
DEPARTMENT OF THE INTERIOR**Fish and Wildlife Service****50 CFR Part 17****RIN 1018 AB52****Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for Six Plants From the Kokee Region, Island of Kauai, Hawaii****AGENCY:** Fish and Wildlife Service, Interior.**ACTION:** Proposed rule.

SUMMARY: The U.S. Fish and Wildlife Service (Service) proposes endangered status pursuant to the Endangered Species Act of 1973, as amended (Act), for six plants: *Chamaesyce halemanui* (no common name (NCN)), *Dubautia latifolia* (NCN), *Poa sandwicensis* (Hawaiian bluegrass), *Poa siphonoglossa* (NCN), *Stenogyne campanulata* (NCN), and *Xylosma crenatum* (NCN). These species are known only from the Kokee region of Kauai Island, Hawaii. The six species have been variously affected and are threatened by one or more of the following: Habitat degradation by feral animals; competition for space, light, nutrients, and/or water from alien plant species; road or trail maintenance activities; and an increased potential for extinction from stochastic events because of the small numbers of extant individuals and their restricted distributions. A limited gene pool may result in depressed reproductive vigor. Probable threats include predation by feral animals. A determination that these six species are endangered would implement the Federal protection and recovery provisions provided by the Act. Comments and materials related to this proposal are solicited.

DATES: Comments from all interested parties must be received by November 27, 1990. Public hearing requests must be received by November 13, 1990.

ADDRESSES: Comments and materials concerning this proposal should be sent to Ernest F. Kosaka, Field Station Supervisor, U.S. Fish and Wildlife Service, 300 Ala Moana Boulevard, room 6307, P.O. Box 50167, Honolulu, Hawaii

96850. Comments and materials received will be available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Joan E. Canfield, at the above address (808/541-2749 or FTS-551-2749).

SUPPLEMENTARY INFORMATION:**Background**

The island of Kauai is 627 square miles (mi) (1,624 square kilometers (km)) in area (Armstrong 1983). The island was formed about six million years ago by a single shield volcano, whose caldera was 9 to 12 mi (15 to 20 km) in diameter, the largest caldera in the Hawaiian Islands (Macdonald *et al.* 1983). The remains of this caldera now extend about 10 mi (16 km) in length, forming the Alakai Swamp, an extremely wet, elevated tableland. Faulting and erosion on the western side of the Alakai Swamp have carved the deeply dissected Waimea Canyon, 10 mi (16 km) long and 1 mi (1.6 km) wide, its near-vertical cliffs well over 2,000 feet (ft) (600 meters (m)) high. The distribution of the six species in this proposed rule centers at Kokee, which lies just above the northern reaches of Waimea Canyon, with the wet Alakai Swamp to the east, steep cliffs of the Na Pali coast to the north, and drier leeward ridges to the west. Kokee is not a strictly defined area; in this document, "Kokee" refers to the boundary of Kokee State Park, roughly 8 square mi (20 square km) in area. To most conveniently delimit the greater part of the range of these species, "Kokee region" used here refers to the uplands (above 3,500 ft (1,070 m)) surrounding upper Waimea Canyon: On the west side of Waimea Canyon from Kauhao Valley northeast to the rim of Kalalau Valley, and south to Kohua Ridge on the canyon's east side, an area of about 15 square mi (40 square km).

The historical range of the six species in this proposed rule included leeward slopes on the west side of Waimea Canyon as far south as Lapa Ridge, north to the rim of Kalalau Valley, and on the east side of Waimea Canyon as far south as Olokele Canyon. That area is approximately 9 by 7 mi (14 by 11 km) in size, with plant localities ranging from 2,200 to 3,900 ft (670 to 1,190 m) in elevation. The currently known range of these species differs primarily from the historical range only on the east side of Waimea Canyon, where Kohua Ridge is now the southernmost locality. The present range is circumscribed by an area 5 by 6 mi (8 by 10 km), from 2,500 to 3,900 ft (760 to 1,190 m) in elevation,

although most localities are above 3,500 ft (1,070 m). Hence, the range of these species may have been reduced by almost 50 percent.

In the Kokee region, the annual rainfall ranges from about 45 to 80 inches (in) (115 to 200 centimeters (cm)), with a sharp orographic gradient increasing to the east. The average annual temperature is about 62° F (17° C) (Armstrong 1983). These six species are primarily found on well-drained, gently sloping to very steep, silty clay loam (Foote *et al.* 1972). The vegetation of the Kokee region is primarily mesic to wet forests dominated by 'ohi'a (*Metrosideros polymorpha*) and koa (*Acacia koa*). Because of the island's age, abrupt topography, and sharp climatic gradient, the native flora of the Kokee region is quite diverse, with a high proportion of locally endemic species.

Discussion of the Six Species Proposed for Listing

Chamaesyce halemanui was first collected in 1840 on Kauai by the U.S. South Pacific Exploring Expedition (Degener and Degener 1959b). In 1936 Edward Sherff named that specimen *Euphorbia remyi* var. *wilkesii*, and also named specimens from one collection from the Halemanu drainage both *E. halemanui* and *E. remyi* var. *leptopoda* (Koutnik 1987). Otto and Isa Degener and L. Croizat (Degener and Croizat 1936, Degener and Degener 1959a, 1959b) transferred all of those names to the genus *Chamaesyce*. In 1987, Daryl Koutnik reduced the two varieties listed above, and *E. remyi* var. *molesata* (Sherff 1938), to synonymy under *Chamaesyce halemanui*.

All collections and confirmed sightings of this species are from seven areas: Kauhao and Makaha valleys in Na Pali-Kona Forest Reserve; Mahanaloa Valley in Kuia Natural Area Reserve; the Halemanu drainage and near Waipoo Falls and Kokee Ranger Station in Kokee State Park; and Olokele Canyon on privately owned land (Hawaii Heritage Program (HHP) 1990a through 1990f). *Chamaesyce halemanui* is known to be extant at the Kauhao, Makaha, and Halemanu sites, all on State-owned land (HHP 1990c, 1990f; Timothy Flynn, Assistant Botanist, National Tropical Botanical Garden, Lawai, Kauai, pers. comm., 1990).

Chamaesyce halemanui is a scandent (climbing) shrub in the spurge family (Euphorbiaceae) with stems 3 to 13 ft (1 to 4 m) long. The egg-shaped to inversely lance-shaped leaves are decussate (successive pairs of leaves at right angles to the previous pair). The leaves

are 1.8 to 5 in (4 to 13 cm) long and 0.4 to 1.8 in (1 to 4.5 cm) wide, with persistent stipules (leaf-like appendages on leaves). Groups of flowers (cyathia) are in dense, compact, nearly spherical clusters or occasionally solitary in leaf axils. The stems of cyathia are about 0.08 in (2 millimeters (mm)) long, or if solitary, about 0.2 in (5 mm) long. The fruits are in green capsules, about 0.1 in (3 mm) long, on recurved stalks, enclosing gray to brown seeds. *Chamaesyce halemanui* is distinguished from closely related species by its decussate leaves, persistent stipules, more compact flower clusters, shorter stems on cyathia and smaller capsules (Koutnik 1987, Koutnik and Huft 1990).

Chamaesyce halemanui typically grows on the steep slopes of gulches in mesic koa forests at an elevation of 2,160 to 3,600 ft (660 to 1,100 m) (HHP 1990a, 1990e). Associated native species include 'ohi'a *Alphitonia ponderosa* (kauila), *Antidesma Platyphyllum* (hame), *Coprosma* (pilo), *Diospyros* (lama), *Doconaea viscosa* ('a'li'i), *Elaeocarpus bifidus* (kalia), *Pisonia* (papala kepau), *Santalum freycinetianum* ('iliahi), and *Styphelia tameiameia* (pukiawe) (HHP 1990a, 1990c, 1990e, 1990f; T. Flynn, pers. comm., 1990). Associated alien species include *Aleurites moluccana* (kukui), *Lantana camara* (lantana), *Psidium cattleianum* (strawberry guava), *Rubus argutus* (blackberry), and *Stenotaphrum secundatum* (St. Augustine grass) (HHP 1990e, 1990f; T. Flynn, pers. comm., 1990).

The greatest immediate threat to the survival of *Chamaesyce halemanui* is competition for space and light from alien plants: St. Augustine grass, lantana, and strawberry guava (T. Flynn, pers. comm., 1990; Joel Lau, Assistant Botanist, HHP, pers. comm., 1990). Habitat degradation by feral pigs (*Sus scrofa*) (digging activity which destroys plants and leads to soil erosion and the invasion of alien plants) threatens the Kauhao and Makaha populations of this species (J. Lau, pers. comm., 1990). The 3 known populations, which extend over a distance of about 2 mi (3 km), contain fewer than 25 individuals (HHP 1990c, 1990f; T. Flynn, pers. comm., 1990). With such a small population size and restricted distribution, *C. halemanui* faces an increased potential for extinction resulting from stochastic events. This species' limited gene pool also constitutes a serious potential threat because of the possibility of depressed reproductive vigor.

Dubautia latifolia was first collected in the mountains of Kauai by the U.S. Exploring Expedition in 1840 (Carr 1982).

Twenty-one years later, Asa Gray (1861) described that specimen as *Raillardia latifolia* (an orthographic error for *Raillardia latifolia*, as Sherff pointed out in 1935), in reference to its broad leaves. In 1936, David Keck transferred the name to the genus *Dubautia*. Sherff published the name *Raillardia latifolia* var. *helleri* in 1952, which Gerald Carr (1985) considered only a phenological variant not worthy of taxonomic recognition. All collections and confirmed sightings of this species are from six areas: Makaha and Awaawapuhi valleys in Na Pali-Kona Forest Reserve, Nualolo Trail and Valley in Kuia Natural Area Reserve, Halemanu in Kokee State Park, along Mohihi Road in both Kokee State Park and Na Pali-Kona Forest Reserve, along the Mohihi-Wai'alae Trail on Mohihi and Kohua ridges in both Na Pali-Kona Forest Reserve and Alakai Wilderness Preserve, and Kaholuamanu on privately owned land (Carr 1982; HHP 1990b through 1990m; T. Flynn, pers. comm., 1990). *Dubautia latifolia* is known to be extant at all but the Halemanu and Kaholuamanu sites (T. Flynn and J. Lau, pers. comm., 1990; Steven Perlman, Plant Collector, Hawaii Plant Conservation Center, Lawai, Kauai, pers. comm., 1990). The species is now known only from State-owned land.

Dubautia latifolia is a diffusely branched, woody vine in the aster family (Asteraceae) with stems up to 26 ft (8 m) long and occasionally up to 3 in (7 cm) in diameter near the base. The paired, egg- to oval-shaped leaves are 3 to 7 in (8 to 17 cm) long and 1 to 3 in (2.5 to 7 cm) wide. The leaves are conspicuously net-veined, with the smaller veins outlining nearly square areas. The distinct petioles (leaf stems) are usually about 0.2 in (5 mm) long. The flower clusters comprise a large aggregation of very small, yellow-flowered heads. The fruits are dry seeds, usually about 0.2 in (5 mm) long. *Dubautia latifolia* is distinguished from closely related species by its vining habit, distinct petioles, and broad leaves with conspicuous net veins outlining squarish areas (Carr 1982, 1985, 1990).

Dubautia latifolia typically grows on gentle to steep slopes on well-drained soil in semi-open, diverse montane mesic forest dominated by koa with 'ohi'a, at an elevation of 3,200 to 3,900 ft (975 to 1,200 m) (Carr 1982, 1990; HHP 1988; Perlman 1990a). Less often, this species is found in either closed forest, conifer plantations, or 'ohi'a-dominated forest, and as low as 2,800 ft (850 m) in elevation (HHP 1988, 1990j, 1990k; Perlman 1990a). The most common associated native species are kauila.

Athyrium sandwicensis, *Bobea* ('ahakea), *Coprosma waimeae* ('olena), *Dicranopteris linearis* (uluhe), *Hedyotis terminalis* (manono), *Ilex anomala* (aiea), *Melicope anisata* (mokihana), *Psychotria maritima* (kopiko), and *Scaevola* (naupaka kuahiwi) (Carr 1982; HHP 1990g, 1990h, 1990j through 1990m). Associated alien species include blackberry, strawberry guava, *Acacia mearnsii* (black wattle), *Acacia melanoxylon* (Australian blackwood), *Hedychium* (ginger), *Lonicera japonica* (honeysuckle), *Myrica faya* (firetree), and *Passiflora mollissima* (banana poka) (Carr 1982; HHP 1990g, 1990j; T. Flynn, pers. comm., 1990).

The greatest immediate threat to the survival of *Dubautia latifolia* is competition from alien plants. Banana poka, a vine now invading four of *D. latifolia*'s six diffuse populations, is the most serious threat (Carr 1982, 1985). Blackberry, honeysuckle, black wattle, Australian blackwood, ginger, and strawberry guava are other alien species that dominate the habitat of and/or threaten *D. latifolia* (HHP 1990g, 1990h, 1990k, 1990m; Perlman 1990a; T. Flynn, pers. comm., 1990). Habitat degradation by feral pigs currently threatens four populations of *D. latifolia* (HHP 1990m; T. Flynn and J. Lau, pers. comms., 1990). Black-tailed deer (*Odocoileus hemionus columbianus*) threaten two populations through trampling that destroys plants, and disturbs the ground leading to soil erosion or favoring the invasion of alien plants; predation by deer is also a probable threat (HHP 1989; Perlman 1990a; S. Perlman, pers. comm., 1990). Vehicle traffic and road maintenance constitute a potential threat to several *D. latifolia* individuals that overhang a State park road. This species suffers from a seasonal dieback that could be a potential threat (Gerald Carr, Professor of Botany, University of Hawaii, pers. comm., 1990).

Since at least some individuals of *D. latifolia* require cross-pollination, the wide spacing of individual plants (e.g., each 0.3 mi (0.5 km) apart) may pose a threat to the reproductive potential of the species (Carr 1982). The very low seed set noted in plants in the wild indicates a reproductive problem, possibly flowering asynchrony (G. Carr, pers. comm., 1990). Seedling establishment is rather rare in the wild (Carr 1982), presumably due to limited reproduction. The estimated 40 individuals of *D. latifolia* known to be extant are spread over a total distance of about 6.5 by 2.5 mi (10.5 by 4 km) (Carr 1982; HHP 1990h, 1990j through 1990m; S. Perlman, pers. comm., 1990), comprising a limited gene pool that

constitutes a potential threat to the species.

Probably the earliest collection of *Poa sandwicensis* was that of Horace Mann and William Brigham from "above Waimea" in 1864 or 1865 (Hillebrand 1888). This species was first described as *Festuca sandwicensis* by H.W. Reichardt in 1878, based on collections from Halemanu. Ten years later, William Hillebrand (1888) described Mann and Brigham's specimen, along with other material, as *Poa longeradiata*. In 1922, Albert Hitchcock combined these and additional collections under the name *Poa sandwicensis*.

All collections and confirmed sightings of this species are from six areas: The rim of Kalalau Valley in Na Pali Coast State Park; Halemanu and Kumuwela Ridge/Kauaikinana drainage in Kokee State Park; Awaawapuhi Trail in Na Pali-Kona Forest Reserve; Kohua Ridge/Mohihi drainage in both the Forest Reserve and Alakai Wilderness Preserve; and Kaholuamanu on privately owned land (HHP 1990n, 1990p, 1990q; Hitchcock 1922; Perlman 1990b; T. Flynn, pers. comm., 1990). *Poa sandwicensis* is known to be extant at the Kalalau, Awaawapuhi, Kumuwela/Kauaikinana, and Kohua/Mohihi localities; it is therefore currently known only from State-owned land. Hillebrand's (1888) questionable reference to a Maui locality is most likely an error.

Poa sandwicensis is a perennial grass (family Poaceae) with densely tufted, mostly erect culms (stems) 1 to 3.3 ft (0.3 to 1m) tall. The short rhizomes (underground stems) from a hardened base for the solid, slightly flattened culms. The leaf sheaths are closed and fused, but may split with age. The toothed ligule (appendage where leaf sheath and blade meet completely surrounds the culm and has a hard tooth extending upward from the mouth of the sheath. The leaf blades are 4 to 8 in (10 to 20 cm) long, and up to 0.2 in (6 mm) wide. The flowers occur in complex clusters with lower panicle (primary) branches up to 4 in (10 cm) long. The lemmas (inner bracts) have only a sparse basal tuft of cobwebby hairs. The fruits are golden brown to reddish brown, oval grains. *Poa sandwicensis* is distinguished from closely related species by its shorter rhizomes, shorter culms which do not become rush-like with age, closed and fused sheaths, relatively even-edged ligules, and longer panicle branches (O'Conner 1990).

Poa sandwicensis grows on wet, shaded, gentle to usually steep slopes, ridges, and rock ledges in semi-open to closed, mesic to wet, diverse montane

forest dominated by 'ohi'a, at an elevation of 3,400 to 4,100 ft (1,035 to 1,250 m) (HHP 1990n through 1990q; Perlman 1990b). Associated native species include koa, kopiko, manono, naupaka kuahiwi, pilo, *Cheirodendron* ('olapa), and *Syzygium sandwicensis* ('ohi'a ha) (HHP 1990n, 1990p, 1990q; Perlman 1990b; T. Flynn, pers. comm., 1990). Associated alien species include blackberry, banana poka, ginger, and *Erigeron karvinskianus* (daisy fleabane) (HHP 1990p; T. Flynn, pers. comm., 1990).

The greatest immediate threat to the survival of *Poa sandwicensis* is competition from alien plants. Daisy fleabane is the primary alien plant threat to the Kalalau population of *P. sandwicensis* (T. Flynn, pers. comm., 1990). Blackberry threatens the Awaawapuhi, Kalalau, and Kohua Ridge populations (HHP 1990q; T. Flynn, pers. comm., 1990). Banana poka and ginger also threaten the Awaawapuhi population (HHP 1990p). Erosion caused by pigs currently threatens the Kohua Ridge population, and both pigs and goats (*Capra hircus*) (which trample plants, cause erosion, and promote the invasion of alien plants) threaten the Kalalau population (HHP 1990m; T. Flynn and J. Lau, pers. comms., 1990). State forest reserve trail maintenance threatens the trailside Awaawapuhi population (HHP 1990p). While about 40 individuals of *P. sandwicensis* are known from 4 populations spread over a distance of about 5 by 2 mi (8 by 3 km), 80 percent of the plants are concentrated at 1 major site (HHP 1990n, 1990q; T. Flynn, pers. comm., 1990). This species is therefore subject to an increased potential for extinction resulting from stochastic events, because a single event could extirpate 80 percent of the known individuals. The small population size with its limited gene pool also constitutes a serious potential threat.

Poa siphonoglossa was first collected in 1910 by Abbe Urbain Faurie, and was described two years later by E. Hackel (1912). According to Hitchcock (1922), one of the two specimens on which Hackel based his description was actually *Poa mannii*. While the localities for Faurie's two specimens are confused, the specimen that Hitchcock designated as the type was most likely collected at an elevation of about 3,000 ft (1,000 m) above Waimea town, possibly near Kaholuamanu (Hitchcock 1922).

All collections and confirmed sightings of *Poa siphonoglossa* are from two sites: Kohua Ridge in Na Pali-Kona Forest Reserve, and near Kaholuamanu on privately owned land (HHP 1990r).

Poa siphonoglossa is only known to be extant on Kohua Ridge, on State-owned land.

An additional *Poa* specimen sharing characteristics of both *P. siphonoglossa* and *P. mannii* was collected in 1988 by David Lorence from Kaulaula Valley in Puu Ka Pele Forest Reserve (David Lorence, Systematic Botanist, National Tropical Botanical Garden, Lawai, Kauai, pers. comm., 1990). Lorence and other local botanical authorities believe that the two species are conspecific, representing different growth stages. Even if the two names are combined, the plant remains extremely rare, since *Poa mannii* has not been collected since 1916 (O'Conner 1990). O'Conner (1990) treats *P. siphonoglossa* and *P. mannii* as distinct species.

Poa siphonoglossa differs from *P. sandwicensis* principally by its longer culms and shorter panicle branches. *Poa siphonoglossa* has extensive tufted and flattened culms that cascade from banks in masses up to 13 ft (4 m) long. The naked, rushlike older culms have bladeless sheaths; the sheaths do not split with age. The ligule has no hard tooth. The flat, loosely packed leaf blades are usually less than 4 in (10 cm) long and 0.1 in (2 mm) wide. The primary panicle branches are about 0.1 in (3 cm) long. The lemmas lack cobwebby hairs. The fruits are reddish brown and oval. *P. siphonoglossa* is distinguished from *P. mannii* and other closely related species by its shorter rhizomes, longer culms, closed and fused sheaths, and toothed ligules (O'Conner 1990).

Poa siphonoglossa typically grows on shady banks near ridge crests in predominantly native mesic 'ohi'a forest between about 3,300 and 3,900 ft (1,000 to 1,200 m) in elevation (HHP 1990; Hitchcock 1922). Associated species include the natives a'ali'i, manono, *Melicope* (alani), and *Vaccinium* (ohelo), and the alien blackberry (HHP 1990r). The population from Kaulaula Valley, whose characteristics are similar to both *P. siphonoglossa* and *P. mannii*, grows on a steep, shady slope in Koa Forest with occasional 'ohi'a at an elevation of 2,900 ft (890 m) (D. Lorence, pers. comm., 1990). Associated species include pukisawe, *Carex meyenii*, *Carex wahuensis*, and *Wilkesia gymnoxiphium* (iliao) (T. Flynn, pers. comm., 1990).

The primary threat to the survival of *Poa siphonoglossa* is habitat degradation by pigs and deer. The Kohua Ridge population of this species may be at risk due to erosion caused by pigs (J. Lau, pers. comm., 1990), and the presence of both pigs and deer may threaten the Kaulaula population (T.

Flynn, pers. comm., 1990). Predation by deer is also a potential threat there. The alien blackberry invading Kohua Ridge constitutes a probable threat to that population (HHP 1990r). *Poa siphonoglossa* (including the Kaulaula population) numbers fewer than 30 known individuals located at 2 populations about 6 mi (10 km) apart (HHP 1990r; T. Flynn, pers. comm., 1990). A limited gene pool and potential for one disturbance event to destroy the majority of known individuals are serious threats to this species.

Stenogyne campanulata was discovered in 1986 by Steven Montgomery on sheer, virtually inaccessible cliffs below the upper rim of Kalalau Valley on Kauai. The species is known only from that single population. In 1989, Stephen Weller and Ann Sakai described the plant as a new species, naming it for the flowers' bell-shaped calyces. *Stenogyne campanulata* was last seen in 1987 and presumably still exists (T. Flynn, pers. comm., 1990). Known only from State-owned land, *S. campanulata* is restricted to Na Pali Coast State Park.

Stenogyne campanulata is a member of the mint family (Lamiaceae), described as a vine with four-angled, hairy stems. The hairy leaves are broadly oval, about 2 in (5 cm) long and 1 in (3 cm) wide. The flowers occur in clusters of about 6 per leaf axil. The very broadly bell-shaped, hairy calyces are about 0.5 in (13 mm) long, with teeth that are 0.1 in (3 mm) long and 0.2 in (5 mm) wide at the base. The petals are fused into a straight, hairy, white tube about 0.5 in (13 mm) long, with short purple lobes. The fruits of this species have not been seen, but all other members of the genus have fleshy nutlets. *Stenogyne campanulata* is distinguished from closely related species by its large and very broadly bell-shaped calyces that nearly enclose the relatively small, straight corollas, and by small calyx teeth that are half as long as wide (Weller and Sakai 1990).

Stenogyne campanulata grows on the rock face of a nearly vertical, north-facing cliff at an elevation of about 3,700 ft (1,130 m) (Weller and Sakai 1990; T. Flynn, pers. comm., 1990). The associated shrubby vegetation includes the native species *Artemisia australis* ('ahinahina), *Lepidium serra* ('anaunau), *Lysimachia glutinosa*, *Perrottetia sandwicensis* (olomea), and *Remya montgomeryi*, and alien blackberry and daisy fleabane (T. Flynn, pers. comm., 1990).

Habitat degradation by feral goats is the primary threat to the survival of *Stenogyne campanulata* (T. Flynn, pers. comm., 1990). The restriction of this

species to virtually inaccessible cliffs suggests that predation by goats may have eliminated it from more accessible locations. Such predation remains a potential threat because goats may limit seedling establishment in more accessible areas and if they reached existing plants losses would occur. (T. Flynn, pers. comm., 1990). Feral pigs have disturbed vegetation in the vicinity of the only known population (T. Flynn, pers. comm., 1990). Erosion caused by goats or pigs exacerbates the potential threat of landslides to this population (T. Flynn, pers. comm., 1990). Daisy fleabane is the primary alien plant threatening *Stenogyne campanulata* (T. Flynn, pers. comm., 1990). *Stenogyne campanulata* is estimated to number 50 plants at the very most, all of which are concentrated at a single site. (T. Flynn, pers. comm., 1990). The small size of the single known population and its restricted distribution (probably well under 500 square ft (45 square m) in area) are serious potential threats to the species. The limited gene pool may depress reproductive vigor, or a single environmental disturbance such as a landslide could destroy all known extant individuals.

Xylosma crenatum was first collected in 1917 by Charles Forbes on the west side of the Waimea drainage basin. However, the collection was misidentified as *Hibiscus waimeae* (HHP 1990s). Over 50 years later (in 1968), Robert Hobdy made the second collection of this plant, along the banks of Mohihi Stream at the edge of the Alakai Swamp. Finally in 1972, Harold St. John recognized the plant as a distinct species, and named it *Antidesma crenatum*, after the rounded teeth along the leaf edges (St. John 1972). In 1978, St. John transferred the name to the genus *Xylosma*.

All collections subsequent to 1968 and confirmed sightings of *Xylosma crenatum* are from two sites: Along upper Nualolo Trail in Kuia Natural Area Reserve and along Mohihi Road between Waiakoali and Mohihi drainages in Na Pali-Kona Forest Reserve (HHP 1990s, 1990t, T. Flynn, pers. comm., 1990; Robert Hobdy, Forester, State Division of Forestry and Wildlife, Maui District, pers. comm., 1990). *Xylosma crenatum* is apparently extant only at the latter site (HHP 1990u; R. Hobdy, pers. comm., 1990). This species is found only on State-owned land.

Xylosma crenatum is a dioecious (unisexual) tree in the flacourtiaceae family (Flacourtiaceae), growing up to 46 feet (14 m) tall, and with dark gray bark. The somewhat leathery leaves are oval to

elliptic-oval, about 4 to 8 in (10 to 20 cm) long and 2.5 to 4 in (6.5 to 10 cm) wide, with coarsely toothed edges and moderately hairy undersides. The female flowers (male flowers have not been described) occur in clusters of 3 to 11 per leaf axil. The four oval sepals are about 0.1 in (2.5 mm) long; petals are absent. The young berries are oval to elliptic-oval and about 0.3 in (7 mm) long (mature fruits have not been seen). *Xylosma crenatum* is distinguished from the other Hawaiian member of this genus by its more coarsely toothed leaf edges and the hairy undersides of its leaves (St. John 1972, Wagner *et al.* 1990).

Xylosma crenatum is known from diverse koa/ohi'a montane mesic forest at an elevation of about 3,200 to 3,500 ft (975 to 1,065 m), sometimes along stream banks or within a planted conifer grove (HHP 1990t; St. John 1972; R. Hobdy, pers. comm., 1990). Associated species include the native manono and *Athyrium sandwicensis* and alien strawberry guava (HHP 1990t).

The three historical populations of *Xylosma crenatum* have apparently been reduced to one male individual (J. Lau, pers. comm., 1990), and as would be expected no regeneration is evident at the site (HHP 1990u). Because no surveys for this species have been conducted in its rather inaccessible habitat, it is hoped that additional research will reveal the presence of more individuals, including some female individuals. In any case, the total size of the population is probably very limited. Furthermore, a single man-caused or natural environmental disturbance (such as continued bulldozing during maintenance activities along the adjacent State forest reserve road) could easily destroy the only known individual of the species (J. Lau, pers. comm., 1990). *Xylosma crenatum* is also threatened by competition from alien plants, particularly strawberry guava, as well as the conifers dominating the only known site (HHP 1990t). In addition, feral pigs may threaten this species (T. Flynn, pers. comm., 1990).

Previous Federal Action

Federal action on these plant species 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, *Chamaesyce halemanui* (as *Euphorbia halemanui*), *Dubautia latifolia* (as *D. latifolia* var. *latifolia*), *Poa sandwicensis*, and

Xylosma crenatum (as *Antidesma crenatum*) were considered endangered. On July 1, 1975, the Service published a notice in the **Federal Register** (40 FR 27823) of its acceptance of the Smithsonian report as a petition within the context of section 4(c)(2) (now section 4(b)(3)) of the Act, and giving notice of its intention to review the status of the plant taxa named therein. As a result of that review, on June 16, 1976, the Service published a proposed rule in **Federal Register** (41 FR 24523) to determine approximately 1,700 vascular plant species, including *Chamaesyce halemanui*, *Dubautia latifolia*, *Poa sandwicensis*, and *Xylosma crenatum*, to be endangered species pursuant to section 4 of the Act. The list of 1,700 plant taxa was assembled on the basis of comments and data received by the Smithsonian Institution and the Service in response to House Document No. 94-51 and the July 1, 1975, **Federal Register** publication.

General comments received in relation 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 2 years old be withdrawn. A 1-year grace period was given to proposals already over 2 years old. On December 10, 1979, the Service published a notice in the **Federal Register** (44 FR 70796) withdrawing the portion of the June 16, 1976, proposal that had not been made final, along with four other proposals that had expired. The Service published an updated notice of review for plants on December 15, 1980 (45 FR 82479), and September 27, 1985 (50 FR 39525). *Chamaesyce halemanui* (as *Euphorbia halemanui*), *Dubautia latifolia*, *Poa sandwicensis*, and *Poa siphonoglossa* were included as Category 1 candidates on both lists, indicating that the Service had substantial information warranting their proposal for listing as endangered or threatened. *Xylosma crenatum* was included as a Category 2 candidate species on both notices, meaning that the Service had some evidence of vulnerability, but not enough data to support a listing proposal at the time. In the last notice of review, published on February 21, 1990 (55 FR 6183), all six of the species included in this proposed rule were considered Category 1 candidates. *Stenogyne campanulata* was not included in prior notices, since it was not discovered until 1986.

Section 4(b)(3)(B) of the Act requires the Secretary to make findings on certain pending petitions 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. The latter was the case for *Chamaesyce halemanui*, *Dubautia latifolia*, *Poa sandwicensis*, *Poa siphonoglossa*, and *Xylosma crenatum* because the Service had accepted the 1975 Smithsonian report as a petition. On October 13, 1983, the Service found that the petition 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 petition to be recycled, pursuant to section 4(b)(3)(C)(i) of the Act. The finding was reviewed in October of 1984, 1985, 1986, 1987, 1988, and 1989. Publication of the present proposal constitutes the final 1-year finding for these species.

Summary of Factors Affecting the Species

Section 4 of the Endangered Species Act (16 U.S.C. 1533) and regulations (50 CFR part 424) promulgated to implement 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 *Chamaesyce halemanui* (Sherff) Croizat and Degener (NCN), *Dubautia latifolia* (A. Gray) Keck (NCN), *Poa sandwicensis* (Reichardt) Hitchc. (Hawaiian bluegrass), *Poa siphonoglossa* Hack. (NCN), *Stenogyne campanulata* Weller and Sakai (NCN), and *Xylosma crenatum* (St. John) St. John (NCN) are as follows:

A. *The present or threatened destruction, modification, or curtailment of its habitat or range.* The flora of the Kokee region is considered very vulnerable because of past and present land management practices, including grazing, deliberate alien plant and animal introductions, water diversion, and recreational development (Wagner *et al.* 1985). Feral animals have made the greatest overall impact, altering and degrading the vegetation and habitats of the Kokee region.

Cattle (*Bos taurus*) were introduced to Kauai by the 1820s and were allowed to run wild (Joesting 1984). Cattle not only feed on native vegetation, but trample roots and seedlings, cause erosion, and promote the invasion of alien plants by creating new sites for colonization, and by spreading seeds in their feces and in their coats (Scott *et al.* 1986). In addition, cattle trails provide new routes

for feral pigs to expand their range (e.g., into the Alakai Swamp) (Paul Higashino, Maui Preserves Naturalist, The Nature Conservancy of Hawaii, pers. comm., 1981). Kokee was leased for cattle grazing in the 1850s (Ryan and Chang 1985). Large cattle ranching operations were underway on both flanks of Waimea Canyon by the 1870s, with many animals wandering into the upper forests. Feral cattle were common at Halemanu in Kokee at this time (Joesting 1984). Concerned over the destruction of upland forests by cattle and goats, Augustus Knudsen, the district forester and cattle rancher on the west side of Waimea Canyon, built a two mile (3 km) long fence in 1898 near the southwest corner of what became Kokee State Park in 1952 (Daehler 1973b). Knudsen had begun eliminating cattle from the northern (Kokee) side of this boundary in 1882. Three of the 6 Kokee plant species proposed for listing historically occurred within 0.5 mi (0.8 km) of this boundary on the Kokee side. Most of the Kokee region, as far southwest as Knudsen's boundary fence, was given forest reserve status (Na Pali-Kona Forest Reserve) in 1907 to protect the watershed from further erosion by feral animals and to ensure the future water supply for lowland use (Daehler 1973a). At that time, Knudsen described the area south of the boundary fence as grazing land outside any true forest (Daehler 1973b). One of the plants proposed for listing (*P. siphonoglossa*) occurs in this area, which in 1938 was designated Puu Ka Pele Forest Reserve and described as unsuitable for grazing because of excessive soil erosion (Daehler 1973b). On the east side of Waimea Canyon, efforts were underway by 1904 to eliminate cattle from the uplands, including the Alakai Swamp (Daehler 1973a). In 1916 considerable damage by cattle to the forests around the Alakai Swamp was reported (Daehler 1973a). Stray unbranded ranch stock still roamed the forests of Kokee and Puu Ka Pele in the 1980s (Tomich 1986). The State-owned portion of the Alakai Swamp was designated as a Wilderness Preserve in 1964. Today, very few if any cattle remain within the range of the six plant species.

Feral goats have inhabited the drier, more rugged areas of Kauai since the 1820s (Cuddihy and Stone 1990). Like cattle, feral goats consume native vegetation, trample roots and seedlings, cause erosion, and promote the invasion of alien plants (Scott *et al.* 1986). They have denuded many ridges of Waimea Canyon, including areas within the historical distribution of *Dubautia latifolia*, *Poa sandvicensis* and *P.*

siphonoglossa (Daehler 1973a). During dry periods, goats venture into wet areas, including the Kokee region (Scott *et al.* 1986). They have degraded the forests at the drier edge of the Alakai Swamp, which lie within the present range of the six Kokee species proposed for listing (Scott *et al.* 1986). Although the State attempted to remove goats when the forest reserve was established in 1907, these animals are now managed by the State as a game species, with a limited hunting season (Daehler 1973a, Tomich 1986). Goats are considered a serious threat to the lower and drier outlying sections of the Kokee region (HHP and Hawaii Division of Forestry and Wildlife (DOFAW) 1989), coinciding roughly with the lower elevation limit of the six Kokee species proposed for listing. The primary threat to *Stenogyne campanulata* is habitat degradation by feral goats (T. Flynn, pers. comm., 1990). While browsing on vegetation, goats disturb the ground, accelerating erosion and creating sites for invasion by more aggressive alien plant species. The restriction of *Stenogyne campanulata* to virtually inaccessible cliffs suggests that predation by goats may have eliminated the species from more accessible locations, as is the case for many rare plants of the Na Pali region. Goats also threaten the Kalalau population of *Poa sandvicensis*, 0.3 mi (0.5 km) from the *Stenogyne* site (T. Flynn, pers. comm., 1990).

Feral pigs have inhabited forests of Kauai for at least 100 years (Cuddihy and Stone 1990). Pigs consume native plants, destroy vegetation by rooting and trampling, cause severe erosion, and spread alien plant seeds in their feces (Scott *et al.* 1986). Pig activity promotes the establishment of alien plants by creating open spaces and increasing soil fertility with their feces; without the disturbance and increase in nutrients many native species would have an advantage, because endemic species often are better adapted to less disturbed sites on poorer soils (Stone 1985).

Because pigs typically expand their range in forested areas by following trails made by other animals or human beings, their ingress into areas of native vegetation has been aided by various human activities (Culliney 1988). Cattle trails helped open the Alakai Swamp to pig traffic (P. Higashino, pers. comm., 1981). The sandalwood trade that flourished on Kauai between about 1810 and 1840 created innumerable minor trails, as Hawaiians dragged the logs on their backs down to Waimea on the southern coast from throughout the upland forests (Anonymous 1978,

Joesting 1984). To provide irrigation for the expanding sugar cane industry in the lowlands, the extensive Kokee/Kekaha ditch and water diversion system was built in the 1920s. Access roads and trails to and along the ditch and tunnels enabled feral pigs to gain new access to Kokee's native forests (Culliney 1988). The food source provided by plum trees (*Prunus cerasifera* X *P. salicina*) planted in Kokee State Park during the 1930s has attracted greater concentrations of pigs to the general vicinity of several of the species proposed for listing.

Currently, pigs are recognized as the primary feral animal threat to the upland forests of the Kokee region (HHP and Dofaw 1989), common in both wet and mesic areas. At least five of these species are threatened by habitat degradation by feral pigs. Fresh pig sign was noted in November 1989 and May 1990 throughout the area of Kchus Ridge where populations of *Poa sandvicensis*, *P. siphonoglossa*, and *Dubautia latifolia* are located (HHP 1190m; J. Lau, pers. comm., 1990). At this steep site, erosion caused by pig activity is a present threat to the two *Poa* species (J. Lau, pers. comm., 1990). The extensive erosion scars on lower Kohua Ridge are expanding and gradually moving upslope toward these two species (J. Lau, pers. comm., 1990). Similarly, by increasing erosion, pig activity would exacerbate the potential threat of landslides to the only known population of *Stenogyne campanulata* on the nearly vertical rim of Kalalau (T. Flynn, pers. comm., 1990). Just 0.3 mi (6.5 km) from the *Stenogyne* population, there was considerable pig damage to vegetation adjacent to a population of *Poa sandvicensis* in May 1990 (T. Flynn, pers. comm., 1990). For *Dubautia latifolia*, pigs constitute a definite threat at the Awaawapuhi population and are known to have caused damage near the Nualolo population (HHP 1989; J. Lau, pers. comm., 1990). Pig sign has been reported from within 200 yards (180 m) of one *D. latifolia* individual in the Mohi Road population, and from near the Kauhao and Makaha populations of *Chamaesyce halemanui* (T. Flynn and J. Lau, pers. comms., 1990). Pigs are a potential threat to the Kaulaula population of *Poa siphonoglossa* and may also threaten the only known individual of *Xylosma crenatum* (T. Flynn, pers. comm., 1990).

Black-tailed deer were first introduced to the forests of western Kauai in 1961 (Culliney 1988). The estimated 350 animals now occupy dry to mesic, alien-dominated forests up to an elevation of 4,000 ft (1,220 m), including the lower distributional range of these 6 Kokee

plant species (Cuddihy and Stone 1990). Like other feral ungulates, deer feed on and trample native vegetation. Deer trails and loss of vegetation from deer foraging activities can cause erosion. Deer are a serious threat to the lower and drier outlying sections of the Kokee region (HHP and DOFAW 1989). Deer also are known to range into the wettest portion of the Kokee area during dry periods, constituting a potential threat to the wet forest habitat (Scott *et al.* 1986). Light to moderate damage by deer was reported from the vicinity of the Nualolo population of *Dubautia latifolia* in 1989 (also a former site of *Xylosma crenatum*) (HHP 1989). Deer occur in the area of the Kaulaula population of *Poa siphonoglossa* and the Makaha population of *Dubautia latifolia*, constituting a potential threat (Perlman 1990a; T. Flynn and S. Perlman, pers. comms., 1990).

In November 1982, Hurricane Iwa caused locally extensive damage to the forest canopy in many parts of Kauai, including numerous areas in the Kokee region. The vicinity of the *Dubautia latifolia* site (and former *Xylosma crenatum* site) along Nualolo Trail was one such area (R. Hobdy, pers. comm. 1990). Since the Nualolo population of *Xylosma crenatum* was not found during a recent survey of the Kuia Natural Area Reserve, it seems likely that the hurricane destroyed the two 40-foot (12 m) individuals that had constituted that population (HHP 1989). Hurricane Iwa's damage to the forest canopy also greatly exacerbated the invasion of fast-growing, light-loving alien plants, which pose a major threat to the native plants of the Kokee region (Wagner *et al.* 1985). Along Nualolo Trail, banana poka, strawberry guava, and blackberry have shown the greatest growth response, threatening *Dubautia latifolia* and other native species (HHP 1989, 1990j).

Of the six Kokee species being proposed for listing, *Dubautia latifolia* is most seriously threatened by competition from alien plants. Primary among these is banana poka, an aggressive vine introduced to Kokee about 50 years ago, now constituting a major infestation (Carr 1985, Smith 1985). Banana poka kills trees by smothering their canopies with its heavy vines. Once the trees fall, the increased sunlight in the understory favors other fast-growing alien species over native plants (Cuddihy and Stone 1990). With its climbing habit, *D. latifolia* occupies a niche similar to banana poka, often growing in close proximity to the aggressive vine (Carr 1982). Banana poka is therefore considered a serious

competitor and threat to *D. latifolia* (Carr 1982). Along with banana poka, alien species such as honeysuckle, black wattle, Australian blackwood, ginger, and strawberry guava dominate the habitat of and threaten the Mohihi Road population of *Dubautia latifolia* (HHP 1990g; T. Flynn, pers. comm., 1990). Alien species are also increasing at the site of the Awaawapuhi population of *D. latifolia* (HHP 1990h). Banana poka and blackberry are invading the Mohihi-Waialae Trail and Makaha populations of this species as well, with blackberry overgrowing the latter area (HHP 1990k, 1990m, Perlman 1990a). Over the past 40 years, blackberry has invaded much of the native wet and mesic forests of Kokee, where it forms dense thickets that compete with native understory species (Cuddihy and Stone 1990, Daehler 1973a). Blackberry threatens the Kalalua population of *P. sandvicensis* (T. Flynn, pers. comm., 1990). The westernmost section of the Kohua Ridge population of *P. sandvicensis* and an adjacent population of *P. siphonoglossa* are heavily invaded by blackberry (HHP 1990q, 1990r). Banana poka and ginger, as well as blackberry, threaten the Awaawapuhi population of *P. sandvicensis* (HHP 1990p). The Halemanu population of *Chamaesyce halemanui* is threatened by St. Augustine grass, whose thick growth prevents regeneration of this native tree (T. Flynn, pers. comm., 1990). The other two populations of *C. halemanui* are threatened by lantana and strawberry guava (J. Lau, pers. comm., 1990). Alien plants, particularly strawberry guava, are increasing at the only known site of *Xylosma crenatum* (HHP 1990t). Daisy fleabane is the primary alien plant threat to *Stenogyne campanulata* and the Kalalau population of *P. sandvicensis* (T. Flynn, pers. comm., 1990).

Several potentially threatening alien plant species were originally introduced deliberately for reforestation or timber utilization. These include conifers (such as the grove surrounding the only known *Xylosma crenatum* individual); firetree, planted on Waimea Canyon's eastern drainages; and karaka nut (*Corynocarpus laevigata*), one of the alien species aerially broadcast over the Kokee region in the 1920s (Daehler 1973a, Wagner *et al.* 1985). While these species do not directly threaten the six species proposed for listing, they may possibly have crowded out former populations, and eventually could invade extant populations. Marijuana (*Cannabis sativa*) is cultivated in the Kokee region, and that activity is considered a management threat to Kuia

Natural Area Reserve, where *Chamaesyce halemanui* and *Dubautia latifolia* occur (HHP and DOFAW 1989). Native vegetation is destroyed when areas are cleared for marijuana cultivation. More significantly, other alien species are inadvertently introduced into the forest from soil and other material brought to the site. After the site is abandoned, it forms a locus for the spread of alien species (Medeiros *et al.* 1988).

Construction of water collection and diversion systems that began in the 1920s for the lowland sugar cane industry damaged the vegetation of Kokee (Wagner *et al.* 1985). Since the Kokee ditch and tunnel system and its access roads run through habitat of four of the six species proposed for listing (particularly *Xylosma crenatum*), it may possibly have destroyed former populations of those species. The ditch system created new routes for the invasion of alien plants and animals into intact native forest (Culliney 1988). Recreational development, concentrated in the 4,640 acre (1,800 hectare) Kokee State Park, has had an equally significant impact on the native vegetation (Wagner *et al.* 1985). Vacation cabins have existed in Kokee for well over a century. The construction and use of an extensive system of hiking, hunting, fishing, and horse trails (45 mi (72 km) in total) has resulted in the direct destruction of some habitat, and has accelerated rate of erosion and the spread of alien plants and animals enormously (Wagner *et al.* 1985). Three of the species proposed for listing are currently threatened by road or trail maintenance activities. State forest reserve road maintenance threatens the sole known individual of *X. crenatum*. Freshly bulldozed dirt was noted immediately adjacent to this plant in November 1989 (J. Lau, pers. comm., 1990). Forest reserve trail maintenance threatens the Awaawapuhi population of *Poa sandvicensis*. The single clump comprising that population had been cut back to the base by trail clearing, but was resprouting as of September 1989 (HHP 1990p). Several individuals of *Dubautia latifolia* overhang a State park road, and have been injured by passing vehicles. Road maintenance constitutes a potential threat to these plants.

While fire has been suggested as a threat to *Dubautia latifolia* (Center for Plant Conservation 1990, St. John 1981), experienced field botanists with the most direct knowledge of this species believe that the potential for fire within the mesic habitat of this species is quite low (T. Flynn, J. Lau, and S. Perlman, pers. comms., 1990). The same applies to

the other five Kokee species proposed for listing.

B. Overutilization for commercial, recreational, scientific, or educational purposes. Illegal collecting for scientific or horticultural purposes or excessive visits by individuals interested in seeing rare plants could result from increased publicity, and would seriously threaten several of these species. For five of these species, disturbance to sites by trampling during recreational use (hiking, for example) could promote erosion and greater ingress by competing alien species. The site of the only known individual of *Xylosma crenatum* is relatively accessible. Overutilization is not a factor for *Stenogyne campanulata*, due to the virtually inaccessible location of the only known population. However, trampling of more accessible nearby areas would promote erosion and increased alien plant invasion. The same potential for erosion and weed ingress applies to *Chamaesyce halemanui*, *Dubautia latifolia*, *Poa sandvicensis* and *P. siphonoglossa*, which are somewhat more accessible than *S. campanulata*.

C. Disease or predation. Although there is no evidence of predation on these species, none of them are known to be unpalatable to goats or deer. Predation is therefore a probable threat at sites where those animals have been reported. Predation by goats is considered a probable threat to *Stenogyne campanulata* and *Poa sandvicensis* (T. Flynn, pers. comm., 1990). The restriction of *S. campanulata* to inaccessible cliffs suggests that predation by goats may have eliminated the species from more accessible locations. Predation by deer potentially threatens *Dubautia latifolia* and *Poa siphonoglossa*. No threat of predation has been reported for *Chamaesyce halemanui* or *Xylosma crenatum*. No evidence of disease is known for any of the species proposed herein except, perhaps *D. latifolia*, where a seasonal blackening and dieback of *D. latifolia* shoot tips could potentially be caused by a disease; however, it may instead be a natural phenological phenomenon (G. Carr, pers. comm., 1990).

D. The inadequacy of existing regulatory mechanisms. All of the known populations of the six Kokee plant species proposed for listing are located on State-owned land, either in forest reserves (five species), parks (four species), a natural area reserve (one species), or a wilderness preserve (two species). State regulations prohibit the removal, destruction, or damage of plants found on these lands. However,

those regulations are difficult to enforce due to limited personnel. Hawaii's Endangered Species Act (HRS, section 195D-4(a)) states, "Any species of wildlife or wild plant that has been determined to be an endangered species pursuant to the Endangered Species Act (of 1973) shall be deemed to be an endangered species under the provisions of this chapter * * * ." 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 (section 195D-5(c)). Funds for these activities could be made available under section 6 of the Federal Act (State Cooperative Agreements). Listing of these six plant species would therefore reinforce and supplement the protection available to the species under State law. The Federal Act also would offer additional protection to these species because if they were listed as endangered, it would be a violation of the Act for any person to remove, cut, dig up, damage, or destroy any such plant in 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 of individual plants of these species increases the potential for extinction from stochastic events. The limited gene pool may depress reproductive vigor, or a single man-caused or natural environmental disturbance could destroy a significant percentage of the individuals of these species. *Xylosma crenatum* epitomizes the problem of small numbers of extant individuals. For this dioecious (unisexual) species, only one male tree is known. *Xylosma crenatum* may be reproductively extinct. If no female individuals remain in the wild, no further sexual reproduction would take place. *Stenogyne campanulata* numbers approximately 50 plants at the very most, concentrated at a single site (T. Flynn, pers. comm., 1990). *Poa siphonoglossa* numbers fewer than 30 known individuals at 2 populations (including the Kaulaula population that also exhibits characteristics of *P. manni*) (HHP 1990; T. Flynn, pers. comm., 1990). Whereas about 40 individuals of *Poa sandvicensis* are known from 4 populations, 80 percent of the plants are concentrated at 1 major site (HHP 1990n, 1990q; T. Flynn, pers. comm., 1990). The fewer than 25 known individuals of *Chamaesyce halemanui* are distributed fairly evenly

between 3 populations, 2 of them reported to include seedlings as well as mature trees (HHP 1990c, 1990f; T. Flynn, pers. comm., 1990). Most *Dubautia latifolia* populations consist of fewer than 6 plants, often widely scattered (e.g., each 0.3 mi (0.5 km) apart). Individual localities are typically 270 to 1,600 square ft (25 to 150 square m) in area (Carr 1982). Only about 40 individuals of *D. latifolia* are known to be extant, also comprising a limited gene pool (Carr 1982; HHP 1990g through 1990m; S. Perlman, pers. comm., 1990).

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 propose this rule. Based on this evaluation, the preferred action is to list *Chamaesyce halemanui*, *Dubautia latifolia*, *Poa sandvicensis*, *Poa siphonoglossa*, *Stenogyne campanulata*, and *Xylosma crenatum* as endangered. Total numbers of known individuals of these 6 species range from a low of 1 (*Xylosma crenatum*) to an estimated high of 50 (*Stenogyne campanulata*). These species are threatened by one or more of the following: competition from alien plants; habitat degradation by feral pigs, goats, and deer; and trail and road maintenance. Small population size makes these species particularly vulnerable to extinction from stochastic events. Given these circumstances, the determination of endangered status for these six species seems warranted.

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 the six Kokee species proposed for listing. The publication of descriptions and maps required in a proposal for critical habitat would increase the degree of threat to these species from possible take or vandalism and therefore could contribute to their decline and increase enforcement problems. The listing of species as either endangered or threatened publicizes the rarity of the plants, and thus could make them attractive to researchers, curiosity seekers, or collectors of rare plants. As the result of its nearly inaccessible location, *Stenogyne campanulata* does not appear to be threatened by potential vandalism. However, actions of nearby curiosity seekers could result in increased erosion or cause land slides.

Because the known distributions of all six species are on State-owned land and there are no known or anticipated Federal actions for the areas in which the plants are located, designation of critical habitat would have no known benefit to these species. All involved parties and landowners have been notified of the location and importance of protecting the habitat of these species. Protection of the species' habitat will be addressed through the recovery 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. Since the six Kokee species being proposed are known to occur on State land, cooperation between Federal and State agencies is necessary to provide for their conservation. The protection required of Federal agencies and the prohibitions against certain activities involving listed plants are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) requires Federal agencies to confer informally 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 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. As none of these species are on Federal land and no Federal activities are currently anticipated in the area, no section 7 consultations or impact on activities of Federal agencies are anticipated as the result of this proposal.

The Act and its implementing regulations found at 50 CFR 17.61, 17.62, and 17.63 for endangered plant species set forth a series of general trade prohibitions and exceptions that apply to all endangered plants. With respect to the six plants from the Kokee region, all trade 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 these species in interstate or foreign commerce; or to remove and reduce to possession any such species from areas under Federal jurisdiction; or to maliciously damage or destroy any such plants on any area under Federal jurisdiction; or to 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 species under certain circumstances. It is anticipated that few trade 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 on plants and inquiries regarding them may be addressed to the Office of Management Authority, U.S. Fish and Wildlife Service, room 432, 4401 N. Fairfax Drive, Arlington, Virginia 22203 (703/358-2104, FTS 921-2104, FAX 703/358-2281).

Public Comments Solicited

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

- (1) Biological, commercial trade, or other relevant data concerning any threat (or lack thereof) to these six species; -
- (2) The location of any additional populations of these species and the reasons why any habitat should or should not be determined to be critical habitat as provided by section 4 of the Act;
- (3) Additional information concerning the range, distribution, and population size of these species; and
- (4) Current or planned activities in the subject area and their possible impacts on these species.

Any final decision on this proposal concerning these six species of plants will take into consideration the comments and any additional information received by the Service, and such communications may lead to a final regulation that differs from this proposal.

The Endangered Species Act provides for a public hearing on this proposal, if requested. Requests must be received within 45 days of the date of publication of the proposal. Such requests must be made in writing and addressed to the Field Office Supervisor (see **ADDRESSES** section).

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment, as defined pursuant to 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, as well as others, is available upon request from the Field Office Supervisor (see **ADDRESSES** above).

Author

The primary author of this proposed rule is Dr. Joan E. Canfield, Fish and Wildlife Enhancement, 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 or FTS 551-2749).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and record-keeping requirements, and Transportation.

Proposed Regulations Promulgation

PART 17—[AMENDED]

Accordingly, it is hereby proposed to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

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. It is proposed to amend § 17.12(h) 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		Historic range	Status	When listed	Critical habitat	Special rule
Scientific name	Common name					
Asteraceae—Aster family:						
<i>Dubautia latifolia</i>	None	U.S.A. (H)	E		NA	NA
Euphorbiaceae—Spurge family:						
<i>Chamaesyce halemanui</i>	None	U.S.A. (H)	E		NA	NA
Flacourtiaceae—Flacourtia family:						
<i>Xylosma crenatum</i>	None	U.S.A. (H)	E		NA	NA
Lamiaceae—Mint family:						
<i>Stenogyne campanulata</i>	None	U.S.A. (H)	E		NA	NA
Poaceae—Grass family:						
<i>Poa sandvicensis</i>	Hawaiian bluegrass	U.S.A. (H)	E		NA	NA
<i>Poa siphonoglossa</i>	None	U.S.A. (H)	E		NA	NA

(Proposal: *Chamaesyce halemanui*, *Dubautia latifolia*, *Poa sandvicensis*, *Poa siphonoglossa*, *Stenogyne campanulata*, and *Xylosma crenatum*—endangered.)

Dated: September 14, 1990.
 Richard N. Smith,
 Acting Director, Fish and Wildlife Service.
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