia warshaueri* (NCN), *Pleomele hawaiiensis* (hala pepe), *Pritchardia schattaueri* (loulu), *Sicyos alba* ('anunu), and *Zanthoxylum*

dipetalum var. *tomentosum* (a'e). All 13 taxa are endemic to the island of Hawaii, Hawaiian Islands. The 13 plant taxa and their habitats have been threatened by one or more of the following—competition for space, light, water, and nutrients by naturalized, introduced vegetation; habitat degradation by wild, feral, or domestic animals (cattle, pigs, goats, and sheep); agricultural and residential development and recreational activities; habitat loss and damage to plants from fires; predation by animals (cattle, pigs, goats, sheep, insects, and rats); and natural disasters such as volcanic activity. Due to the small number of existing individuals and their very narrow distributions, these 13 taxa and their populations are subject to an increased likelihood of extinction and/or reduced reproductive vigor from natural disasters. This final rule implements the Federal protection provisions provided by the Act for listed plants. Listing under the Act also triggers listed status for these 13 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 Pacific Islands Ecoregion, U.S. Fish and Wildlife Service, 300 Ala Moana Boulevard, Room 3108, Box 50088, Honolulu, Hawaii 96850.

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

SUPPLEMENTARY INFORMATION:

Background

Clermontia drepanomorpha ('oha wai), *Cyanea platyphylla* (haha), *Hibiscadelphus giffardianus* (hau kuahiwi), *Hibiscadelphus hualalaiensis* (hau kuahiwi), *Melicope zahlbruckneri* (alani), *Neraudia ovata* (no common name (NCN)), *Phyllostegia racemosa* (kiponapona), *Phyllostegia velutina* (NCN), *Phyllostegia warshaueri* (NCN), *Pleomele hawaiiensis* (hala pepe), *Pritchardia schattaueri* (loulu), *Sicyos alba* ('anunu), and *Zanthoxylum dipetalum* var. *tomentosum* (a'e) all are endemic to the island of Hawaii, Hawaiian Islands.

The island of Hawaii is the southernmost, easternmost, and youngest of the eight major Hawaiian Islands. Hawaii, the largest island of the Hawaiian archipelago comprises 10,458 square kilometers (sq km) (4,038 sq miles (mi)), or two-thirds of the land area of the State of Hawaii, giving rise to its common name, the "Big Island." The Hawaiian Islands are volcanic islands formed over a "hot spot," a fixed area of pressurized molten rock deep within the Earth. As the Pacific Plate, a