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50 CFR Part 17

**Endangered and Threatened Wildlife and
Plants; Revised Determinations of
Prudence and Proposed Designations of
Critical Habitat for Plant Species From
the Islands of Maui and Kahoolawe,
Hawaii; Proposed Rule**

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018-AH70

Endangered and Threatened Wildlife and Plants; Revised Determinations of Prudency and Proposed Designations of Critical Habitat for Plant Species From the Islands of Maui and Kahoolawe, Hawaii

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Revised proposed rule and notice of determinations of whether designation of critical habitat is prudent.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose critical habitat for 61 of the 70 species known historically from the islands of Maui and Kahoolawe that are listed under the Endangered Species Act of 1973, as amended.

We propose critical habitat designations for 61 species within 13 critical habitat units totaling approximately 51,208 hectares (ha) (126,531 acres (ac)) on the island of Maui, and within 2 critical habitat units totaling approximately 714 ha (1,763 ac) on the island of Kahoolawe.

If this proposal is made final, section 7 of the Act requires Federal agencies to ensure that actions they carry out, fund, or authorize do not destroy or adversely modify critical habitat to the extent that the action appreciably diminishes the value of the critical habitat for the survival and recovery of the species.

Section 4 of the Act requires us to consider economic and other relevant impacts of specifying any particular area as critical habitat.

We solicit data and comments from the public on all aspects of this proposal, including data on the economic and other impacts of the designations. We may revise or further refine this rule, including critical habitat boundaries, prior to final designation based on habitat and plant surveys, public comment on the revised proposed critical habitat rule, and new scientific and commercial information.

DATES: We will accept comments until June 3, 2002. Public hearing requests must be received by May 20, 2002.

ADDRESSES: If you wish to comment, you may submit your comments and materials concerning this proposal by writing to the Field Supervisor, U.S. Fish and Wildlife Service, Pacific Islands Office, 300 Ala Moana Blvd., Room 3-122, P.O. Box 50088, Honolulu, HI 96850-0001.

You may view comments and materials received, as well as supporting documentation used in the preparation of this proposed rule, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Paul Henson, Field Supervisor, Pacific Islands Office (see ADDRESSES section) (telephone 808/541-3441; facsimile 808/541-3470).

SUPPLEMENTARY INFORMATION:

Background

In the Lists of Endangered and Threatened Plants (50 CFR 17.12), there are 70 plant species that, at the time of listing, were reported from the islands

of Maui and Kahoolawe (Table 1). Seventeen of these species are endemic to the islands of Maui and/or Kahoolawe, while 53 species are reported from one or more other islands, as well as Maui and/or Kahoolawe.

We originally determined that designation of critical habitat was prudent for 37 plants from the islands of Maui and Kahoolawe on December 18, 2000 (65 FR 7919). In a previous proposal, published on November 7, 2000 (65 FR 66808), we determined that designation of critical habitat was prudent for 11 plants that are reported from Maui and Kahoolawe as well as from Kauai and Niihau. In addition, at the time we listed *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, and *Kanaloa kahoolawensis*, on September 3, 1999 (64 FR 48307), we determined that designation of critical habitat was prudent for these six taxa from Maui and Kahoolawe. No change is made to these 54 prudency determinations in this revised proposal, and they are hereby incorporated by reference (64 FR 48307; 65 FR 66808; 65 FR 79192).

In the December 18, 2000 proposed rule, we determined that critical habitat was not prudent for *Acaena exigua*, a species known only from Kauai and Maui, because it had not been seen recently in the wild, and no viable genetic material of this species was known to exist. No change is made here to the December 18, 2000, prudency determination for this species and it is hereby incorporated by reference (65 FR 79192).

TABLE 1.—SUMMARY OF ISLAND DISTRIBUTION OF 70 SPECIES FROM MAUI AND KAHOOLAWE

Species (common name)	Island distribution						
	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	NW Isles, kahoolawe Niihau
<i>Acaena exigua</i> (liliwai)	H				H		
<i>Adenophorus periens</i>	C	C	C	R	H	C	
<i>Alectryon macrococcus</i> (mahoe)	C	C	C		C		
<i>Argyroxiphium sandwicense</i> ssp. <i>macrocephalum</i> (ahinahina)					C		
<i>Asplenium fragile</i> var. <i>insulare</i> (NCN*)					C	C	
<i>Bidens micrantha</i> ssp. <i>kalealaha</i> (kookoolau)				H	C		
<i>Bonamia menziesii</i> (NCN)	C	C	H	C	C	C	
<i>Brighamia rockii</i> (pua ala)			C	H	H		
<i>Cenchrus agrimonoides</i> (kamanomano)		C		H	C	R	NW Isles (H).
<i>Centaurium sebaeoides</i> (awiwai)	C	C	C	C	C		
<i>Clermontia lindseyana</i> (oha wai)					C	C	
<i>Clermontia oblongifolia</i> ssp. <i>mauiensis</i> (oha wai)				C	C		
<i>Clermontia peleana</i> (oha wai)					H	C	
<i>Clermontia samuelii</i> (oha wai)					C		
<i>Colubrina oppositifolia</i> (kauila)		C			C	C	
<i>Ctenitis squamigera</i> (pauoa)	H	C	C	C	C	H	
<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i> (haha)					C		

TABLE 1.—SUMMARY OF ISLAND DISTRIBUTION OF 70 SPECIES FROM MAUI AND KAHOO LAWE—Continued

Species (common name)	Island distribution						
	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	NW Isles, kahoolawe Niihau
<i>Cyanea glabra</i> (haha)					C		
<i>Cyanea grimesiana</i> ssp. <i>grimesiana</i> (haha)		C	C	C	C		
<i>Cyanea hamatiflora</i> ssp. <i>hamatiflora</i> (haha)					C		
<i>Cyanea lobata</i> (haha)				H	C		
<i>Cyanea mceldowneyi</i> (haha)					C		
<i>Cyrtandra munroi</i> (haiwale)				C	C		
<i>Delissea undulata</i> (NCN)	C				H	C	Ni (H).
<i>Diellia erecta</i> (Asplenium-leaved diellia)	H	H	C	H	C	C	
<i>Diplazium molokaiense</i> (NCN)	H	H	H	H	C		
<i>Dubautia plantaginea</i> ssp. <i>humilis</i> (naenae)					C		
<i>Flueggea neowawraea</i> (mehamehame)	C	C	H		C	C	
<i>Geranium arboreum</i> (nohoanu)					C		
<i>Geranium multiflorum</i> (nohoanu)					C		
<i>Gouania vitifolia</i> (NCN)		C			H	C	
<i>Hedyotis coriacea</i> (kioele)		H			C	C	
<i>Hedyotis mannii</i> (pilo)			C	C	C		
<i>Hesperomannia arborescens</i> (NCN)		C	C	H	C		
<i>Hesperomannia arbuscula</i> (NCN)		C			C		
<i>Hibiscus brackenridgei</i> (mao hau hele)	H	C	H	C	C	C	Ka (R).
<i>Ischaemum byrone</i> (Hilo ischaemum)	C	H	C		C	C	
<i>Isodendron pyriformis</i> (wahine noho kula)		H	H	H	H	C	Ni (H). Ka (C).
<i>Kanaloa kahoolawensis</i> (kohe malama malama o Kanaloa)							
<i>Lipochaeta kamolensis</i> (nehe)					C		
<i>Lysimachia lydgatei</i> (NCN)		H			C		
<i>Mariscus pennatifolius</i> (NCN)	H	H			C	H	NW Isles (C).
<i>Melicope adscendens</i> (alani)					C		
<i>Melicope balloui</i> (alani)					C		
<i>Melicope knudsenii</i> (alani)	C				C		
<i>Melicope mucronulata</i> (alani)			C		C		
<i>Melicope ovalis</i> (alani)					C		
<i>Neraudia sericea</i> (NCN)			C	H	C		Ka (H).
<i>Nototrichium humile</i> (kului)		C			H		
<i>Peucedanum sandwicense</i> (makou)	C	C	C		C		
<i>Phlegmariurus mannii</i> (wawaeiole)	H				C	C	
<i>Phyllostegia mannii</i> (NCN)			C		H		
<i>Phyllostegia mollis</i> (NCN)		C	H		C		
<i>Phyllostegia parviflora</i> (NCN)		C			H	H	
<i>Plantago princeps</i> (Laukahi kuahiwi)	C	C	C		C		
<i>Platanthera holochila</i> (NCN)	C	H	C		C		
<i>Pteris lidgatei</i> (NCN)		C	H		C		
<i>Remya mauiensis</i> (NCN)					C		
<i>Sanicula purpurea</i> (NCN)		C			C		
<i>Schiedea haleakalensis</i> (NCN)					C		
<i>Schiedea hookeri</i> (NCN)		C			H		
<i>Schiedea nuttallii</i> (NCN)	C	C	C		R		
<i>Sesbania tomentosa</i> (ohai)	C	C	C	H	C	C	Ni (H), Ka (C), NW Isles (C).
<i>Solanum incompletum</i> (popolo ku mai)	H		H	H	H	C	
<i>Spermolepis hawaiiensis</i> (NCN)	C	C	C	C	C	C	
<i>Tetramolopium arenarium</i> (NCN)					H	C	
<i>Tetramolopium capillare</i> (pamakani)					C		
<i>Tetramolopium remyi</i> (NCN)				C	H		
<i>Vigna o-wahuensis</i> (NCN)		H	C	C	C	C	Ni (H), Ka (C).
<i>Zanthoxylum hawaiiense</i> (ae)	C		C	H	C	C	

KEY

C (Current)—population last observed within the past 30 years

H (Historical)—population not seen for more than 30 years

R (Reported)—reported from undocumented observations

* NCN—no common name

In the December 18, 2000, proposal we proposed designation of critical habitat for 50 plants from the islands of Maui and Kahoolawe. These species are: *Alectryon macrococcus*, *Bidens micrantha* ssp. *kalealaha*, *Bonamia*

menziesii, *Cenchrus agrimonioides*, *Centaurium sebaeoides*, *Clermontia lindseyana*, *Clermontia oblongifolia* ssp. *mauiensis*, *Clermontia samuelii*, *Colubrina oppositifolia*, *Ctenitis squamigera*, *Cyanea copelandii* ssp.

haleakalensis, *Cyanea glabra*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Cyanea lobata*, *Cyanea mceldowneyi*, *Cyrtandra munroi*, *Diellia erecta*, *Diplazium molokaiense*, *Dubautia plantaginea* ssp.

humilis, *Flueggea neowawraea*, *Geranium arboreum*, *Geranium multiflorum*, *Hedyotis coriacea*, *Hedyotis mannii*, *Hesperomannia arborescens*, *Hesperomannia arbuscula*, *Hibiscus brackenridgei*, *Ischaemum byrone*, *Kanaloa kahoolawensis*, *Lipochaeta kamolensis*, *Lysimachia lydgatei*, *Mariscus pennatiformis*, *Melicope adscendens*, *Melicope knudsenii*, *Melicope mucronulata*, *Neraudia sericea*, *Peucedanum sandwicense*, *Phlegmariurus mannii*, *Phyllostegia mollis*, *Plantago princeps*, *Platanthera holochila*, *Pteris lidgatei*, *Remya mauiensis*, *Sanicula purpurea*, *Sesbania tomentosa*, *Spermolepis hawaiiensis*, *Tetramolopium capillare*, *Vigna o-wahuensis*, and *Zanthoxylum hawaiiense*. In this proposal we have revised the proposed designations for the 50 plants based on new information received during the comment periods. In addition, we incorporate new information, and address comments and new information received during the comment periods on the December 18, 2000, proposal.

In the December 18, 2000, we did not propose critical habitat for four species (*Argyroxiphium sandwicense* ssp. *macrocephalum*, *Melicope balloui*, *Melicope ovalis*, and *Schiedea haleakalensis*) found only in Waikamoi Preserve and Haleakala National Park, on Maui. We determined that these lands did not meet the definition of critical habitat in the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*). Due to new information received during the comment periods regarding management considerations or protection at Haleakala National Park, we have reconsidered our earlier finding regarding Haleakala National Park lands and propose designation of critical habitat for *Argyroxiphium sandwicense* ssp. *macrocephalum*, *Melicope balloui*, *Melicope ovalis*, and *Schiedea haleakalensis* within Haleakala National Park.

In the December 18, 2000, proposal we did not propose designation of critical habitat for 14 species that no longer occur on Maui and Kahoolawe but are reported from one or more other islands. We determined that critical habitat was prudent for eight of these species (*Adenophorus periens*, *Brighamia rockii*, *Delissea undulata*, *Isodendron pyriformis*, *Phyllostegia mannii*, *Schiedea nuttallii*, *Solanum incompletum*, and *Tetramolopium remyi*) in other proposed rules published on November 7, 2000 (Kauai), December 27, 2000 (Lanai), December 29, 2000 (Molokai), and January 28, 2002 (Kauai revised proposal). No

change is made to these prudency determinations for these eight species in this proposal, and they are hereby incorporated by reference (65 FR 66808; 65 FR 82086; 65 FR 83158; and 67 FR 3940). In this proposal, we propose designation of critical habitat for *Brighamia rockii*, *Isodendron pyriformis*, *Phyllostegia mannii*, and *Tetramolopium remyi* on the island of Maui, based on new information and information received during the comment periods on the December 18, 2000, proposal. Critical habitat is not proposed for *Adenophorus periens*, *Delissea undulata*, *Schiedea nuttallii*, and *Solanum incompletum* on the islands of Maui and Kahoolawe because we have not identified habitat essential to their conservation on these islands.

In this proposal, we determine that critical habitat is prudent for six other species (*Clermontia peleana*, *Gouania vitifolia*, *Nototrichium humile*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium*) for which prudency determinations have not been made previously, and that no longer occur on Maui but are reported from one or more other islands. These six plants were listed as endangered species under the Act between 1994 and 1996. At the time each plant was listed, we determined that designation of critical habitat was not prudent because designation would increase the degree of threat to the species and/or would not benefit the plant. We determine that designation of critical habitat is prudent for these six species because we believe that such designation would be beneficial to these species. Critical habitat is proposed at this time for *Gouania vitifolia* and *Nototrichium humile* on Maui based on new information and information received during the comment periods on the December 18, 2000, proposal. Critical habitat is not proposed for *Clermontia peleana*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium* on the island of Maui because we have not identified habitat essential to their conservation on this island.

In this proposal, we determine that critical habitat is prudent for *Asplenium fragile* var. *insulare*, a species recently rediscovered on Maui and for which a prudency determination has not been made previously. Critical habitat is proposed at this time for *Asplenium fragile* var. *insulare* on Maui based on new information and information received during the comment periods on the December 18, 2000, proposal.

Critical habitat for 61 of the 70 species from the islands of Maui and Kahoolawe is proposed at this time. Critical habitat

is not proposed for 8 of the 70 species (*Adenophorus periens*, *Clermontia peleana*, *Delissea undulata*, *Phyllostegia parviflora*, *Schiedea hookeri*, *Schiedea nuttallii*, *Solanum incompletum*, and *Tetramolopium arenarium*) that no longer occur on the islands of Maui or Kahoolawe, and for which we have not identified habitat essential to their conservation on the islands of Maui or Kahoolawe. However, proposed critical habitat designations, or non-designations, for these species will be included in other future Hawaiian plants proposed critical habitat rules (see Table 2).

TABLE 2.—LIST OF PROPOSED RULES IN WHICH CRITICAL HABITAT DESIGNATIONS OR NONDESIGNATIONS WILL BE MADE FOR EIGHT SPECIES FOR WHICH WE ARE UNABLE TO DETERMINE HABITAT THAT IS ESSENTIAL FOR THEIR CONSERVATION ON THE ISLANDS OF MAUI AND KAHOO LAWE.

Species	Proposed rules in which critical habitat designations will be made
<i>Adenophorus periens</i>	Kauai; Molokai; Hawaii; Oahu.
<i>Clermontia peleana</i> ...	Hawaii.
<i>Delissea undulata</i>	Hawaii.
<i>Phyllostegia parviflora</i>	Oahu.
<i>Schiedea hookeri</i>	Oahu.
<i>Schiedea nuttallii</i>	Kauai; Oahu; Molokai.
<i>Solanum incompletum</i>	Hawaii.
<i>Tetramolopium arenarium</i> .	Hawaii.

Critical habitat is not proposed for *Acaena exigua* for which we determined, on December 18, 2000, that critical habitat designation is not prudent because it has not been seen recently in the wild, and no viable genetic material of this species is known to exist. No change is made to this prudency determination here, and it is hereby incorporated by reference (65 FR 79192).

The Islands of Maui and Kahoolawe

Maui, the second largest island in Hawaii at 1,888 square kilometers (km²) (729 square miles (mi²)) in area, was formed from the remnants of two large shield volcanoes, the older west Maui volcano (1.3 million years) on the west and the larger, but much younger, Haleakala volcano on the east. Stream erosion has cut deep valleys and ridges into the originally shield-shaped West Maui volcano. The highest point on West Maui is Puu Kukui at 1,764 meters (m) (5,787 feet (ft)) elevation, which has

an average rainfall of 1,020 centimeters (cm) (400 inches (in)) per year, making it the second wettest spot in Hawaii (Department of Geography 1998). Having erupted just 200 years ago, East Maui's Haleakala crater, reaching 3,055 m (10,023 ft) in elevation, has retained its classic shield shape and lacks the diverse vegetation typical of the older and more eroded West Maui mountain. Rainfall on the slopes of Haleakala is about 89 cm (35 in) per year, with its windward (northeastern) slope receiving the most precipitation. However, Haleakala's crater is a dry cinder desert because it is above the level at which precipitation develops, and is sheltered from moisture-laden winds (Gagne and Cuddihy 1999).

The island of Kahoolawe measures about 17.7 kilometers (km) (11 miles (mi)) long by 11.3 km (7 mi) wide, comprising some 11,655 ha (28,800 ac). Located in the lee of Haleakala, the island lies approximately 11 km (6.7 mi) from East Maui. The highest point is the rim of an extinct volcano at 450 m (1,477 ft) above sea level. The estimated annual precipitation is approximately 500 millimeters (mm) (20 in), with most of it falling from November through March. In addition to the low precipitation, Kahoolawe is the windiest of the Hawaiian Islands (Gon *et al.* 1992).

Discussion of Plant Taxa

Species Endemic to Maui and/or Kahoolawe

Argyroxiphium sandwicense ssp. macrocephalum (ahinahina)

Argyroxiphium sandwicense ssp. macrocephalum, a long-lived perennial and a member of the aster family (Asteraceae), is called the Haleakala silversword. It is a distinctive, globe-shaped rosette plant with a dense covering of silver hairs. This subspecies is distinguished from *Argyroxiphium sandwicense ssp. sandwicense* by the shape and ratio of the dimensions of the inflorescence (flowering part of plant), the number of ray florets per head, and the combination of its longer, three-angled leaves; its silvery leaf hairs, which completely hide the leaf surface; and its longer achenes (Carr 1985, 1999a).

This monocarpic (flowers only once, at the end of its lifetime) plant matures from seed to its final stage in approximately 15–50 years. The plant remains a compact rosette until it sends up an erect, central flowering stalk, sets seed, and dies. Flowering occurs from June to September, with annual numbers of flowering plants varying dramatically from year to year. Reliable

counts of flowering plants were made in 1935 (217 flowered) and in 1941 (815 flowered). Numbers recorded flowering in recent years have ranged from zero in 1970 to 6,632 in 1991. The environmental stimulus for synchronous flowering is as yet unknown. An apparent relationship of the 1991 mass flowering event to stratospheric alteration by the eruption of Pinatubo Volcano in the Philippines has been considered. Investigations are underway by R. Pharis of the University of Calgary and L.L. Loope to explore whether enhanced flowering is related to increased UV-B radiation due to temporary reduction of stratospheric ozone. Flying insects, especially native bees, moths, flies, bugs, and wasps, many of which are pollinators, are attracted in large numbers to the giant, aromatic inflorescences. It has been demonstrated that *Argyroxiphium sandwicense ssp. macrocephalum* cannot fertilize itself and is reliant on insect pollinators for reproduction. Rarely, hybrids between *A. sandwicense ssp. macrocephalum* and *Dubautia menziesii* (naenae) have been observed. Primarily found within Haleakala Crater, especially on Puu o Pele and Puu o Maui cinder cones, these hybrid individuals flower for several years before dying (Loope and Crivellone 1986; Loope and Medeiros, in press; Service 1997; Carr 1985; 57 FR 20772).

Currently, *Argyroxiphium sandwicense ssp. macrocephalum* occupies all of its historic range, a 1,000 ha (2,500 ac) area at 2,100–3,000 m (6,890–9,840 ft) elevation in the crater and outer slopes of Haleakala Volcano, within Haleakala National Park, and The Nature Conservancy of Hawaii's (TNCH) Waikamoi Preserve. There are a total of four populations on Federal and privately owned land, with a total of 39,025 to 44,025 individual plants (Loope and Crivellone 1986; TNC 1998; Geographic Decision Systems International (GDSI) 2001; Hawaii Natural Heritage Program (HINHP) Database 2001; Service 1997; 57 FR 20772).

The habitat of this species consists primarily of lava flows and otherwise barren, unstable slopes of recent (less than several thousand years old) volcanic cinder cones and in *Deschampsia nubigena* (hair grass) grasslands at elevations between 1,511 and 3,053 m (4,957 and 10,016 ft). Mean annual precipitation is approximately 75 to 250 cm (29.6 to 98.4 in). The substrate has almost no soil development and is subject to frequent formation of ice at night and extreme heating during cloudless days. This species is found in alpine dry shrubland

with native species, including *Agrostis sandwicensis* (bent grass), *Dubautia menziesii*, *Silene struthioloides* (catchfly), *Styphelia tameiameiae* (pukiawe), *Tetramolopium humile* (pamakani), or *Trisetum glomeratum* (pili uka) (Robert Hobdy, Hawaii Division of Forestry and Wildlife (DOFAW), *et al.*, pers. comm., 2001; Service 1997; 57 FR 20772).

The threats to this species are loss of pollinators due to the Argentine ant (*Iridomyrmex humilis*) and alien yellow jackets (*Vespula pennsylvanica*); native seed-eating and herbivorous insects such as the tephritid fly (*Trupanea cratericola*); limited natural range which makes it vulnerable to extinction due to catastrophic events, such as a natural disaster; competition from the alien plant species *Verbascum thapsus* (mullein); and human impacts (trampling and site degradation). Although goats (*Capra hircus*) and cattle (*Bos taurus*) have been removed from the park, they remain a potential threat (Service 1997; 57 FR 20772).

Clermontia samuelii (oha wai)

Clermontia samuelii, a short-lived perennial in the bellflower family (Campanulaceae), is a terrestrial shrub with elliptical leaves which are sometimes broader at the tips. *Clermontia samuelii ssp. hanaensis* is differentiated from *C. samuelii ssp. samuelii* by the greenish white to white flowers; longer, narrower leaves with the broadest point near the base of the leaves; and fewer hairs on the lower surface of the leaves. This species is separated from other members of this endemic Hawaiian genus by the size of the flowers and the hypanthium (Lammers 1999; Service 2001).

Little is known about the life history of *Clermontia samuelii*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 2001; 64 FR 48307).

Historically, *Clermontia samuelii* has been reported from Haleakala and from Keanae Valley on the windward side to Manawainui on the more leeward (southeastern) side of Haleakala. Currently, *Clermontia samuelii* is known from Papanalaoa Point, Kuhiwa Valley, the ridge north of Palike Stream, Kawaipapa Gulch, and Mokulehua Gulch. There is a total of four populations with 309 individual plants on State and Federal lands within Haleakala National Park, Hanawi Natural Area Reserve (NAR), the Hana Forest Reserve, and within the East Maui Watershed Partnership (Medeiros and Loope 1989; Warshauer 1998; 64 FR

48307; GDSI 2001; HINHP Database 2001; Robert Hobdy, DOFAW, *in litt.* 2000; Ken Wood, National Tropical Botanical Garden (NTBG) *in litt.* 2000; Service 2001).

Clermontia samuelii is found at elevations between 723 and 2,244 m (2,372 and 7,362 ft). *Clermontia samuelii* ssp. *hanaensis* is found in wet *Metrosideros polymorpha* (ohia) and *Metrosideros polymorpha-Dicranopteris linearis* (uluhe) forest containing one or more of the following associated native plant species: *Adenophorus tamariscinus* (pendant fern), *Broussaisia arguta* (kanawao), *Carex alligata* (NCN), *Cheirodendron trigynum* (olapa), *Cibotium* spp. (hapuu), *Diplazium sandwichianum* (hoio), *Dubautia* spp. (naenae), *Hedyotis hillebrandii* (manono), *Hedyotis terminalis* (manono), *Melicope clusiifolia* (kolokolo mokihana), *Melicope* spp. (alani), *Peperomia obovatilimba* (ala ala wai nui), *Psychotria mariniana* (kopiko), *Tetraplasandra oahuensis* (ohe ohe), or *Vaccinium* spp. (ohelo). *Clermontia samuelii* ssp. *samuelii* is found in wet *Metrosideros polymorpha* and *M. polymorpha-Cheirodendron trigynum* forest and containing one or more of the following native plant species: *Hedyotis hillebrandii*, *Hedyotis* spp. (NCN), *Cibotium* spp., *Broussaisia arguta*, *Dubautia* spp., *Diplazium sandwichianum*, *Rubus hawaiiensis* (akala), *Clermontia arborescens* ssp. *waihia* (oha wai), *Clermontia* spp. (oha wai), *Vaccinium* spp., *Carex alligata*, or *Melicope* spp. (Service 2001; K. Wood, *in litt.* 2000; HINHP Database 2001; 64 FR 48307; R. Hobdy *et al.*, pers. comm., 2001).

Threats to *Clermontia samuelii* ssp. *hanaensis* include habitat degradation and destruction by feral pigs (*Sus scrofa*) and competition with alien plant species such as *Tibouchina herbacea* (glorybush), *Paspalum urvillei* (vasey grass), *Paspalum conjugatum* (Hilo grass), *Juncus* spp. (NCN), *Hedychium coronarium* (white ginger), or *Hedychium gardnerianum* (Kahili ginger). In addition, two extremely invasive alien plant species, *Miconia calvescens* (velvet tree) and *Clidemia hirta* (Koster's curse), are found in nearby areas and may invade this habitat if not controlled. The habitat of *C. samuelii* ssp. *samuelii* was extensively damaged by pigs in the past, and pigs are still a major threat to the populations on State owned lands. The population within the National Park has been fenced and pigs have been eradicated. However, due to the large populations of pigs in adjacent areas, the park populations must constantly be monitored to prevent further ingress.

Competition with alien plant species such as *Holcus lanatus* (velvet grass) and *Juncus planifolius* (NCN) is a major threat to this subspecies. In addition, rats (mainly black rats (*Rattus rattus*)) and slugs (mainly *Milax gagetes*) are known to eat leaves, stems, and fruits of other members of this genus, and therefore are a potential threat to both subspecies (Service 2001; 64 FR 48307; K. Wood *in litt.* 2000).

Cyanea copelandii ssp. *haleakalaensis* (haha)

Cyanea copelandii ssp. *haleakalaensis*, a short-lived perennial member of the bellflower family (Campanulaceae), is a vine-like shrub with sprawling stems and tan latex (sap). This subspecies is differentiated from the other subspecies by its shorter elliptical leaves. The species differs from others in this endemic Hawaiian genus by the vine-like stems and the yellowish flowers that appear red due to the covering of hairs (Service 2001; Lammers 1999).

Little is known about the life history of *Cyanea copelandii* ssp. *haleakalaensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 2001; 64 FR 48307).

Historically, *Cyanea copelandii* ssp. *haleakalaensis* was reported from the windward side of Haleakala and from Waikamoi to Kipahulu Valley. Currently, this taxon is known from three populations with a total of 204 individuals on Federal, State, and privately owned land within the East Maui Watershed Partnership in Haiku Uka, the ridge above Kuhiwa Valley, and Kipahulu Valley within Haleakala National Park and Hanawi NAR (Lammers 1999; Service 2001; 64 FR 48307; Warshauer 1998; HINHP Database 2001; GDSI 2001).

Cyanea copelandii ssp. *haleakalaensis* is found on stream banks or wet scree (a sloping mass of rocks at the base of a cliff) slopes or forest understory in montane wet or mesic forests dominated by *Acacia koa* (koa) and *Metrosideros polymorpha* at elevations between 616 and 1,411 m (2,021 and 4,630 ft). Associated species include *Broussaisia arguta*, *Cibotium* spp., *Hedyotis acuminata* (au), *Perrottetia sandwicensis* (olomea), and *Psychotria hawaiiensis* (kopiko ula) (Service 2001; 64 FR 48307; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to this species are habitat degradation and destruction by feral pigs; competition with several

alien plant species; rats; slugs; human activities; and potential extinction due to random environmental events due to small population sizes (Service 2001; 64 FR 48307).

Cyanea glabra (haha)

Cyanea glabra, a member of the bellflower family (Campanulaceae), is a short-lived, perennial shrub, with the leaves of juvenile plants deeply pinnately lobed, while those of the adult plants are more or less entire and elliptical. This species is differentiated from others in this endemic Hawaiian genus by the size of the flower and the pinnately-lobed juvenile leaves (Service 2001; Lammers 1999).

Little is known about the life history of *Cyanea glabra*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 2001; 64 FR 48307).

Historically, *Cyanea glabra* has been reported from West Maui and on Haleakala, East Maui. Currently, this species is known from a single population of 12 individual plants on privately owned land in Kauaula Valley (64 FR 48307; GDSI 2001; HINHP Database 2001).

Cyanea glabra is found on soil and rock stream banks in wet lowland forests dominated by *Acacia koa* and *Metrosideros polymorpha*, at elevations between 413 and 1,572 m (1,355 and 5,156 ft). Associated native plants include *Xylosma hawaiiense* (maua), *Dodonaea viscosa* (aalii), *Psychotria* spp. (kopiko), *Pipturus albidus* (mamaki), *Touchardia latifolia* (olona), *Boehmeria grandis* (akolea), *Clermontia kakeana* (ohai wai), *Cyanea elliptica* (haha), *Perrottetia sandwicensis*, *Coprosma* spp. (pilo), *Cibotium* spp., *Dubautia plantaginea* (naenae), *Cheirodendron trigynum*, *Thelypteris cyatheoides* (palapalaia), *Diplazium* spp. (NCN), and *Sadleria* spp. (amau) (HINHP Database 2001; Joel Lau, Hawaii Natural Heritage Program, pers. comm., 2001; Service 2001; 64 FR 48307; R. Hobdy *et al.*, pers. comm., 2001).

The threats to this species are slugs; habitat degradation and destruction by feral pigs; flooding; competition with several alien plant species; rats; the two-spotted leafhopper (*Saphonia rufofascia*); and extinction caused by random environmental events due to the small number individuals in the only remaining population (Service 2001; 64 FR 48307).

Cyanea hamatiflora ssp. *hamatiflora* (haha)

Cyanea hamatiflora ssp. *hamatiflora*, a short-lived perennial and member of the bellflower family (Campanulaceae), is a palm-like tree with tan colored latex. This subspecies is differentiated from the other listed subspecies (*C. hamatiflora* ssp. *carlsonii*) by its longer calyx lobes and shorter individual flower stalks. This species is separated from others in this endemic Hawaiian genus by fewer flowers per inflorescence and narrower leaves (Service 2001; Lammers 1999).

Little is known about the life history of *Cyanea hamatiflora* ssp. *hamatiflora*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 2001; 64 FR 48307).

Historically, *Cyanea hamatiflora* ssp. *hamatiflora* was known from the windward side of Haleakala, stretching from Puu o Kakae to Manawainui. Currently, this taxon is known from seven populations with a total of 12 individuals within the East Maui Watershed Partnership in Honomanu, Wailuaiki, Kipahulu Valley, Koukouai, and Puu Ahulili on State (Koolau and Kipahulu Forest Reserves), Federal (Haleakala National Park), and privately owned lands (Service 2001; Warshauer 1998; GDSI 2001; HINHP Database 2001; 64 FR 48307).

Typical habitat for this taxon is montane wet forest dominated by *Metrosideros polymorpha*, with a *Cibotium* spp. and/or native shrub understory or closed *Acacia koa*-*M. polymorpha* wet forest containing one or more of the following associated native plant species: *Dicranopteris linearis*, *Cheirodendron trigynum*, *Broussaisia arguta*, *Cyanea aculeatiflora* (haha), *Cyanea kunthiana* (haha), *Vaccinium* spp., *Melicope* spp., *Athyrium microphyllum* (akolea), *Diplazium sandwichianum*, and *Myrsine* spp. (kolea) at elevations between 767 and 1,553 m (2,515 and 5,095 ft) (Service 2001; 64 FR 48307; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The threats to this species are habitat degradation and destruction by feral pigs; landslides; competition with the alien plant *Ageratina adenophora* (Maui pamakani); rats; and slugs (Service 2001; 64 FR 48307).

Cyanea mceldowneyi (haha)

Cyanea mceldowneyi, a member of the bellflower family (Campanulaceae), is a short-lived, unbranched perennial shrub with rough to prickly stems. This

species is distinguished from other species of *Cyanea* by the combination of a densely armed trunk; long (40 mm (1.6 in)), white-colored corollas; and leaf blade size and shape (Service 2001; Lammers 1999).

Little is known about the life history of *Cyanea mceldowneyi*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (57 FR 20772; Service 1997).

Historically, *Cyanea mceldowneyi* was known from rainforest west of Waikamoi to Honomanu on northwestern Haleakala. Currently, this species is known from six populations with a total of 36 individuals on State (Makawao Forest Reserve and Hanawi NAR) and privately owned lands within the East Maui Watershed Partnership at Kahakapao Gulch, Opana Gulch, Waikamoi, Puohokamo, Makapipi, and the flats above Kuhiwa Valley (Lammers 1999; Warshauer 1998; GDSI 2001; HINHP Database 2001; Service 1997; 57 FR 20772).

The habitat of this species is montane wet and mesic forest with mixed *Metrosideros polymorpha*-*Acacia koa* containing one or more of the following associated native plant species: *Melicope clusiifolia*, *Hedyotis* spp., *Clermontia arborescens*, *Diplazium sandwichianum*, *Broussaisia arguta*, *Cibotium* spp., *Cyrtandra* spp. (haiwale), *Dicranopteris linearis*, or *Cheirodendron trigynum* at elevations between 779 and 1,357 m (2,555 and 4,453 ft) (Service 1997; 57 FR 20772; R. Hobdy *et al.*, pers. comm., 2001).

The threats to this species are habitat degradation and physical destruction by feral pigs; small number of populations and individuals; human activities; and competition with alien plant species, especially *Setaria palmifolia* (palmgrass) (Service 1997; 57 FR 20772).

Dubautia plantaginea ssp. *humilis* (naenae)

Dubautia plantaginea ssp. *humilis*, a short-lived perennial of the aster family (Asteraceae), is a dwarf shrub less than 80 cm (30 in) tall with hairless or strigillose (bulbous-based hairs, all pointing in the same direction) stems. This species differs from other Hawaiian members of the genus by the number of nerves in the leaves and by the close resemblance of the leaves to the genus *Plantago*. The subspecies *humilis* differs from the other two subspecies (*D. plantaginea* ssp. *magnifolia* and *Dubautia plantaginea* ssp. *plantaginea*) by having fewer heads per inflorescence, but more florets per head (Service 2001; Carr 1985; Carr 1999b).

Little is known about the life history of *Dubautia plantaginea* ssp. *humilis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 2001; 64 FR 48307).

Dubautia plantaginea ssp. *humilis* has only been reported from Iao Valley, on West Maui. This population with 60 to 65 individuals occurs on privately owned land (GDSI 2001; HINHP Database 2001; Service 2001; 64 FR 48307).

The typical habitat of the species is wet, barren, steep, rocky, wind-blown cliffs containing one or more of the following associated native plant species: *Metrosideros polymorpha*, *Pipturus albidus*, *Eragrostis variabilis* (kawelu), *Carex* spp. (NCN), *Hedyotis formosa* (NCN), *Lysimachia remyi* (kolokolo kuahiwi), *Bidens* spp. (kookoolau), *Pritchardia* spp. (loulou), or *Plantago princeps* (laukahi kuahiwi) and elevations between 266 and 1,593 m (873 and 5,226 ft) (Service 2001; 64 FR 48307; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

Threats to *Dubautia plantaginea* ssp. *humilis* include landslides and competition from alien plant species. Random environmental events, such as landslides, are a threat because of the limited number of individuals and populations and their narrow distribution (Service 2001; 64 FR 48307).

Geranium arboreum (nohoanu)

Geranium arboreum, a long-lived perennial and a member of the geranium family (Geraniaceae), is a many branched, spreading, woody shrub about 1.8 to 3.7 m (6 to 12 ft) tall. This species can be distinguished from other *Geranium* species by its red petals with the upper three petals erect and the lower two reflexed, causing the flower to appear curved (Wagner *et al.* 1999).

Geranium arboreum is the only species in its genus that appears to be adapted to bird-pollination. Native honeycreepers appear to be a major pollination vector. *Geranium arboreum* from the southwest area of Haleakala in the Kula Forest Reserve produce seeds that are larger and fuller than seeds from the northwest extension of its distribution. Native honeycreepers are reasonably abundant in both areas. Little else is known about the life history of *Geranium arboreum*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Funk 1982; 1988; Service 1997; 57 FR 20772).

The original range and abundance of the species is unknown, but late 19th and early 20th century collections indicate that it once grew on the southern slopes of Haleakala and that its distribution on the northern slopes extended beyond its presently known range. Currently, there are seven populations totaling 158 individuals, within the East Maui Watershed Partnership on State (Kula and Kahikinui Forest Reserves), private and federally owned or leased (Haleakala National Park) lands. These populations are found in Kahua, Kanahau, Waiohuli, Kaipoioi Gulch, Hapapa Gulch, Keauaiwi Gulch, Kalialinui, and south of Puu Luau and east of Puu Nianiau (Warshauer 1998; HINHP Database 2001; GDSI 2001; Service 1997; 57 FR 20772).

Geranium arboreum grows in steep, damp, and shaded narrow canyons and gulches, steep banks, and intermittent streams in *Sophora chrysophylla* (mamane) subalpine dry shrubland or *Metrosideros polymorpha* montane forest and containing one or more of the following associated native plant species: *Vaccinium reticulatum* (ohelo ai), *Dodonaea viscosa*, *Styphelia tameiameia*, *Rubus hawaiiensis*, or *Dryopteris wallichiana* (io nui) and elevations between 1,451 and 2,184 m (4,760 and 7,164 ft) (Service 1997; 57 FR 20772; R. Hobdy *et al.*, pers. comm., 2001).

The greatest immediate threat to the survival of this species is the encroachment and competition from naturalized, exotic vegetation, chiefly grasses and trees. Soil disturbance, caused by trampling cattle and rooting by feral pigs, also is a major threat as it destroys plants and facilitates the encroachment of competing species of naturalized plants. Other less important threats include browsing by cattle; fires; and pollen from exotic pine trees, which at times of the year completely cover the stigmas of the geraniums, precluding any fertilization by its own species. The small number of individual plants increases the potential for extinction from random environmental events, and the limited gene pool may depress reproductive vigor (Funk 1982, 1988; 57 FR 20772; Service 1997).

Geranium multiflorum (nohoanu)

Geranium multiflorum, a long-lived member of the geranium family (Geraniaceae), is a perennial many-branched shrub 1 to 3 m (3 to 10 ft) tall. Flowers are in clusters of 25 to 50, and have 5 white petals that are 10 to 15 mm (0.4 to 0.6 in) long with purple veins or bases. This species is distinguished from others of the genus by its white,

regularly symmetrical flowers and by the shape and pattern of teeth on its leaf margins (Wagner *et al.* 1999).

Little is known about the life history of *Geranium multiflorum*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

Historically, *Geranium multiflorum* was known from Ukulele, Waieleele, and Waiapanapa on East Maui. This species is now known from Federal (Haleakala National Park), State (Hanawi NAR and Koolau Forest Reserve), and private lands within the East Maui Watershed Partnership in Haiku Ula, Kalialinui, Koolau Gap, Koolau Gap near Haiku Ula, between East Waiuaki and Kopiliula Streams, near Puu Alaea along Kalapawili Ridge, Kipahulu Valley, Waiakeehea, and Haleakala Crater. The eight known populations extend over a distance of about 10.5 by 5.5 km (6.5 by 3.5 mi). Due to the inaccessibility of the populations, and the difficulty in determining the number of individuals (due to the plant's multi-branched form), the total number of individuals of this species is not known; however, it probably does not exceed 3,000 plants (Warshauer 1998; GDSI 2001; Service 1997; 57 FR 20772; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

Geranium multiflorum is found in wet or mesic *Metrosideros polymorpha* montane forest or alpine mesic forest, *Styphelia tameiameia* shrubland, *Sophora chrysophylla* subalpine dry forest, open sedge swamps, fog-swept lava flows, or montane grasslands containing one or more of the following associated native plant species: *Coprosma montana* (pilo), *Dryopteris glabra* (hohui), *Dryopteris wallichiana*, *Rubus hawaiiensis*, *Vaccinium* spp., *Hedyotis* spp., or *Sadleria cyathoides* (amau) at elevations between 1,499 and 2,710 m (4,918 and 8,890 ft) (Wagner *et al.* 1999; HINHP Database 2001; Service 1997; 57 FR 20772).

The major threat to *Geranium multiflorum* is competition with encroaching alien plant species, particularly *Rubus argutus* (prickly Florida blackberry). A potential threat is habitat destruction by feral pigs and goats in unfenced areas (Service 1997; 57 FR 20772).

Kanaloa kahoowawensis (kohe malama malama o kanaloa)

Kanaloa kahoowawensis, a short-lived perennial and a member of the legume family (Fabaceae), is a densely branched shrub 0.75 to 1 m (2.5 to 3.5 ft) tall. The

leaves are divided into three pairs of leaflets, with a leaf nectary (nectar-bearing gland) at the joint between each pair of leaflets. One to three inflorescences are found in the leaf axils (joint between leaf and stem), developing with the flush of new leaves. The inflorescence is a globose head with 20 to 54 white flowers. Up to four fruits develop in each flowering head. The fruit is egg-shaped to subcircular, compressed, hairy at the base, and open along two sides. One heart-shaped, brown seed, 1.0 to 1.4 by 1.1 to 1.6 cm (0.4 to 0.5 by 0.4 to 0.6 in), is found in each fruit. There is no other species of legume in Hawaii that bears any resemblance to this species, which is the only one in this genus (Service 2001; Lorence and Wood 1994).

Little is known about the life history of *Kanaloa kahoowawensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 2001; 64 FR 48307).

Kanaloa kahoowawensis was unknown to science until its discovery by Steve Perlman and Ken Wood of NTBG in 1992 on a steep rocky spire on the coast of Kahoolawe. The only known location of *Kanaloa kahoowawensis* is this rocky stack on the southern coast of the island of Kahoolawe, which is owned by the State of Hawaii. While there are no previous records of the plant, pollen core studies on the island of Oahu revealed a legume pollen that could not be identified but is most likely this species. The pollen cores indicate that this previously unidentified species was a codominant with *Dodonaea viscosa* and *Pritchardia* spp. from before 1210 B.C. to 1565 A.D., at which point *K. kahoowawensis* disappeared from the pollen record and *D. viscosa* and *Pritchardia* spp. declined dramatically. Only one population with two living individuals is known (Athens *et al.* 1992; Athens and Ward 1993; Lorence and Wood 1994; Paul Higashino, Kahoolawe Island Reserve Commission (KIRC), pers. comm., 2000; Service 2001; 64 FR 48307).

The only known habitat is steep rocky talus slopes in mixed coastal shrubland at elevations between 45 to 60 m (150 to 200 ft) and containing one or more of the following associated native plant species: *Sida fallax* (ilima), *Senna gaudichaudii* (kolomona), *Bidens mauiensis* (kookoolau), *Lipochaeta lavarum* (nehe), *Portulaca molokiniensis* (ihi), or *Capparis sandwichiana* (maiapilo) (Service 2001; 64 FR 48307; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to *Kanaloa kahoolawensis* are landslides and competition with the alien plant species *Emilia fosbergii* (pualele), *Chloris barbata* (swollen finger grass), or *Nicotiana glauca* (tobacco tree). Goats played a major role in the destruction of vegetation on Kahoolawe before they were removed, and *K. kahoolawensis* probably survived only because the rocky stack is almost completely separated from the island and inaccessible to goats. Rats are a potential threat to *K. kahoolawensis*, because the species has seeds similar in appearance and presentation to the seeds of the federally endangered *Caesalpinia kavaiensis* (uhiuhi), which are eaten by rats. Rats may have been the cause of the decline of this species 800 years ago. Trampling and habitat degradation from introduced cats and native seabirds are also potential threats. Random environmental events and reduced reproductive vigor are also threats to this species, because only two individuals are known (P. Higashino, pers. comm., 2000; Cuddihy and Stone 1990; Lorence and Wood 1994; Service 2001; 64 FR 48307).

Lipochaeta kamolensis (nehe)

Lipochaeta kamolensis, a short-lived perennial herb of the aster family (Asteraceae), has trailing or climbing stems that are woody at the base and reach a length of 0.3 to 3 m (1 to 10 ft). This species is distinguished from others of the genus by the simple leaves which are pinnately lobed or cut and by the size of the flower heads (Wagner *et al.* 1999).

Lipochaeta kamolensis has been observed flowering from December through February, as well as in April. The growing season coincides with the wet season between November and April to May. Plants are deciduous and appear to be metabolically inactive during the dry season. Little else is known about the life history of *Lipochaeta kamolensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

Historically, *Lipochaeta kamolensis* was known from Kamole Gulch, west of Kepuni Gulch, and 7.2 km (11.8 mi) southeast of Ulupalakua Ranch Office. This species still occurs in Kamole Gulch, on State owned (Department of Hawaiian Home Lands) land. The only known population, which extends over an area of about 40 ha (100 ac), is estimated to contain less than 500 individuals (Wagner *et al.* 1999; GDSI

2001; HINHP Database 2001; K. Wood, *in litt.* 1999; Service 1997; 57 FR 20772).

Lipochaeta kamolensis typically grows in gulches or on gentle slopes outside gulches in dry shrubland at elevations between 40 and 602 m (132 and 1,974 ft) and containing one or more of the following associated native plant species: *Dodonaea viscosa*, *Plumbago zeylanica* (iliee), or *Ipomoea indica* (koali awa) (Wagner *et al.* 1999; K. Wood, *in litt.* 1999; Service 1997; 57 FR 20772; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to *Lipochaeta kamolensis* are habitat destruction and predation by cattle and goats, competition with alien plants such as *Lantana camara* (lantana), fire, and the one population subject to extinction by random environmental events (57 FR 20772; Service 1997).

Melicope adscendens (alani)

Melicope adscendens, a long-lived perennial of the rue family (Rutaceae), is a sprawling shrub with long, slender branches covered with gray hairs when young, which become hairless when older. *M. adscendens* is distinguished from other species of the genus by its growth habit, the distinct follicles of its fruit, and the persistent (remaining attached) sepals and petals (Stone *et al.* 1999).

Melicope adscendens fruits have been collected in March and July. Little else is known about the life history of *Melicope adscendens*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 59 FR 62346).

Melicope adscendens has been found only on the southwestern slope of Haleakala; two plants, separated by an unspecified distance, were found by Forbes in 1920. Today, there are two known populations with a total of 16 individuals on State (Kanaio NAR) and privately owned lands at Puu Ouli and on the border of the Hana and Makawao Districts (GDSI 2001; HINHP Database 2001; Service 1997; 59 FR 62346).

This species typically grows on aa lava (a particular type of lava flow with very sharp edges) with pockets of soil in *Nestegis sandwicensis* (olopua)-*Pleomele auwahiensis* (hala pepe)-*Dodonaea viscosa* lowland mesic forest or open dry forest and containing one or more of the following associated native plant species: *Osteomeles anthyllidifolia* (ulei), *Alphitonia ponderosa* (kauila), *Chamaesyce celastroides* var. *lorifolia* (akoko), *Santalum ellipticum* (iliahialoe), *Pouteria sandwicensis* (alaa), *Styphelia tameiameia*, or

Xylosma hawaiiensis (maua) at elevations between 761 and 1,209 m (2,497 and 3,967 ft) (HINHP Database 2001; K. Wood, *in litt.* 1999; Service 1997; 59 FR 62346; R. Hobdy *et al.*, pers. comm., 2001).

Major threats are habitat damage and trampling by cattle; competition with alien plant species, including *Lantana camara*, *Bocconia frutescens* (NCN), and *Pennisetum clandestinum* (kikuyu grass), and reduced reproductive vigor or extinction from random environmental events due to the small number of individuals and narrow distribution. Potential threats include habitat degradation and damage to plants by axis deer (*Axis axis*), feral goats, feral pigs, black twig borer, fire, and ranch activities (Service 1997; 59 FR 62346; HINHP Database 2001).

Melicope balloui (alani)

Melicope balloui, a long-lived perennial of the rue family (Rutaceae), is a small tree or shrub. New growth has yellowish brown woolly hairs and waxy scales; plant parts later become nearly hairless. *Melicope balloui* is distinguished from other species of the genus by the partially fused carpels of its four-lobed capsule and usually persistent sepals and petals (Stone *et al.* 1999).

Little is known about the life history of *Melicope balloui*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 59 FR 62346).

Melicope balloui has been found only on the northern and southeastern slopes of Haleakala. There are two known populations with a total of approximately 50 individuals on private and federally owned (Haleakala National Park) lands within the East Maui Watershed Partnership at Puu O Kakae and Palikea Stream (GDSI 2001; HINHP Database 2001; K. Wood, *in litt.* 1999; Service 1997; 59 FR 62346).

Melicope balloui typically grows in mesic to wet forest between 781 and 1,596 m (2,561 and 5,235 ft), containing one or more of the following associated native plant species: *Acacia koa*, *Cibotium chamissoi* (hapuu), *Cibotium glaucum* (hapuu), *Diplazium sandwichianum*, *Melicope clusiifolia*, *Metrosideros polymorpha*, or *Sadleria pallida* (amau) (HINHP Database 2001; J. Lau, pers. comm., 2001; Service 1997; 59 FR 62346).

Major threats are habitat degradation and damage to plants by feral pigs and axis deer and reduced reproductive vigor or extinction caused by random environmental events due to the small

number of existing populations and individuals. Potential threats include competition with alien plant species such as *Paspalum conjugatum*, *Clidemia hirta*, *Paspalum urvillei*, *Andropogon virginicus* (broomsedge), and *Psidium cattleianum* (strawberry guava); susceptibility to black twig borer (*Xylosandrus compactus*); and predation by rats (59 FR 62346; Service 1997; HINHP Database 2001).

Melicope ovalis (alani)

Melicope ovalis, a long-lived perennial of the rue family (Rutaceae), is a tree growing up to 5 m (16 ft) tall. New growth has fine, short, brownish hairs, but soon becomes hairless. Leaves are opposite, leathery, and broadly elliptic. The upper and lower surfaces of the leaves are hairless, and bruised foliage has an anise odor similar to that of *M. anisata* (mokihana). Each flower cluster is on a main stalk and comprises three to seven flowers on individual stalks. Further details of the flowers are unknown. The fruit, a capsule, has carpels that are fused along almost their entire length. Each fertile carpel contains one or two glossy black seeds. The exocarp and endocarp are both hairless. *M. ovalis* is distinguished from other species of the genus by the almost entirely fused carpels of its capsule, its nonpersistent sepals and petals, and its well-developed petioles (Stone *et al.* 1999).

Little is known about the life history of *Melicope ovalis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 59 FR 62346).

Melicope ovalis has been found only on the eastern and southeastern slopes of Haleakala. There is one known population with approximately 200 individuals, found on federally owned land along the Palikea Stream in Haleakala National Park within the East Maui Watershed Partnership (GDSI 2001; HINHP Database 2001; K. Wood, *in litt.* 1999; Service 1997; 59 FR 62346).

This species typically grows in *Acacia koa* and *Metrosideros polymorpha*-dominated montane wet forests along streams at elevations between 753 and 1,537 m (2,469 and 5,042 ft). Associated plant species include *Dicranopteris linearis*, *Machaerina angustifolia* (uki), *Labordia hedyosmifolia* (NCN), *Wikstroemia oahuensis* (akia), *Dubautia plantaginea*, *Hedyotis hillebrandii*, *Broussaisia arguta*, *Cheirodendron trigynum*, or *Perrottetia sandwicensis* (Service 1997; 59 FR 62346; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

Major threats to the only known population are habitat degradation and damage to plants by feral pigs and reduced reproductive vigor and/or extinction due to random environmental events. Competition with introduced plants such as *Paspalum conjugatum*, *Clidemia hirta*, *Rubus rosifolius* (thimbleberry), and *Psidium cattleianum*; seed predation by rats; and susceptibility to black twig borer are also threats to this species. Habitat degradation and damage to plants by feral goats and axis deer are potential threats if the integrity of the fence currently surrounding the population is compromised (Service 1997; 59 FR 62346; HINHP Database 2001; K. Wood, *in litt.* 1999).

Remya mauiensis (NCN)

Remya mauiensis is a short-lived perennial member of the aster family (Asteraceae). The genus *Remya* is endemic to the Hawaiian Islands. It is a small perennial shrub, about 90 cm (3 ft) tall, with many slender, sprawling, or scandent to weakly erect branches, covered with a fine tan fuzz near their tips. The leaves are narrow, up to about 15 cm (6 in) long, and are bunched at the ends of the branches. The coarsely toothed leaf blade is 5 to 12 times longer than wide, has a long-attenuate base, and a petiole of less than 1 cm (0.4 in) long. The leaves are green on the upper surface and covered with a dense mat of fine white hairs on the lower surface. The flowers are small, about 0.7 cm (0.3 in) in diameter, dark yellow, and densely clustered at the ends of their stems (Wagner *et al.* 1999).

Little is known about the life history of *Remya mauiensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 56 FR 1450).

Remya mauiensis was collected twice by William Hillebrand on West Maui between 1851 and 1871, and again in 1920 by Charles Forbes, also on West Maui. It was thought to be extinct until its rediscovery in 1971 by L.E. Bishop, W. Gagne, and S. Montgomery on the slopes of Manawainui Gulch, West Maui. Currently, *R. mauiensis* is known from three small populations on State owned land within the West Maui Mountains Watershed Partnership at Paupau, Kokuula, Kanaulaiki, and Maunawainui Gulch in the Panaewa section of the West Maui NAR, the West Maui Forest Reserve, and the Manawainui Plant Sanctuary. Because of the sprawling habit of this species, and the often dense growth of the surrounding vegetation, it is difficult to

determine the exact number of individuals in a population; however, there is an estimate of 21 individuals (HINHP Database 2001; GDSI 2001; Service 1997; 56 FR 1450).

Remya mauiensis grows chiefly on steep, north or northeast-facing slopes in mixed mesophytic forests or *Metrosideros polymorpha* montane wet forests and containing one or more of the following associated native species: *Diospyros sandwicensis* (lama), *Xylosma hawaiiensis*, *Nestegis sandwicensis*, *Myrsine lessertiana* (kolea lau nui), *Wikstroemia* spp. (akia), *Dodonaea viscosa*, *Diplazium sandwichianum*, *Lysimachia remyi*, *Microlepia strigosa* (palapalai), *Melicope* spp., *Alyxia oliviformis* (maile), *Pleomele auwahiensis*, *Psychotria mariniana*, or *Styphelia tameiameia* at elevations between 400 and 1,228 m (1,312 and 4,029 ft) (HINHP Database 2001; Service 1997; 56 FR 1450; R. Hobdy *et al.*, pers. comm., 2001).

This species is threatened by extinction due to random catastrophic environmental events by virtue of the extremely small size of the populations coupled with a limited distribution of the remaining populations. The limited gene pool may depress reproductive vigor, or a single environmental disturbance could destroy a significant percentage of the known individuals. However, the primary threat to this species is the loss and degradation of its habitat due to the introduction of alien plants, such as *Rubus rosifolius*, *Schinus terebinthifolius* (Christmas berry), *Adiantum hispidulum* (rough maidenhair fern), or *Tibouchina herbacea*; human activities; and feral goats and pigs (56 FR 1450; Service 1997).

Schiedea haleakalensis (NCN)

Schiedea haleakalensis, a short-lived perennial of the pink family (Caryophyllaceae), is a hairless shrub, with slightly fleshy, narrow leaves and a single vein. Flowers are arranged in clusters at the ends of the branches. The flower has five green, oval sepals; no petals; five nectaries; and ten stamens. Capsules contain grayish to reddish brown seeds. This species differs from other species of the genus on East Maui by its crowded, hairless inflorescence composed of bisexual flowers (Wagner *et al.* 1999).

Schiedea haleakalensis is gynodioecious (individuals either have only female flowers or only perfect flowers) and so likely needs cross pollination by small insects. Small, short-flighted flies and moths have been observed visiting flowers. Fruits and seeds have been observed from August

through September. Little else is known about the life history of *Schiedea haleakalensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

Due to the lack of early collections or sightings, the historical range of *Schiedea haleakalensis* is unknown. This species is known only from Lelewi Pali and Kaupo Gap in Haleakala National Park within the East Maui Watershed Partnership. The two populations are estimated to contain a total of 100 to 200 individuals, which together extend over a total area of 11 ha (28 ac) (GDSI 2001; HINHP Database 2001; Service 1997; 57 FR 20772).

Schiedea haleakalensis typically grows in rock cracks on sheer cliffs adjacent to barren lava and subalpine shrublands and grasslands with cinder, weathered volcanic ash, or bare lava substrate with little or no soil development and periodic freezing temperatures and containing one or more of the following associated plant species: *Artemisia mauiensis* (hinahina), *Bidens micrantha* (kookoolau), *Dubautia menziesii*, *Styphelia tameiameia*, *Vaccinium reticulatum*, or *Viola chamissoniana* (pamakani) at elevations between 1,678 and 2,434 m (5,505 and 7,986 ft) (Service 1997; 57 FR 20772; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The greatest threats to *Schiedea haleakalensis* are fire and other catastrophic events that could severely impact the species due the small number and restricted distribution of remaining individuals and populations (Service 1997; 57 FR 20772).

Tetramolopium capillare (pamakani)

Tetramolopium capillare, a short-lived perennial of the sunflower family (Asteraceae), is a sprawling shrub with stems measuring 50 to 80 cm (20 to 31 in) long and covered with many glands when young. The very firm, stalkless leaves are involute (edges rolled under). Flower heads are situated singly at the ends of stalks. Located beneath each flower head are 45 to 50 bracts, arranged in a structure 3 to 4 mm (about 0.1 in) high and 7 to 10 mm (0.3 to 0.4 in) in diameter. In each flower head, 30 to 50 white, male ray florets are surrounded by 15 to 25 greenish yellow tinged with red, functionally female florets. The achenes (dry, one-seeded fruits) are topped by a white pappus comprising a single series of bristles. *Tetramolopium capillare* differs from other species of the genus by its very firm leaves with edges rolled under, its solitary flower

heads, the color of its disk florets, and its shorter pappus. It differs from *T. remyi*, with which it sometimes grows, by its more sprawling habit and the shorter stalks of its smaller flower heads (Lowrey 1999).

Little is known about the life history of *Tetramolopium capillare*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Lowrey 1999).

Historically, *Tetramolopium capillare* is known from Lahaina Luna to Wailuku on West Maui. Currently, four known populations with a total of 166 individuals are known from State (West Maui Forest Reserve) and privately owned lands within the West Maui Mountains Watershed Partnership, south of Kanaha Stream, Kauaula, Ulaula, and Koia (Lowrey 1999; GDSI 2001; Service 1997; 59 FR 49860).

Tetramolopium capillare typically grows on rocky substrates in *Heteropogon contortus* (pili grass) lowland dry forest containing one or more of the following associated native plant species: *Dodonaea viscosa* or *Myoporum sandwicense* (naio); or in *Metrosideros polymorpha*-*Styphelia tameiameia* montane mesic or wet shrubland and wet cliff faces and containing one or more of the following associated plant species: *Metrosideros polymorpha*, *Styphelia tameiameia*, or *Dodonaea viscosa* at elevations between 131 and 1,432 m (430 and 4,698 ft) (Service 1997; 59 FR 49860; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to *Tetramolopium capillare* are fires; competition from alien plant species, particularly *Lantana camara*, *Leucaena leucocephala* (koa haole), or *Melinis repens* (natal redbtop); and reduced reproductive vigor and/or extinction from random environmental events due to the small number of existing populations and individuals (Service 1997; 59 FR 49860).

Multi-Island Species

Acaena exigua (liliwai)

Acaena exigua is a small perennial rosette herb in the rose family (Rosaceae) with narrow, fern-like, divided leaves and slender flowering stalks 5–15 cm (2–5.9 in) long. It is easily hidden among the other low, tufted bog plants with which it grows. The narrow, oblong leaves are usually 10–25 mm (0.4–1.0 in) long with 6–17 leaflets 1–4 mm (0.04–0.16 in) long and 1–2 mm (0.04–0.08 in) wide. The leaflet on the end is wider (to 3 mm (0.12 in)). The upper surface of the leaves is glossy with conspicuous veins; the lower

surface is whitish. The flowers lack petals and are arranged in short, dense spikes 5–10 mm (0.2–0.4 in) long held on slender, sparsely leafy stalks 5–15 cm (2–6 in) tall. The base of the flower is urn-shaped, sometimes with very short spines or bristles, and encloses a single cone-shaped dry fruit (achene) 1 mm (0.04 in) long (Wagner *et al.* 1999).

Little is known about the life history of *Acaena exigua*. Its flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

Historically, *Acaena exigua* was known from Puu Kukui on West Maui and from Mount Waialeale on Kauai. On Maui, *Acaena exigua* was last seen by Hank Oppenheimer and Steve Perlman in 1999 within the Puu Kukui Watershed Management Area. It has not been seen in the wild since March 2000 (Hank Oppenheimer, Maui Pineapple Company Limited, pers. comm., 2001; Service 1997; 57 FR 20772).

Acaena exigua is known only from montane bogs characterized by a thick peat substrate overlying an impervious clay substrate, with hummocks of sedges and grasses, stunted trees, and shrubs at elevations between 1,178 and 1,764 m (3,865 and 5,787 ft). Associated native species include the sedges and grasses *Carex montis-eke* (NCN), *Deschampsia nubigena*, *Dichanthelium cynodon* (NCN), *Dichanthelium hillebrandianum* (NCN), *Dichanthelium isachnoides* (NCN), *Oreobolus furcatus* (NCN), or *Rhynchospora chinensis* (kuolohia), and the shrubs *Metrosideros polymorpha*, *Viola maviensis* (pamakani), *Myrsine* spp., *Lagenifera maviensis* (NCN), or *Vaccinium* spp. (Service 1997; 57 FR 20772; R. Hobdy *et al.*, pers. comm., 2001).

The reason for the disappearance of this species is not known. The main current threats to *Acaena exigua*, if it exists, are believed to include small population size; human impacts (collecting and site degradation); potentially consumption of vegetative or floral parts of this species by non-native slugs and/or rats; predation and habitat disturbance by feral pigs; and non-native plant species (Service 1997; 57 FR 20772).

Adenophorus periens (pendant kiki fern)

Adenophorus periens, a member of the grammitis family (Grammitidaceae) and a short-lived perennial, is a small, pendant, epiphytic fern. This species differs from other species in this endemic Hawaiian genus by having hairs along the pinna margins, by the

pinnae being at right angles to the midrib axis, by the placement of the sori on the pinnae, and the degree of dissection of each pinna (Linney 1989).

Little is known about the life history of *Adenophorus periens*, which seems to grow only in closed canopy dense forest with high humidity. Its breeding system is unknown, but outbreeding is very likely to be the predominant mode of reproduction. Spores are dispersed by wind, possibly by water, and perhaps on the feet of birds or insects. Spores lack a thick resistant coat which may indicate their longevity is brief, probably measured in days at most. Due to the weak differences between the seasons, there seems to be no evidence of seasonality in growth or reproduction. Additional information on reproductive cycles, longevity, specific environmental requirements, and limiting factors is not known (Linney 1989).

Historically, *Adenophorus periens* was reported from Kauai, Oahu, Lanai, Maui, and the island of Hawaii. Currently, it is known from Kauai, Molokai, and Hawaii. On Maui, it has not been seen in the wild since 1929 (HINHP Database 2001; Service 1999; 59 FR 56333; GDSI 2001).

Nothing is known of the preferred habitat of or native plant species associated with *Adenophorus periens* on the island of Maui (Service 1999; 59 FR 56333).

Nothing is known of the threats to *Adenophorus periens* on the island of Maui (Service 1999; 59 FR 56333).

Alectryon macrococcus (mahoe)

Alectryon macrococcus, a long-lived perennial and a member of the soapberry family (Sapindaceae), consists of two varieties, *macrococcus* and *auwahiensis*, both trees with reddish-brown branches and net-veined paper- or leather-like leaves with one to five pairs of sometimes asymmetrical egg-shaped leaflets. The underside of the leaf has dense brown hairs, only when young in *A. macrococcus* var. *macrococcus*, and persistent in *A. macrococcus* var. *auwahiensis*. The only member of its genus found in Hawaii, this species is distinguished from other Hawaiian members of its family by being a tree with a hard fruit 2.5 cm (1 in) or more in diameter (Service 1997; 57 FR 20772; Wagner et al. 1999).

Alectryon macrococcus is a relatively slow-growing, long-lived tree that grows in xeric to mesic sites and is adapted to periodic drought. Little else is known about the life history of *A. macrococcus*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, and

specific environmental requirements are unknown (Service 1997; 57 FR 20772).

Historically and currently, *Alectryon macrococcus* var. *macrococcus* is known from Kauai, Oahu, Molokai, and Maui. On Maui, three populations with a total of 22 individuals is found along the Honokowai Ditch Trail, Launiupoko Valley, and Iao Valley on privately owned land within the West Maui Mountains Watershed Partnership. Currently, *A. macrococcus* var. *auwahiensis* is known from two populations with 22 individuals on leeward East Maui in Auwahi in the Hana District and on the ridge east of Pahihi Gulch on private and State owned (Kahikinui Forest Reserve) lands (Medeiros et al. 1986; GDSI 2001; HINHP Database 2001; Service 1997; 57 FR 20772).

The habitat of *Alectryon macrococcus* var. *macrococcus* is mesic forests with *Pouteria sandwicensis*, *Nestegis sandwicensis*, *Xylosma* spp. (maua), *Antidesma platyphylla* (hame), *Antidesma pulvinatum* (hame), *Bobea sandwicensis* (ahakea), *Pittosporum confertiflorum* (hoawa), or *Pittosporum glabrum* (hoawa) at elevations between 1,017 and 3,562 m (1,168 and 3,337 ft). The habitat of *A. macrococcus* var. *auwahiensis* is mesic to wetter mesic and upper dryland forest containing one or more of the following associated native plant species: *Diospyros sandwicensis*, *Dodonaea viscosa*, *Osteomeles anthyllidifolia*, *Alphitonia ponderosa*, *Santalum ellipticum*, *Xylosma hawaiiensis*, *Streblus pendulinus* (aiiai), *Pouteria sandwicensis*, or *Pleomele auwahiensis* at elevations between 333 and 1,210 m (1,092 and 3,969 ft) (HINHP Database 2001; K. Wood, *in litt.* 1999; Service 1997; 57 FR 20772; R. Hobdy et al., pers. comm., 2001).

The threats to *Alectryon macrococcus* var. *macrococcus* on Maui include feral goats and pigs; alien plant species, such as *Melinis minutiflora* (molasses grass), *Pennisetum clandestinum*, *Schinus terebinthifolius*, or *Psidium cattleianum*; damage from the black twig borer; seed predation by rats and mice (*Mus musculus*); fire; seed predation by insects (probably the endemic microlepidopteran *Prays* cf. *fulvocanella*); loss of pollinators; depressed reproductive vigor; and due to the very small remaining number of individuals and their limited distribution, a single natural or human-caused environmental disturbance could easily be catastrophic. The threats to *A. macrococcus* var. *auwahiensis* on Maui are damage from the black twig borer; seed predation by rats and mice; habitat degradation by feral pigs, deer,

and escaped cattle; seed predation by insects (probably *Prays* cf. *fulvocanella*); alien plant species; loss of pollinators; depressed reproductive vigor; and due to the very small remaining number of individuals and their limited distribution, a single natural or human-caused environmental disturbance could easily be catastrophic (Service 1997; 57 FR 20772).

Asplenium fragile var. *insulare* (NCN)

Asplenium fragile var. *insulare*, a short-lived perennial and a member of the spleenwort family (Aspleniaceae), is a fern with a short sub-erect stem with a dull gray or brown main axis with two greenish ridges. This Hawaiian fern species is most similar to *Asplenium macraei*. The two can be distinguished by the size and shape of the pinnae and the number of sori per pinna (Wagner and Wagner 1992).

Little life history information is available for *Asplenium fragile* var. *insulare*. Reproductive cycles, longevity, specific environmental requirements, and limiting factors are unknown. Researchers have collected information on species composition, extent of cover, and age-class structure in six sub-populations at Pohakuloa Training Area in order to describe the populations. No gametophytes (gamete-producing life stage) were found, and the age-class structure of the sub-populations sampled was determined to be 100 percent reproductive adults because all the sporophytes (spore-producing life stage) had sori (spore-bearing structures) on some fronds (Service 1998a; 59 FR 49025).

Asplenium fragile var. *insulare* was known historically and currently from East Maui and on the island of Hawaii. Currently, on Maui there is one population with 18 individuals found in Kalialinui within the East Maui Watershed Partnership on private and federally (Haleakala National Park) owned lands (GDSI 2001; Service 1998a; 59 FR 49025).

On Maui, *Asplenium fragile* var. *insulare* is found in streamside hollows and grottos in gulches that occur in mesic to dry subalpine shrubland dominated by *Styphelia tameiameia* and *Sadleria cyatheoides*, with scattered *Metrosideros polymorpha* between 1,682 and 2,407 m (5,518 and 7,896 ft). Associated native plant species include *Grammitis hookeri* (makue lau lii), and *Dryopteris wallichiana* (Service 1998a; 59 FR 49025; R. Hobdy et al., pers. comm., 2001).

The primary threat to *Asplenium fragile* var. *insulare* on the island of Maui is the risk of extinction due to random naturally occurring events due

to the small number of existing individuals (Service 1998a; 59 FR 49025; Shaw 1992).

Bidens micrantha ssp. *kalealaha* (*ko oko olau*)

Bidens micrantha ssp. *kalealaha*, a short-lived member of the aster family (Asteraceae), is an erect perennial herb. This subspecies can be distinguished from other subspecies by the shape of the seeds, the density of the flower clusters, the numbers of ray and disk florets per head, differences in leaf surfaces, and other characteristics (57 FR 20772; Ganders and Nagata 1999).

Bidens micrantha is known to hybridize with other native *Bidens*, such as *B. mauiensis* and *B. menziesii*, and possibly *B. conjuncta*. Little else is known about the life history of *B. micrantha* ssp. *kalealaha*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, and specific environmental requirements are unknown (Ganders and Nagata 1999; Service 1997; 57 FR 20772).

Historically, *Bidens micrantha* ssp. *kalealaha* was known from Lanai, the south slope of Haleakala on East Maui, and from one locality on West Maui. Currently, this taxon remains only on East Maui in Kahua, Nakula, and Haleakala Crater and Kaupo Gap, on State (Kahikinui Forest Reserve) and Federal (Haleakala National Park) lands within the East Maui Watershed Partnership. There are a total of three populations with less than a total of 2,000 individuals (Ganders and Nagata 1999; HINHP Database 2001; Service 1997; 57 FR 20772; GDSI 2001; HINHP Database 2001).

The habitat of *Bidens micrantha* ssp. *kalealaha* is blocky lava flows with little or no soil development, deep pit craters, and sheer rock walls in open canopy *Metrosideros polymorpha*-*Acacia koa* forest, montane shrubland, *Sophora chrysophylla* forests or cliff faces containing one or more of the following associated native plant species: *Styphelia tameiameia*, *Coprosma montana* (pilo), *Dodonaea viscosa*, *Dubautia platyphylla* (naenae), *Vaccinium reticulatum*, or *Santalum haleakalae* (iliahi) at elevations between 1,317 and 2,565 m (4,321 and 8,414 ft) (Ganders and Nagata 1999; HINHP Database 2001; Service 1997; 57 FR 20772; R. Hobdy *et al.*, pers. comm., 2001).

The threats to this species on Maui are habitat destruction by feral goats, pigs, and cattle; competition from a variety of invasive plant species; and fire (Service 1997; 57 FR 20772).

Bonamia menziesii (NCN)

Bonamia menziesii, a short-lived perennial member of the morning-glory family (Convolvulaceae), is a vine with twining branches that are fuzzy when young. This species is the only member of the genus that is endemic to the Hawaiian Islands and differs from other genera in the family by its two styles, longer stems and petioles, and rounder leaves (Austin 1999).

Little is known about the life history of *Bonamia menziesii*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Historically, *Bonamia menziesii* was known from Kauai, Oahu, Molokai, one location on West Maui, and the island of Hawaii. Currently, this species is known from Kauai, Oahu, Lanai, Maui, and Hawaii. On Maui, there are four populations containing a total of eight individuals on State (Kanaio NAR) and privately owned lands within the West Maui Mountains Watershed Partnership at Honokawai, Keokea, Haunauhane, and Kanaio (GDSI 2001; HINHP Database 2001; K. Wood, *in litt.* 1999; Service 1999; 59 FR 56333).

Bonamia menziesii is found on aa lava in mixed open dry forest, or *Erythrina sandwicensis* (wiliwili) lowland dry forest, and in mesic mixed *Metrosideros polymorpha* forest and containing one or more of the following associated native plant species: *Nestegis sandwicensis*, *Pleomele auwahiensis*, *Dodonaea viscosa*, *Alyxia oliviformis*, *Diospyros sandwicensis*, *Osteomeles anthyllidifolia*, *Alphitonia ponderosa*, *Santalum ellipticum*, *Xylosma hawaiiensis*, *Nothocestrum latifolium* (aiea), *Pouteria sandwicensis*, *Achyranthes splendens* (NCN), *Acacia koaia* (koaia), *Sida fallax*, *Reynoldsia sandwicensis* (ohe), *Sicyos* spp. (anunu), *Lipochaeta rockii* (nehe), *Nototrichium* spp. (kului), or *Myoporum sandwicense* at elevations between 184 and 906 m (604 and 2,971 ft) (HINHP Database 2001; K. Wood, *in litt.* 1999; Service 1999; 59 FR 56333; R. Hobdy *et al.*, pers. comm., 2001).

The primary threats to this species on Maui are habitat degradation and possible predation by feral pigs, goats, axis deer, and cattle; competition with a variety of alien plant species, particularly *Lantana camara* or *Bocconia frutescens*; and an alien beetle (*Physomerus grossipes*) (Service 1999; 59 FR 56333).

Brighamia rockii (*pua ala*)

Brighamia rockii, a long-lived perennial member of the bellflower

family (Campanulaceae), grows as an unbranched stem succulent with a thickened stem that tapers from the base. This species is a member of a unique endemic Hawaiian genus with only one other species, found on Kauai, from which it differs by the color of its petals, its longer calyx (fused sepals) lobes, and its shorter flower stalks (Lammers 1999).

Observations of *Brighamia rockii* have provided the following information: the reproductive system is protandrous, meaning there is a temporal separation between the production of male and female gametes, in this case a separation of several days; only five percent of the flowers produce pollen; very few fruits are produced per inflorescence; there are 20 to 60 seeds per capsule; and plants in cultivation have flowers at an age of 9 months. This species was observed in flower during August. Little else is known about the life history of *Brighamia rockii*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (HINHP Database 2001; Service 1996b; 57 FR 4632).

Historically, *Brighamia rockii* ranged along the northern coast of East Molokai from Kalaupapa to Halawa and may possibly have grown on Lanai and Maui. Currently, it is only extant on Molokai (Lammers 1999; HINHP Database 2001; K. Wood, *in litt.* 2000; Service 1996b; 57 FR 46325).

On Maui, *Brighamia rockii* occurs in rock crevices on steep sea cliffs, often within the spray zone, in coastal dry to mesic forests and shrublands between 0 and 195 m (0 and 640 ft). Associated plant species include *Psydrax odorata* (alahee), *Diospyros sandwicensis*, *Osteomeles anthyllidifolia*, and *Scaevola sericea* (naupaka kahahai) (J. Lau, pers. comm., 2001; Service 1996b; 57 FR 46325).

Nothing is known of the threats to *Brighamia rockii* on the island of Maui (Service 1996b; 57 FR 46325).

Cenchrus agrimonioides (*kamanomano*)

Cenchrus agrimonioides is a short-lived perennial member of the grass family (Poaceae) with leaf blades which are flat or folded and have a prominent midrib. There are two varieties, *C. agrimonioides* var. *laysanensis* and *C. agrimonioides* var. *agrimonioides*. They differ from each other in that var. *agrimonioides* has smaller burs, shorter stems, and narrower leaves. This species is distinguished from others in the genus by the cylindrical to lance-shaped bur and the arrangement and position of the bristles (O'Connor 1999).

Little is known about the life history of *Cenchrus agrimonioides*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown. This species has been observed to produce fruit year round (Service 1999; 61 FR 53108).

Historically, *Cenchrus agrimonioides* var. *agrimonioides* was known from the Oahu, Lanai, and the south slope of Haleakala and Ulupalakua on Maui, and an undocumented report from the Island of Hawaii. Historically, *C.*

agrimonioides var. *laysanensis* was known from Laysan, Kure, and Midway, all within the Northwestern Hawaiian Islands National Wildlife Refuge. This variety has not been seen since 1973. Currently, *C. agrimonioides* var. *agrimonioides* is known from Oahu and Maui. On Maui, this variety is known from two populations on State owned land (West Maui Forest Reserve within the West Maui Mountains Watershed Partnership and Kanaio NAR) at Ukumehame and Kanaio, East Maui containing an unknown number of individuals (Corn 1980; Service 1999; 61 FR 53108; HINHP Database 2001).

Cenchrus agrimonioides var. *agrimonioides* is found in mid-elevation dry forest or *Pleomele-Diospyros* forest associated with *Dodonaea viscosa*, *Osteomeles anthyllidifolia*, *Alyxia oliviformis*, or *Santalum ellipticum* at elevations between 471 and 1,091 m (1,544 and 3,579 ft) (Service 1999; 61 FR 53108; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to the only known population of *Cenchrus agrimonioides* var. *agrimonioides* on Maui are competition with alien plant species; browsing and habitat degradation by goats and cattle; and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of existing individuals (Service 1999; 61 FR 53108).

Centaurium sebaeoides (awiiwi)

Centaurium sebaeoides is an annual herb in the gentian family (Gentianaceae), with fleshy leaves and stalkless flowers. This species is distinguished from *C. erythraea*, which is naturalized in Hawaii, by its fleshy leaves and the unbranched arrangement of the flower cluster (Wagner *et al.* 1999).

Centaurium sebaeoides has been observed flowering in April. Flowering may be induced by heavy rainfall. Populations are found in dry areas, and plants are more likely to be found following heavy rains. Other than that, little is known about the life history of

this plant. Reproductive cycles, longevity, specific environmental regulations, and limiting factors are generally unknown (Service 1999; 56 FR 55770).

Historically and currently, *Centaurium sebaeoides* is known from Kauai, Oahu, Molokai, Lanai, and Maui. On Maui, there are three populations of this species, with a total of more than 50 individuals, on State and privately owned lands at Kahakuloa Head, Lahoole, and Kupaa Gulch (Wagner *et al.* 1999; HINHP Database 2001; Service 1999; 56 FR 55770).

This species typically grows in volcanic or clay soils or on cliffs in windward coastal areas at elevations between 0 and 194 m (0 and 636 ft) and containing one or more of the following associated native plant species: *Panicum torridum* (kakonakona), *Lysimachia mauritiana* (kolokolo kuahiwi), *Schiedea globosa* (NCN), *Lipochaeta integrifolia* (nehe), *Bidens mauriense*, *Scaevola sericea*, or *Lycium sandwicense* (ohelo kai) (Service 1999; 56 FR 55770; Wagner *et al.* 1999; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to this species on Maui are habitat degradation by feral goats and cattle; competition from the alien plant species *Leucaena leucocephala*; trampling by humans on or near trails; and fire (Service 1999; 56 FR 55770).

Clermontia lindseyana (oha wai)

Clermontia lindseyana, a short-lived perennial and a member of the bellflower family (Campanulaceae), is a small, branched tree that grows 2.5 to 6 m (8.2 to 20 ft) tall. *Clermontia lindseyana* is either terrestrial or epiphytic, living on the surface of other plants. The upper surface of the oblong-shaped leaves is dark green while the lower is pale green or purplish and hairy. Leaf stalks are 2.5–7 cm (1–2.8 in) long and hairy. Berries are 2.5–4 cm (1–1.6 in) wide, almost round, and orange. *Clermontia lindseyana* is easily separable from the other species within this genus by several characters: much larger leaves and flowers, similar petals and sepals, and spreading floral lobes. Rock (1962) commented on the leaves being conspicuously hairy beneath (Cuddihy *et al.* 1983; Lammers 1999).

This species was observed in fruit from June to October, and in flower from February to August. Little else is known about the life history of *Clermontia lindseyana*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service

1996a; 59 FR 10305; HINHP Database 2001).

Historically, *Clermontia lindseyana* was known from Maui and the island of Hawaii. The two Maui populations are located in Waiopai and Wailaulau Gulches in the Kahikinui and Kula Forest Reserves on State and private lands, and are estimated to total about 330 individuals (Service 1996a; 59 FR 10305; Arthur Medeiros, U.S. Geological Survey, Biological Resources Division, *in litt.* 2000; HINHP Database 2001; GDSI 2001).

On Maui, *Clermontia lindseyana* grows in *Acacia koa* mesic forest containing one or more of the following associated native plant species: *Cyrtandra* spp., native fern species, *Ilex anomala* (kawau), *Coprosma* spp., or *Myrsine* spp. at elevations between 1,142 and 1,870 m (3,747 and 6,134 ft) (HINHP Database 2001; Service 1996a; 59 FR 10305; R. Hobdy *et al.*, pers. comm., 2001).

The threats to *Clermontia lindseyana* are trampling and grazing by cattle, trampling and browsing by goats, and rooting and trampling by pigs; competition with the alien plant *Pennisetum clandestinum*; and consumption of berries, flowers, and vegetation by black rats (Service 1996a; 59 FR 10305).

Clermontia oblongifolia ssp. *mauiensis* (oha wai)

Clermontia oblongifolia ssp. *mauiensis*, a short-lived perennial and a member of the bellflower family (Campanulaceae), is a shrub or tree with oblong to lance-shaped leaves on leaf stalks (petioles). *Clermontia oblongifolia* is distinguished from other members of the genus by its calyx and corolla, which are similar in color and are each fused into a curved tube that falls off as the flower ages. The species is also distinguished by the leaf shape, the male floral parts, the shape of the flower buds, and the lengths of the leaf and flower stalks, the flower, and the smooth green basal portion of the flower (the hypanthium). *Clermontia oblongifolia* ssp. *mauiensis* is reported from Maui and Lanai, while ssp. *oblongifolia* is only known from Oahu and ssp. *brevipes* is only known from Molokai (57 FR 20772; Lammers 1988, 1999).

Clermontia oblongifolia ssp. *mauiensis* is known to flower from November to July. Little else is known about the life history of *Clermontia oblongifolia* ssp. *mauiensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and

limiting factors are unknown (Rock 1919; Service 1997; 57 FR 20772).

Historically, *Clermontia oblongifolia* ssp. *mauiensis* known from Lanai and from Honomanu Valley on Haleakala, East Maui. Currently, it is known from Lanai and Maui. On West Maui, this taxon is currently known from one population with an unknown number of individuals, at Kaulalewele on privately owned land within the West Maui Mountains Watershed Partnership (Service 1997; 57 FR 20772; GDSI 2001; HINHP Database 2001; Lammers 1999).

This plant typically grows on the sides of ridges and ridge tops in *Metrosideros polymorpha*-dominated montane wet forests at elevations between 414 and 1,764 m (1,358 and 5,787 ft) and containing one or more of the following associated native plant species: *Dicranopteris linearis*, *Ilex anomala*, *Myrsine* spp., *Cheirodendron* spp. (NCN), *Coprosma* spp., *Clermontia* spp., *Hedyotis* spp., or *Melicope* spp. (Service 1997; 57 FR 20772; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The only known population of this species on Maui is vulnerable to extinction from a natural or human-caused environmental disturbance due to its small size; depressed reproductive vigor; competition with the alien plant species *Tibouchina herbacea*; and habitat degradation by feral pigs (Service 1997; 57 FR 20772).

Clermontia peleana (oha wai)

Clermontia peleana, a member of the bellflower family (Campanulaceae) and a short-lived perennial, is an epiphytic shrub or tree that grows on native trees and tree ferns. Two subspecies are recognized: *C. peleana* ssp. *singuliflora* (greenish-white petals) and *C. peleana* ssp. *peleana* (blackish-purple petals). This species can be separated from other Hawaiian members of the genus by its epiphytic growth, small triangular green calyx lobes, and single-lipped flowers (Lammers 1999).

Clermontia peleana has been observed in flower during June and November, and in fruit during November. Little else is known about the life history of *Clermontia peleana*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1996a; 59 FR 10305; HINHP Database 2001).

Clermontia peleana ssp. *singuliflora* was formerly found on the island of Hawaii and on East Maui, but has not been seen in either place since the early 1900s (HINHP Database 2001; Wagner *et*

al. 1999, L. Perry, pers. comm., 2000; Service 1996a; 59 FR 10305).

Nothing is known of the preferred habitat of or native plant species: associated with *Clermontia peleana* on the island of Maui (Service 1996a; 59 FR 10305; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Clermontia peleana* on the island of Maui (Service 1996a; 59 FR 10305).

Colubrina oppositifolia (kauila)

Colubrina oppositifolia, a member of the buckthorn family (Rhamnaceae), is a long-lived tree with extremely hard red wood. This species is readily distinguished from the other species in Hawaii by the opposite leaf position, dull leaf surface, and entire leaf margins (Wagner *et al.* 1999).

This species has been observed in fruit and flower in September and June, and in flower during December and January. Little else is known about the life history of *Colubrina oppositifolia*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (HINHP Database 2001; Service 1996a; 59 FR 10305).

Historically and currently, *Colubrina oppositifolia* is known from Oahu, Maui, and the Island of Hawaii. Currently on Maui, there are two populations containing one individual each on privately owned land in Honokawai and in Auwahi in the Hana District (Service 1996a; 59 FR 10305; Warshauer 1998; GDSI 2001; HINHP Database 2001).

Habitats of this species are lowland dry and mesic forests dominated by *Diospyros sandwicensis*, at elevations between 192 and 929 m (630 and 3,047 ft) and containing one or more of the following associated native plant species: *Dodonaea viscosa*, *Canavalia* spp. (awikiwiki), *Wikstroemia* spp., *Psydrax odorata*, *Pleomele auwahiensis*, *Freycinetia arborea* (ieie), *Metrosideros polymorpha*, *Microlepia strigosa*, *Bidens micrantha* spp. *micrantha* (kookoolau), or *Reynoldsia sandwicensis* (HINHP Database 2001; Service 1996a; 59 FR 10305; R. Hobdy *et al.*, pers. comm., 2001).

The threats to this species on Maui are habitat destruction by feral pigs; competition with the alien plants *Lantana camara*, *Pennisetum setaceum*, or *Schinus terebinthifolius*; black twig borer; Chinese rose beetles (*Adoretus sinicus*); fire; and its small population numbers and limited distribution (Service 1996a; 59 FR 10305).

Ctenitis squamigera (pauoa)

Ctenitis squamigera is a short-lived perennial of the spleenwort family (Aspleniaceae). It has a rhizome (horizontal stem) 5 to 10 mm (0.2 to 0.4 in) thick, creeping above the ground and densely covered with scales similar to those on the lower part of the leaf stalk. The leaf stalks are densely clothed with tan-colored scales up to 1.8 cm (0.7 in) long and 1 mm (0.04 in) wide. The sori are tan-colored when mature and are in a single row one-third of the distance from the margin to the midrib of the ultimate segments. The indusium (the membrane enclosing the sori) is whitish before wrinkling, thin, suborbicular with a narrow sinus extending about half way, glabrous except for a circular margin which is ciliolate with simple several-celled glandular and nonglandular hairs arising directly from the margin or from the deltoid base. *Ctenitis squamigera* can be readily distinguished from other Hawaiian species of *Ctenitis* by the dense covering of tan-colored scales on its frond (Degener and Degener 1957; Wagner and Wagner 1992).

Little is known about the life history of *Ctenitis squamigera*. Flowering cycles, pollination vectors, seed dispersal agents, specific environmental requirements, and limiting factors are unknown (Service 1998a; 59 FR 49025).

Historically, *Ctenitis squamigera* was recorded from the islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii. It is currently found on Oahu, Lanai, Molokai, and Maui. On Maui, there are currently six populations with 41 individuals on State (West Maui Forest Reserve) and privately owned lands at Honolulu, Kahana, Honokawai, Wahikuli, Kapilau Ridge, Paupau, and Hukoula within the West Maui Mountains Watershed Partnership (GDSI 2001; H. Oppenheimer, *in litt.* 2000; K. Wood, pers. comm., 2000; J. Lau, pers. comm., 2000 and *in litt.* 2000; HINHP Database 2001; Service 1998a; 59 FR 49025).

This species is found in the forest understory, in *Metrosideros polymorpha* montane wet forest or diverse mesic forest at elevations between 74 and 1,593 m (243 and 5,226 ft) and containing one or more of the following native plant species: *Alyxia oliviformis*, *Freycinetia arborea*, *Coprosma* spp., *Pleomele* spp. (hala pepe), *Sadleria* spp., *Doodia* spp. (okupukupu lauii), *Pittosporum* spp. (hoawa), *Dryopteris* spp. (NCN), *Bobea* spp. (ahakea), *Antidesma* spp. (hame), *Peperomia* spp. (ala ala wainui), *Dicranopteris linearis*, *Schiedea pubescens* var. *pubescens* (NCN), *Hibiscus kokio* spp. *kokio*

(kokio), *Hedyotis terminalis*, *Pritchardia* spp., *Remya mauiensis*, *Canavalia* spp., *Myrsine* spp., *Psychotria* spp., or *Xylosma* spp. (Service 1998a; 59 FR 49025; HINHP Database 2001; H. Oppenheimer, pers. comm., 2000; R. Hobdy *et al.*, pers. comm., 2001).

The primary threats to *Ctenitis squamigera* are habitat degradation by feral pigs, goats, and axis deer; competition with alien plant species, especially *Psidium cattleianum* and *Schinus terebinthifolius*; fire; and extinction from naturally occurring events due to the small number of existing populations and individuals (Service 1998a; 59 FR 49025).

Cyanea grimesiana ssp. *grimesiana* (*haha*)

Cyanea grimesiana ssp. *grimesiana*, a short-lived member of the bellflower family (Campanulaceae), is a perennial shrub with pinnately divided leaves. This species is distinguished from others in this endemic Hawaiian genus by the pinnately lobed leaf margins and the width of the leaf blades. This subspecies is distinguished from the other two subspecies by the shape and size of the calyx lobes, which overlap at the base (Lammers 1990).

On Molokai, flowering plants have been reported in July and August. Little else is known about the life history of *Cyanea grimesiana* ssp. *grimesiana*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 61 FR 53108).

Historically and currently, *Cyanea grimesiana* ssp. *grimesiana* is known from Oahu, Molokai, Lanai, and scattered locations on Maui. Currently on Maui, there are two populations with a total of five individuals on privately owned land in Iao Valley and Kapilau Ridge (Service 1999; 61 FR 53108; GDSI 2001; HINHP Database 2001).

This species is typically found on rocky or steep slopes of stream banks in wet forest gulch bottoms often dominated by *Metrosideros polymorpha* at elevations between 312 and 1,617 m (1,024 and 5,305 ft) and containing one or more of the following associated native plant species: *Antidesma* spp., *Bobea* spp., *Myrsine* spp., *Nestegis sandwicensis*, *Psychotria* spp., or *Xylosma* spp. (Service 1999; 61 FR 53108; R. Hobdy *et al.*, pers. comm., 2001).

The threats to this species on Maui are habitat degradation and/or destruction caused by axis deer, goats, and pigs; competition with various alien plants; randomly naturally occurring events that could cause extinction due

to the small number of existing individuals; trampling by hikers; landslides; rats; and slugs (Service 1999; 61 FR 53108).

Cyanea lobata (*haha*)

Cyanea lobata, a short-lived member of the bellflower family (Campanulaceae), is a sparingly branched perennial shrub with smooth to somewhat rough stems and oblong, irregularly lobed leaves. This species is distinguished from other species of *Cyanea* by the size of the flower and the irregularly lobed leaves with petioles (Lammers 1990).

Cyanea lobata is known to flower from August to February, even in individuals as small as 50 cm (20 in) in height. Little else is known about the life history of *Cyanea lobata*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Rock 1919; Degener 1936; Service 1997; 57 FR 20772).

Historically, *Cyanea lobata* was known from Lanai and West Maui. It is no longer extant on Lanai. On Maui, there are currently four populations with a total of 12 individuals on privately owned land within the West Maui Mountains Watershed Partnership at Kaulalewelewe, Honolulu, Honokohau, and Waikapu (Lammers 1999; GDSI 2001; HINHP Database 2001; Service 1997; 57 FR 20772).

This species has been seen and collected on steep stream banks in deep shade in wet forest at elevations between 204 and 1,531 m (669 and 5,020 ft) and containing one or more of the following associated native plant species: *Touchardia latifolia*, *Morinda trimera* (noni kuahiwi), *Metrosideros polymorpha*, *Clermontia kakeana*, *Cyrtandra* spp., *Xylosma* spp., *Psychotria* spp., *Antidesma* spp., *Pipturus albidus*, *Peperomia* spp., *Touchardia latifolia*, *Freycinetia arborea*, *Pleomele* spp., or *Athyrium* spp. (akolea) (Service 1997; 57 FR 20772; Lammers 1999; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The threats to this species on Maui are habitat degradation by feral pigs; depressed reproductive vigor; and natural or human-caused environmental disturbance that could easily be catastrophic to the only known population due to the small number of remaining individuals and the limited and scattered distribution of the species (Service 1997; 57 FR 20772).

Cyrtandra munroi (*ha iwale*)

Cyrtandra munroi, a short-lived perennial and member of the African violet family (Gesneriaceae), is a shrub with opposite, elliptic to almost circular leaves which are sparsely to moderately hairy on the upper surface and covered with velvety, rust-colored hairs underneath. This species is distinguished from other species of the genus by the broad opposite leaves, the length of the flower cluster stalks, the size of the flowers, and the amount of hair on various parts of the plant (Wagner *et al.* 1999).

Some work has been done on the reproductive biology of some species of *Cyrtandra*, but not on that of *C. munroi* specifically. The pollinators of these plants have not been identified, although studies indicate that a specific pollinator may be necessary for successful pollination. Seed dispersal may be carried out by birds which eat the fruits. Little else is known about the life history of *Cyrtandra munroi*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1995b; 57 FR 20772).

Historically and currently, *Cyrtandra munroi* is known from Lanai and West Maui. Currently on Maui, there are four populations with a total of approximately 1,000 individuals on private and State (West Maui Forest Reserve) owned lands within the West Maui Mountains Watershed Partnership in Kahanaiki Gulch, Pulepule Gulch, Honokahua Gulch, along Makamakaole Stream, and Hahakea (Wagner *et al.* 1999; GDSI 2001; HINHP Database 2001; Service 1995b; 57 FR 20772).

The habitat of this species is rich, moist to wet, moderately steep talus slopes in lowland wet *Metrosideros polymorpha* forest at elevations between 390 and 1,108 m (1,280 and 3,635 ft) and containing one or more of the following associated native plant species: *Diospyros* spp. (lama), *Strongylodon ruber* (nuku iiwi), *Hedyotis acuminata*, *Clermontia* spp., *Alyxia oliviformis*, *Bobea* spp., *Coprosma* spp., *Freycinetia arborea*, *Melicope* spp., *Myrsine* spp., *Perrottetia sandwicensis*, *Pipturus* spp. (mamaki), *Pittosporum* spp., *Pouteria sandwicensis*, *Psychotria* spp., *Sadleria* spp., *Scaevola* spp. (naupaka), *Xylosma* spp., *Sicyos* spp., *Zanthoxylum kauense* (ae), or other *Cyrtandra* spp. (Service 1995b; 57 FR 20772; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The threats to this species on Maui are from competition with the alien

plant species *Psidium cattleianum*, *Pluchea symphytifolia* (sourbush), *Melinis minutiflora*, *Rubus rosifolius*, and *Paspalum conjugatum*; loss of appropriate pollinators; a very small number of extant individuals which can cause depressed reproductive vigor; and the effects of random environmental events that could easily be catastrophic to the only known population on Maui (Service 1995b; 57 FR 20772).

Delissea undulata (NCN)

Delissea undulata, a member of the bellflower family (Campanulaceae) and a short-lived perennial, is an unbranched, palm-like, woody-stemmed tree, with a dense cluster of leaves at the tips of the stems. One or two knob-like structures often occur on the back of the flower tube. Three subspecies, all but the last of which are considered extinct, may be separated on the basis of leaf shape and margin characters: *D. undulata* var. *kauaiensis* (leaf blades are oval and flat-margined with sharp teeth) (Kauai), *D. undulata* var. *niihauensis* (leaf blades are heart shaped and flat-margined with shallow, rounded teeth) (Niihau) and *D. undulata* var. *undulata* (leaf blades are elliptic to lance-shaped and wavy-margined with small, sharply pointed teeth) (Maui, Hawaii). This species is separated from the other closely related members of the genus by its large flowers and berries and broad leaf bases. *Delissea undulata* ssp. *undulata* is the only subspecies known from Maui (Lammers 1999).

Delissea undulata var. *undulata* was observed in fruit and flower during December. Little else is known about the life history of *Delissea undulata* var. *undulata*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1996a; 61 FR 53124; HINHP Database 2001).

Delissea undulata var. *undulata* was known from southwestern Maui, western Hawaii and Niihau. Currently it occurs Kauai and the island of Hawaii (GDSI 2001; HINHP Database 2001; Linda Pratt, U.S. Geological Survey-Biological Resources Division, *et al.*, pers. comm., 2001; K. Wood pers comm., 2001; Service 1996a; 61 FR 53124).

Nothing is known of the preferred habitat of or native plant species associated with *Delissea undulata* var. *undulata* on the island of Maui (Service 1996a; 61 FR 53124; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Delissea undulata* var. *undulata* on the island of Maui (Service 1996a; 61 FR 53124).

Diellia erecta (*Asplenium-leaved diellia*)

Diellia erecta, a short-lived perennial fern in the spleenwort family (Aspleniaceae), grows in tufts of three to nine lance-shaped fronds emerging from a rhizome covered with brown to dark gray scales. This species differs from other members of the genus in having brown or dark gray scales usually more than 2 cm (0.8 in) in length, fused or separate sori along both margins, shiny black midribs that have a hardened surface, and veins that do not usually encircle the sori (Smith 1934; Degener and Greenwell 1950; Wagner 1952).

Little is known about the life history of *Diellia erecta*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Historically, *Diellia erecta* was known on Kauai, Oahu, Molokai, Lanai, Maui, and the island of Hawaii. Currently, it is only known from Molokai, Maui, and Hawaii. On Maui, there are five known populations with a total of 35 individual plants on State (West Maui Forest Reserve, Manawainui Plant Sanctuary, and Department of Hawaiian Home Lands) or privately owned lands within the West Maui Mountains Watershed Partnership in Iao Valley, Hanaulaiki, Manawainui Gulch, Near Polipoli in Kamaole and West of Waiopai Gulch (Service 1999; 59 FR 56333; GDSI 2001; HINHP Database 2001).

This species is found in steep slopes or gulch sides in deep shade in *Acacia koa*-*Metrosideros polymorpha* low-to mid-elevation mesic forests at elevations between 338 and 1,744 m (1,109 and 5,722 ft) and containing one or more of the following associated native plant species: *Styphelia tameiameia*, *Melicope* spp., *Coprosma* spp., *Dodonaea viscosa*, *Dryopteris unidentata* (NCN), *Myrsine* spp., *Psychotria* spp., or *Osteomeles anthyllidifolia* (HINHP Database 2001; Service 1999; 59 FR 56333; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to *Diellia erecta* on Maui are habitat degradation by pigs, goats, and cattle; competition with alien plant species, including *Blechnum occidentale* (NCN); and random naturally occurring events that could cause extinction and/or reduced reproductive vigor due to the small number of existing individuals (Service 1999; 59 FR 56333).

Diplazium molokaiense (NCN)

Diplazium molokaiense, a short-lived perennial member of the woodfern family (Dryopteridaceae), has a short

prostrate rhizome and green or straw-colored leaf stalks with thin-textured fronds. This species can be distinguished from other species of *Diplazium* in the Hawaiian Islands by a combination of characteristics, including venation pattern, the length and arrangement of the sori, frond shape, and the degree of dissection of the frond (Wagner and Wagner 1992).

Little is known about the life history of *Diplazium molokaiense*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1998a; 59 FR 49025).

Historically, *Diplazium molokaiense* was found on Kauai, Oahu, Molokai, Lanai, and Aiehou Valley and Maliko Gulch (East Maui) and Wailuku (Iao Valley and Waikapu (West Maui) on Maui. Currently, this species is only known from Maui. Four populations with a total of 23 individuals are found on State (Kula and Kahikinui Forest Reserves) and privately owned lands within the East Maui Watershed Partnership Near Polipoli in Kamaole, between Kahakapao Gulch and Puu O Kaka, Honomanu, and Waiopai Gulch (Warshauer 1998; GDSI 2001; HINHP Database 2001; Service 1998a; 59 FR 49025).

This species occurs near water courses often in proximity to waterfalls in lowland or montane mesic *Metrosideros polymorpha*-*Acacia koa* forest at elevations between 273 and 1,917 m (896 and 6,289 ft) (Service 1998a; 59 FR 49025; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The primary threats on Maui are habitat degradation by feral goats, cattle, pigs, and axis deer; competition with alien plant species; decreased reproductive vigor; and extinction from randomly occurring natural events due to the small number of populations and individuals (Service 1998a; 59 FR 49025; HINHP Database 2001).

Flueggea neowawraea (*mehamehame*)

Flueggea neowawraea, a long-lived perennial and a member of the spurge family (Euphorbiaceae), is a large tree with white oblong pores covering its scaly, pale brown bark. This species is the only member of the genus found in Hawaii and can be distinguished from other species in the genus by its large size, scaly bark, the shape, size, and color of the leaves, flowers clustered along the branches, and the size and shape of the fruits (Linney 1982; Hayden 1999).

Individual trees of *Flueggea neowawraea* bear only male or female

flowers, and must be cross-pollinated from a different tree to produce viable seed. Little else is known about the life history of *Flueggea neowawraea*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Hayden 1999; Service 1999; 59 FR 56333).

Historically, *Flueggea neowawraea* was known from the islands of Molokai, Oahu, Kauai, and Hawaii. Currently, populations are known from Kauai, Oahu, East Maui, and Hawaii. On Maui, there are three populations with a total of five trees on State (Department of Hawaiian Home Lands) and privately owned lands at Auwahi, and above the Lualailua and Alena (GDSI 2001; HINHP Database 2001; Mahealani Kaiaokamelie, (formerly with) Ulupalakua Ranch, *in litt.* 2000; Service 1999; 59 FR 56333).

Flueggea neowawraea occurs in dry or mesic forest at elevations between 633 and 971 m (2,078 and 3,186 ft) and containing one or more of the following associated native plant species: *Alectryon macrococcus*, *Bohea timonioides* (ahakea), *Charpentiera* spp. (papala), *Myrsine lanaiensis* (kolea), *Tetraplasandra* spp. (oheohe), *Diplazium sandwichianum*, *Nesoluma polynesianum* (keahi), *Diospyros* spp., *Antidesma pulvinatum*, *Psydrax odorata*, *Nestegis sandwicensis*, *Rauvolfia sandwicensis* (hao), *Pleomele* spp., *Pouteria sandwicensis*, or *Pleomele auwahiensis* (HINHP Database 2001; Service 1999; 59 FR 56333; R. Hobdy *et al.*, pers. comm., 2001).

The threats to the populations on Maui are the black twig borer; habitat degradation by feral pigs, goats, deer, and cattle; competition with alien plant species; depressed reproductive vigor; the risk of extinction from a random environmental event due to the small number of individuals; and predation of the fruit by rats (Service 1999; 59 FR 56333; HINHP Database 2001).

Gouania vitifolia (NCN)

Gouania vitifolia, a member of the buckthorn family (Rhamnaceae) and a short-lived perennial, is a climbing shrub with tendriled flowering branches. This species differs from other members of its genus by having flowering branches with a tendril and coarsely crenate (wavy) to serrate-dentate (toothed) leaf margins (Wagner *et al.* 1999).

In winter and late spring the main vine of *Gouania vitifolia* produces new young side shoots which soon die. Plants have been observed flowering from late November to January, but flowering probably depends on

precipitation. Little else is known about the life history of *Gouania vitifolia*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1998b; 59 FR 32932).

Historically, *Gouania vitifolia* was known from West Maui, the Kau District of the island of Hawaii, and Oahu. The species currently occurs on Oahu and on the island of Hawaii (GDSI 2001; Jon Giffin, DOFAW, *in litt.* 2000; Service 1998b; 59 FR 32932).

On Maui, *Gouania vitifolia* typically grows on the sides of ridges and gulches in dry to mesic forests at elevations between 155 and 1,326 m (509 and 4,350 ft). Associated plant species include *Erythrina sandwicensis*, *Dodonaea viscosa*, *Hibiscus arnottianus* (kokio keokeo), *Pipturus albidus*, *Ureca glabra* (opuhe), *Chamaesyce* spp. (akoko), *Psychotria* spp., *Hedyotis* spp., *Melicope* spp., *Nestegis sandwicensis*, *Bidens* spp., *Carex meyenii* (NCN), and *Diospyros sandwicensis* (J. Lau, pers. comm., 2001; Service 1998b; 59 FR 32932).

Nothing is known of the threats to *Gouania vitifolia* on the island of Maui (Service 1998b; 59 FR 32932).

Hedyotis coriacea (kio ele)

Hedyotis coriacea, a member of the coffee family (Rubiaceae), is a small, short-lived perennial shrub with leathery leaves which are generally elliptic to oblong in shape, 3 to 8 cm (1.2 to 3.1 in) long and usually 1.5 to 3 cm (0.6 to 1.2 in) wide. This species is distinguished from others of the genus by its small, triangular calyx lobes, which do not enlarge in fruit, and the combination of capsules which are longer than wide and flower buds which are square in cross section (Wagner *et al.* 1999).

Little is known about the life history of *Hedyotis coriacea*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

Historically, *Hedyotis coriacea* was known from Oahu and the Island of Hawaii. Considered extinct on all islands in recent years, this species was discovered in 1990 by Steve Perlman in the State owned Lihau section of the West Maui NAR and in 1991 on the 1859 lava flow in the Pohakuloa Training Area, Island of Hawaii. Currently, only a single individual is known from West Maui on State owned land withing the West Maui Mountains Watershed Partnership (GDSI 2001;

HINHP Database 2001; Service 1997; 57 FR 20772).

Hedyotis coriacea is found on steep, rocky, slopes in dry lowland *Dodonaea viscosa* dominated shrublands at elevations between 110 and 937 m (361 and 3,074 ft) and containing one or more of the following associated native plant species: *Sida fallax*, *Gouania hillebrandii* (NCN), *Bidens menziesii* (kookoolau), *Lipochaeta lavarum*, *Myoporum sandwicense*, or *Schiedea menziesii* (NCN) (HINHP Database 2001; Service 1997; 57 FR 20772; R. Hobdy *et al.*, pers. comm., 2001).

The single remaining individual of *Hedyotis coriacea* on Maui is threatened by extinction from a random naturally occurring event (Service 1997; 57 FR 20772).

Hedyotis mannii (pilo)

Hedyotis mannii, a member of the coffee family (Rubiaceae), is a short-lived perennial plant with smooth, usually erect stems 30 to 60 cm (1 to 2 ft) long, which are woody at the base and four-angled or winged. The leaves are opposite, thin in texture, and elliptic to sometimes lance-shaped. Stipules (leaf-like appendages), which are attached to the slightly winged leaf stalks where they join and clasp the stem, are triangular. Flowers are arranged in loose clusters up to 30 cm (1 ft) long at the ends of the stems and are either bisexual or female. This species' growth habit, its quadrangular or winged stems, the shape, size, and texture of its leaves, and its dry capsule, which opens when mature, separate it from other species of the genus (Wagner *et al.* 1999).

Little is known about the life history of *Hedyotis mannii*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1996b; 57 FR 46325).

Currently and historically, *Hedyotis mannii* is known from Lanai, West Maui, and Molokai. On Maui, there is a single population of approximately 20 individuals located on private land in Kauaula Valley (Service 1996b; 57 FR 46325; GDSI 2001; K. Wood *in litt.* 2000).

The population on Maui is found on basalt cliffs along stream banks in *Metrosideros polymorpha-Dicranopteris linearis* montane wet forest at elevations between 340 and 1,593 m (1,115 and 5,226 ft) and containing one or more of the following associated native plant species: *Machaerina* spp. (uki), *Carex meyenii*, *Phyllostegia* spp. (NCN), *Hedyotis acuminata*, *Cyrtandra platyphylla* (haiwale), *Cyanea* spp.

(haha), *Psychotria* spp., *Pipturus albidus*, *Boehmeria grandis*, *Urera glabra*, *Touchardia latifolia*, *Cyrtandra grayi* (haiwale), *Cyrtandra hawaiiensis* (haiwale), or *Isachne distichophylla* (ohe) (K. Wood *in litt.* 2000; Service 1996b; 57 FR 46325; R. Hobdy *et al.*, pers. comm., 2001).

Hedyotis mannii on Maui is threatened by landslides; competition with the alien plant species *Rubus rosifolius*, *Ageratina adenophora*, *Buddleia asiatica* (butterfly bush), *Pluchea carolinensis* (sourbush), and *Clidemia hirta*; and the low number of individuals makes it extremely vulnerable to extinction by random naturally occurring events (Service 1996b; 57 FR 46325; K. Wood *in litt.* 2000).

Hesperomannia arborescens (NCN)

Hesperomannia arborescens, a long-lived perennial of the aster family (Asteraceae), is a small shrubby tree that usually stands 1.5 to 5 m (5 to 16 ft) tall. This member of an endemic Hawaiian genus differs from other *Hesperomannia* species in having the following combination of characteristics: erect to ascending flower heads, thick flower head stalks, and usually hairless and relatively narrow leaves (Wagner *et al.* 1999).

This species has been observed in flower from April through June and fruit during March and June. Little else is known about the life history of *Hesperomannia arborescens*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1998b; 59 FR 14482).

Hesperomannia arborescens was formerly known from Lanai, Molokai, and Oahu. This species is now known from Oahu, Molokai, and Maui. There are currently two populations with a total of six individuals on State (Kahukuloa section West Maui NAR) and privately-owned lands in Honokohau and Lanilii within the West Maui Mountains Watershed Partnership (GDSI 2001; HINHP Database 2001; Service 1998b; 59 FR 14482).

Hesperomannia arborescens is found on slopes or ridges in lowland mesic or wet forest at elevations between 346 and 1,335 m (1,135 and 4,380 ft) and containing one or more of the following associated native plant species: *Metrosideros polymorpha*, *Myrsine sandwicensis* (kolea), *Isachne distichophylla*, *Pipturus* spp., *Antidesma* spp., *Psychotria* spp., *Clermontia* spp., *Cibotium* spp., *Dicranopteris linearis*, *Bobea* spp., *Coprosma* spp., *Sadleria* spp., *Melicope*

spp., *Machaerina* spp., *Cheirodendron* spp., or *Freycinetia arborea* (HINHP Database 2001; Service 1998b; 59 FR 14482; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to *Hesperomannia arborescens* on Maui are habitat degradation by feral pigs and goats; competition with alien plant species; extinction due to random environmental events or reduced reproductive vigor due to the small number of individuals in one remaining population; and impact by humans (Service 1998b; 59 FR 14482; HINHP Database 2001).

Hesperomannia arbuscula (NCN)

Hesperomannia arbuscula, a long-lived perennial member of the aster family (Asteraceae), is a small shrubby tree, 2 to 3.3 m (7 to 11 ft) tall. This species can be distinguished from other members of the genus by the erect flower heads and the leaves, usually hairy beneath, which are one to two times as long as wide (Wagner *et al.* 1999).

Hesperomannia arbuscula usually flowers in the spring depending on precipitation. Seeds mature in about 6 weeks and trees live about 10 to 15 years. Little else is known about the life history of *Hesperomannia arbuscula*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1998b; 56 FR 55770).

Historically and currently, *Hesperomannia arbuscula* is known from Oahu and West Maui. On Maui, this species is found in two populations with a total of 37 individuals, on privately owned land along the Waihee Stream and Nakalaloe within the West Maui Mountains Watershed Partnership (GDSI 2001; HINHP Database 2001; K. Wood, *in litt.* 1999; Service 1998b; 56 FR 55770).

Hesperomannia arbuscula typically grows on steep forested slopes and ridges in mesic forest dominated by *Metrosideros polymorpha* or *Diospyros sandwicensis* at elevations between 354 and 1,453 m (1,161 and 4,767 ft) and containing one or more of the following associated native plant species: *Bidens* spp., *Tetraplasandra* spp., *Alyxia oliviformis*, *Clermontia* spp., *Cyanea* spp., *Cheirodendron* spp., or *Psychotria* spp. (HINHP Database 2001; J. Lau, pers. comm., 2001; Service 1998b; 56 FR 55770; R. Hobdy *et al.*, pers. comm., 2001).

The major threats to *Hesperomannia arbuscula* on Maui are habitat degradation by feral pigs, competition from alien plant species, trampling by humans, and extinction from naturally

occurring random events due to the small number of populations (Service 1998b; 56 FR 55770).

Hibiscus brackenridgei (ma o hau hele)

Hibiscus brackenridgei, a short-lived perennial and a member of the mallow family (Malvaceae), is a sprawling to erect shrub or small tree. This species differs from other members of the genus in having the following combination of characteristics: yellow petals, a calyx consisting of triangular lobes with raised veins and a single midrib, bracts attached below the calyx, and thin stipules that fall off, leaving an elliptic scar. Two subspecies are currently recognized, *Hibiscus brackenridgei* ssp. *brackenridgei* and *H. brackenridgei* ssp. *mokuleianus* (Bates 1990).

Hibiscus brackenridgei is known to flower continuously from early February through late May, and intermittently at other times of year. Intermittent flowering may possibly be tied to day length. Little else is known about the life history of *Hibiscus brackenridgei*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Historically, *Hibiscus brackenridgei* was known from the islands of Kauai, Oahu, Lanai, Maui, Molokai, Kahoolawe and Hawaii. Currently, *Hibiscus brackenridgei* ssp. *mokuleianus* is known from Oahu and from undocumented observations on Kauai. *Hibiscus brackenridgei* ssp. *brackenridgei* is currently known from Lanai, Maui, and Hawaii. On Maui, *Hibiscus brackenridgei* ssp. *brackenridgei* is found in five populations, containing 40 individuals, on State (Lihau section of West Maui NAR and Department of Hawaiian Home Lands) and privately owned lands at Lihau, Kaonohua, Keokea, and near Puu O Kali (Bates 1990; Service 1999; 59 FR 56333; GDSI 2001; HINHP Database 2001).

Hibiscus brackenridgei ssp. *brackenridgei* occurs in lowland dry forest sometimes with *Erythrina sandwicensis* as the dominant tree at elevations between 43 and 610 m (141 and 2,001 ft) and containing one or more of the following associated native plant species: *Myoporum sandwicense*, *Chenopodium* spp. (aheahea), *Achyranthes* spp. (NCN), *Nototrichium* spp., *Diospyros* spp., *Chamaesyce celastroides* var. *lorifolia*, *Dodonaea viscosa*, *Psydrax odorata*, *Schiedea salicaria* (NCN), *Lipochaeta lavarum*, annual *Panicum* spp., or *Sida fallax* (HINHP Database 2001; Service 1999; 59

FR 56333; R. Hobdy *et al.*, pers. comm., 2001).

The primary threats to *Hibiscus brackenridgei* ssp. *brackenridgei* on Maui and/or Kahoolawe are habitat degradation and possible predation by pigs, goats, cattle, axis deer, and rats; competition with alien plant species; fire; and susceptibility to extinction caused by random environmental events or reduced reproductive vigor due to small population size and a limited number of populations (Service 1999; 59 FR 56333).

Ischaemum byrone (*Hilo ischaemum*)

Ischaemum byrone, a short-lived member of the grass family (Poaceae), is a perennial species with creeping underground and erect stems. *Ischaemum byrone* can be distinguished from other Hawaiian grasses by its tough outer flower bracts, dissimilar basic flower units, which are awned (slender bristle) and two-flowered, and a dichotomously- or trichotomously-branching (forking or branching in two's or three's) inflorescence (O'Connor 1999).

Little is known about the life history of *Ischaemum byrone*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1996a; 59 FR 10305).

Historically, *Ischaemum byrone* was reported from Oahu, Molokai, East Maui, the Island of Hawaii, and an undocumented site on Kauai. Currently, this species is found on Kauai, Molokai, Hawaii, and Maui. On Maui, it is currently found State and privately owned lands at Keopuka Rock, Paupalu Point, Moku Huki, West of Kalahu Point, between Keakulikuli Point and Pukaulua Point, and Kauiki Head. There is a total of six populations with less than 2,000 individuals (GDSI 2001; HINHP Database 2001; Service 1996a; 59 FR 10305).

Ischaemum byrone grows in close proximity to the ocean, among rocks or on basalt cliffs in windward coastal dry shrubland at elevations between 0 and 190 m (0 and 623 ft) and containing one or more of the following associated native plant species: *Bidens* spp., *Fimbristylis cymosa* (mauu akiaki), or *Scaevola sericea* (HINHP Database 2001; Service 1996a; 59 FR 10305; R. Hobdy *et al.*, pers. comm., 2001).

The most serious threat to *Ischaemum byrone* is the invasion of alien plant species, particularly *Digitaria ciliaris* (Henry's crabgrass), *Ardisia elliptica* (shoebuttan ardisia) and *Casuarina equisetifolia* (ironwood). Additionally, fire may pose a threat in areas infested

with alien grasses, provided enough fuel is present. Other potential threats include grazing and browsing by goats and axis deer. Disturbance incurred from these ungulates further promotes the introduction and establishment of alien weeds. Some populations are also threatened by residential development (Service 1996a; 59 FR 10305; HINHP Database 2001).

Isodendron pyrifolium (*wahine noho kula*)

Isodendron pyrifolium, a short-lived perennial of the violet family (Violaceae), is a small, branched shrub with elliptic to lance-shaped leaf blades. The papery-textured blade is moderately hairy beneath (at least on the veins) and stalked. The petiole (stalk) is subtended by oval, hairy stipules. Fragrant, bilaterally symmetrical flowers are solitary. The flower stalk is white-hairy, and subtended by two bracts. Bracts arise at the tip of the main flower stalk. The five sepals are lance-shaped, membranous-edged and fringed with white hairs. Five green-yellow petals are somewhat unequal, and lobed, the upper being the shortest and the lower the longest. The fruit is a three-lobed, oval capsule, which splits to release olive-colored seeds. *Isodendron pyrifolium* is distinguished from other species in the genus by its smaller, green-yellow flowers, and hairy stipules and leaf veins (Wagner *et al.* 1999).

During periods of drought, this species will drop all but the newest leaves. After sufficient rains, the plants produce flowers with seeds ripening 1 to 2 months later. Little else is known about the life history of *Isodendron pyrifolium*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1996a; 59 FR 10305).

Isodendron pyrifolium is known historically from six of the Hawaiian Islands: Niihau, Molokai, Lanai, Oahu, Maui, and the island of Hawaii. Currently, it is only found on the island of Hawaii (Service 1996a; 59 FR 10305; GDSI 2001; HINHP Database 2001; Marie Bruegmann, Service, pers. comm., 2000).

On Maui, *Isodendron pyrifolium* occurs in dry shrubland at elevations between 54 and 557 m (177 and 1,827 ft) with one or more of the following associated native plant species: *Psydrax odorata*, *Capparis sandwicensis*, *Dodonaea viscosa*, or *Myoporum sandwicense* (J. Lau, pers. comm., 2001; Service 1996a; 59 FR 10305; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Isodendron pyrifolium* on the island of Maui (Service 1996a; 59 FR 10305).

Lysimachia lydgatei (NCN)

Lysimachia lydgatei, a short-lived perennial member of the primrose family (Primulaceae), is a sprawling, branched shrub with stems from 1 to 1.3 m (3 to 4 ft) long. This species is distinguished from others in the genus by the dense hairs on both the upper and lower surfaces of mature leaves (Wagner *et al.* 1999).

Little is known about the life history of *Lysimachia lydgatei*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

Lysimachia lydgatei was known historically from a gulch behind Lahaina on West Maui and from Oahu. Currently, it is found only on Maui on State (Lihau section of West Maui NAR and the West Maui Forest Reserve) and privately owned lands Helu, Lihau, east of Halepohaku, and Ulaula within the West Maui Mountains Watershed Partnership. The four Maui populations number approximately 240 individuals (Wagner *et al.* 1999; HINHP Database 2001; GDSI 2001; Service 1997; 57 FR 20772).

Lysimachia lydgatei typically grows on the sides of steep ridges in *Metrosideros polymorpha-Dicranopteris linearis* dominated wet to mesic shrubland or *Metrosideros-Cheirodendron* spp. montane forest at elevations between 829 and 1,432 m (2,720 and 4,698 ft) and containing one or more of the following associated native plant species: *Lycopodium* spp. (wawae iole), *Ilex anomala*, *Dodonaea viscosa*, *Vaccinium* spp., *Eurya sandwicensis* (anini), *Styphelia tameiameia*, *Coprosma* spp., *Ochrosia* spp. (holei), *Astelia* spp. (painiu), *Broussaisia arguta*, or mat ferns such as *Dicranopteris* spp. (HINHP Database 2001; Service 1997; 57 FR 20772; R. Hobdy *et al.*, pers. comm., 2001).

The greatest threats to *Lysimachia lydgatei* are the threat of extinction from a random environmental event due to the small number of populations; competition with alien plant species such as *Rubus argutus*; and fire (Service 1997; 57 FR 20772).

Mariscus pennatiformis (NCN)

Mariscus pennatiformis, a short-lived member of the sedge family (Cyperaceae), is a perennial plant with a woody root system covered with brown scales. *Mariscus pennatiformis* is a subdivided into two subspecies, ssp.

bryanii and ssp. *pennatiformis*, which are distinguished by the length and width of the spikelets; color, length, and width of the glume; and by the shape and length of the achenes. This species differs from other members of the genus by its three-sided, slightly concave, smooth stems; the length and number of spikelets; the leaf width; and the length and diameter of stems (Koyama 1990).

Mariscus pennatiformis is known to flower from November to December after heavy rainfall. Little else is known about the life history of *Mariscus pennatiformis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Historically, *Mariscus pennatiformis* was known from Kauai, Oahu, East Maui (Keanae Valley, Hana, and Nahiku), the Island of Hawaii, and from Laysan in the Northwestern Hawaiian Islands. *Mariscus pennatiformis* ssp. *bryanii* is only known from Laysan Island in the Northwestern Hawaiian Islands National Wildlife Refuge.

Mariscus pennatiformis ssp. *pennatiformis* is currently found only on East Maui. One population of approximately 30 individuals is found on State owned land near the mouth of Hanawi Stream (HINHP Database 2001; GDSI 2001; K. Wood *in litt.* 1999; Service 1999; 59 FR 56333).

On Maui, *Mariscus pennatiformis* ssp. *pennatiformis* is found on cliffs with brown soil and talus within reach of ocean spray in *Pandanus tectorius* (hala) coastal wet forests at elevations between 0 and 188 m (0 and 615 ft) and containing one or more of the following associated native plant species: *Sadleria pallida*, *Lysimachia mauritiana* (kolokolo kuahiwi), *Cyperus laevigatus* (makaloa), *Eragrostis* spp. (NCN), or *Ipomoea* spp. (morning glory) (HINHP Database 2001; K. Wood *in litt.* 1999; J. Lau, pers. comm., 2001; Service 1999; 59 FR 56333).

Threats to the only known population of *Mariscus pennatiformis* ssp. *pennatiformis* on Maui include grazing and habitat destruction caused by ungulates; competition from alien plant species; and extinction from random naturally occurring events (Service 1999; 59 FR 56333).

Melicope knudsenii (alani)

Melicope knudsenii, a long-lived perennial and a member of the rue family (Rutaceae), is a tree with smooth gray bark and yellowish brown to olive-brown hairs on the tips of the branches. The species is distinguished from *M. haupuensis* and other members of the

genus by the distinct carpels present in the fruit, a hairless endocarp, a larger number of flowers per cluster, and the distribution of hairs on the underside of the leaves (Stone *et al.* 1999).

Little is known about the life history of *Melicope knudsenii*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1995a; 59 FR 9304).

Historically and currently, *Melicope knudsenii* was known from the southeast slope of Haleakala on Maui and from Kauai. Currently on Maui, there is one population with three individuals on State (Department of Hawaiian Home Lands) and privately owned lands from Puu Mahoe to east of Puu Ouli (GDSI 2001; HINHP Database 2001; Service 1995a; 59 FR 9304).

Melicope knudsenii grows in *Nestegis-Pleomele* mixed open dry forests at elevations between 648 and 1,331 m (2,125 and 4,367 ft) and containing one or more of the following associated native plant species: *Dodonaea viscosa*, *Osteomeles anthyllidifolia*, *Alphitonia ponderosa*, *Santalum ellipticum*, or *Xylosma hawaiiensis* (HINHP Database 2001; Service 1995a; 59 FR 9304; R. Hobdy *et al.*, pers. comm., 2001).

Threats to *Melicope knudsenii* include habitat degradation by alien animals, such as goats, cattle, and pigs; reduced reproductive vigor; fire; natural aging and death; and invasive plant species, such as *Pennisetum clandestinum* (Service 1995a; 59 FR 9304).

Melicope mucronulata (alani)

Melicope mucronulata, a long-lived perennial of the rue family (Rutaceae), is a small tree up to 4 m (13 ft) tall with oval to elliptic-oval leaves, 8 to 16 cm (3 to 6.5 in) long and 3.5 to 6.5 cm (1.5 to 2.5 in) wide. This species is distinguished from others in the genus by the growth habit, the number of flowers in each flower cluster, the size and shape of the fruit, and the degree of hairiness of the leaves and fruit walls (Stone *et al.* 1999).

Little is known about the life history of *Melicope mucronulata*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

First discovered in 1920 in Kanaio, East Maui, *Melicope mucronulata* was not relocated until 1983 when it was reported from privately owned land with an unknown number of plants in Auwahi. This species was also found 2 years later on East Molokai (Stone *et al.*

1999; GDSI 2001; HINHP Database 2001; Service 1997; 57 FR 20772).

Melicope mucronulata typically grows on gentle south-facing slopes in lowland dry to mesic forest at elevations between 625 and 1,331 m (2,050 and 4,367 ft) and containing one or more of the following associated species: *Pleomele auwahiensis*, *Dodonaea viscosa*, *Nestegis sandwicensis*, *Pouteria sandwicensis*, *Antidesma pulvinatum*, *Streblus pendulinus*, and *Melicope hawaiiensis* (alani) (Service 1997; 57 FR 20772; J. Lau, pers. comm., 2001).

The major threat to the continued existence of the only known population of *Melicope mucronulata* on Maui is the risk of extinction from a random environmental event. Habitat degradation by goats and pigs, predation by goats, and competition with alien plant species, particularly *Melinis minutiflora*, also pose immediate threats to this species (Service 1997; 57 FR 20772).

Neraudia sericea (NCN)

Neraudia sericea, a short-lived perennial member of the nettle family (Urticaceae), is a 3 to 5 m (10 to 16 ft) tall shrub with densely hairy branches. The elliptic or oval leaves have smooth margins or slightly toothed margins on young leaves. The upper leaf surface is moderately hairy and the lower leaf surface is densely covered with irregularly curved, silky gray to white hairs along the veins. The male flowers may be stalkless or have short stalks. The female flowers are stalkless and have a densely hairy calyx that is either toothed, collar-like, or divided into narrow unequal segments. The fruits are achenes with the apical section separated from the basal portion by a deep constriction. Seeds are oval with a constriction across the upper half. *Neraudia sericea* differs from the other four closely related species of this endemic Hawaiian genus by the density, length, color, and posture of the hairs on the lower leaf surface and by its mostly entire leaf margins (Wagner *et al.* 1999).

Little is known about the life history of *Neraudia sericea*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Neraudia sericea was known historically from Molokai, Lanai, Olowalu Valley on West Maui, the southern slopes of Haleakala on East Maui, and from Kahoolawe. Currently, this species is known from Molokai and Maui. On Maui, three populations totaling more than five individuals are found on State (Department of Hawaiian

Home Lands) and privately owned lands in Pohakea Gulch (West Maui) and in Manawainui and Kamole Gulches (East Maui) (GDSI 2001; HINHP Database 2001; M. Kaiaokamelie, *in litt.* 2000; Service 1999; 59 FR 56333).

Neraudia sericea generally occurs in dry to mesic *Metrosideros polymorpha-Dodonaea viscosa-Styphelia tameiameia* shrubland or forest or *Acacia koa* forest at elevations between 198 and 1,658 m (650 and 5,439 ft) and containing one or more of the following associated native plant species: *Urera glabra*, *Cyrtandra oxybapha* (haiwale), *Cyrtandra* spp., *Sida fallax*, *Diospyros* spp., *Bohea* spp., *Coprosma* spp., or *Hedyotis* spp. (Wagner *et al.* 1999; HINHP Database 2001; M. Bruegmann, *in litt.* 1995; Service 1999; 59 FR 56333; R. Hobby *et al.*, pers. comm., 2001).

The primary threats to *Neraudia sericea* on Maui are habitat degradation by feral pigs and goats; competition with the alien plant species, *Melinis minutiflora*, *Pennisetum clandestinum*, *Holcus lanatus*, *Cymbopogon refractus* (barbwire grass), and alien *Eragrostis* spp. (love grass); and a risk of extinction due to random environmental events (Service 1999; 59 FR 56333).

Nototrichium humile (kulu i)

Nototrichium humile, a member of the amaranth family (Amaranthaceae), is an upright to trailing shrub with branched stems to 1.5 m (5 ft) long. Stems and young leaves are covered with short hairs. Leaves are oppositely arranged, oval to oblong in outline, 3 to 9 cm (1.2 to 3.5 in) long, and 2 to 5 cm (0.8 to 2.0 in) wide. Stalkless flowers are arranged in a spike at the ends of the stem. Membranous bracts grow below each flower. Two of the bracts and the sepals fall off with the mature fruit. This species is distinguished from the only other species in the genus by its inflorescence, a slender spike 4 mm (0.2 in) in diameter or less, which is covered with short hairs (Wagner *et al.* 1999).

Nototrichium humile has been observed flowering after heavy rain, but flowering is generally heaviest in the spring and summer. Fruits mature a few weeks after flowering. In cultivation, this species is known to live for more than a decade. Little else is known about the life history of *Nototrichium humile*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1998b; 56 FR 55770).

Historically, *Nototrichium humile* was known from Oahu and Maui. It currently occurs only on Oahu. On Maui, *Nototrichium humile* was last seen in the wild by Robert Hobby in

1979 in Pohakea Gulch (HINHP Database 2001; Service 1998b; 56 FR 55770).

On Maui, *Nototrichium humile* occurred on old cinder cones in dry shrubland at elevations between 338 and 734 m (1,110 and 2,407 ft) with one or more of the following associated native plant species: *Dodonaea viscosa*, *Erythrina sandwicensis*, *Heteropogon contortus*, and *Nototrichium sandwicense* (J. Lau, pers. comm., 2001; Service 1998b; 56 FR 55770).

Nothing is known of the threats to *Nototrichium humile* on the island of Maui (Service 1998b; 56 FR 55770).

Peucedanum sandwicense (makou)

Peucedanum sandwicense, a member of the parsley family (Apiaceae), is a short-lived, parsley-scented, sprawling herb. Hollow stems arise from a short, vertical, perennial stem with several fleshy roots. This species is the only member of the genus in the Hawaiian Islands (Constance and Affolter 1999).

Little is known about the life history of *Peucedanum sandwicense*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1995a; 59 FR 9304).

Historically and currently, *Peucedanum sandwicense* is known from Molokai, Maui, and Kauai. Discoveries in 1990 extended the known distribution of this species to the island of Oahu. Currently, on Maui there are three populations on State and privately owned lands at Keopuka Islet, near Pauwalu Point, and east of Hanawi Stream, with a total of 32 individuals (Service 1995a; 59 FR 9304; GDSI 2001; HINHP Database 2001).

This species grows sparsely vegetated steep to vertical cliff habitats with little soil in mesic or coastal communities at elevations between 0 and 1,131 m (0 and 3,711 ft) and containing one or more of the following associated native species: *Artemisia australis*, *Eragrostis* spp., *Metrosideros polymorpha*, *Carex* spp., *Bidens* spp., *Diospyros sandwicensis*, *Chamaesyce* spp., *Peperomia* spp., *Pandanus tectorius*, *Scaevola sericea*, *Lysimachia mauritiana*, *Schiedea globosa* (NCN), or *Hedyotis littoralis* (NCN) (Constance and Affolter 1999; Service 1995a; HINHP Database 2001; 59 FR 9304; R. Hobby *et al.*, pers. comm., 2001; J. Lau pers. comm., 2001).

Competition with introduced plants is the major threat to *Peucedanum sandwicense* on Keopuka Rock. Additionally, small population sizes also make the species subject to

extinction due to random environmental events (Service 1995a; 59 FR 9304).

Phlegmariurus mannii (wawae iole)

Phlegmariurus mannii (= *Huperzia mannii*, = *Lycopodium mannii*), a short-lived member of the clubmoss family (Lycopodiaceae), is a hanging epiphyte (growing on the outside of other plants instead of being rooted in the ground) with clustered, delicate red stems and forked reproductive spikes. These traits distinguish it from others in the genus in Hawaii (Degener and Degener 1959; St. John 1981; Wagner and Wagner 1992).

Little is known about the life history of *Phlegmariurus mannii*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

Historically, *Phlegmariurus mannii* was known from Kauai, West Maui (Haelaau and Hanaula), and the Island of Hawaii. Currently, this species is found on Maui and Hawaii. On Maui, this species is now known on State (Lihau section West Maui NAR, Makawao Forest Reserve, Department of Hawaiian Home Lands, and Kipahulu Forest Reserve), Federal and privately owned lands in Honokohau, Lihau, Puu Okakae, Manawainui, Healani Stream, Puu Ahulili, and Kaapahu within the East Maui Watershed Partnership and the West Maui Mountains Watershed Partnership. There are seven populations with a total of 22 individuals on Maui (GDSI 2001; HINHP Database 2001; Service 1997; 57 FR 20772).

On Maui, *Phlegmariurus mannii* typically grows as an epiphyte on *Metrosideros polymorpha*, *Dodonaea viscosa* and *Acacia koa* trees in moist protected gulches or mossy tussocks in mesic to wet montane *Metrosideros polymorpha-Acacia koa* forests or wet montane *Metrosideros polymorpha-Acacia koa* forests at elevations between 446 and 1,688 m (1,464 and 5,539 ft) and containing one or more of the following associated native plant species: *Thelypteris* spp. (NCN), *Athyrium* spp., *Styphelia tameiameia*, *Cyanea* spp., *Machaerina* spp., *Cyrtandra* spp., *Sadleria* spp., *Vaccinium* spp., *Astelia menziesii* (kaluaha), *Coprosma* spp., *Cheirodendron trigynum*, or *Ilex anomala* (Service 1997; 57 FR 20772; R. Hobby *et al.*, pers. comm., 2001).

The primary reasons for the endangerment of this species are habitat alteration by goats, cattle and pigs, and the impacts of alien plant species. Additionally, small population sizes

also make the species subject to extinction due to random environmental events (Service 1997; 57 FR 20772).

Phyllostegia mannii (NCN)

Phyllostegia mannii, a nonaromatic member of the mint family (Lamiaceae), is a climbing vine with many-branched, four-sided, hairy stems. The opposite, hairy leaves, which are shaped like narrow triangles or narrow triangular ovals, have coarsely toothed margins. Clusters of four to six white flowers are arranged in each of several false whorls along an unbranched flowering stem. The fruits are fleshy, dark-green to black nutlets (dry seeds with a hard outer covering). This species is distinguished from others in the genus by its hairiness; its thin, narrow leaves, which are not pinnately divided; and the usually six flowers per false whorl in a terminal inflorescence (Wagner *et al.* 1999).

This species was observed with fruit in July. Little else is known about the life history of *Phyllostegia mannii*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1996b; 57 FR 46325).

Historically, *Phyllostegia mannii* was found from Hanalilolilo to Ohialele on East Molokai and at Ukulele on East Maui. It has not been seen on Maui for over 70 years. This species is now known only from Molokai (HINHP Database 2001; Service 1996b; 57 FR 46325).

On Maui, *Phyllostegia mannii* occurs in gentle slopes and the steep sides of gulches in mesic to wet forest dominated by *Acacia koa* and/or *Metrosideros polymorpha* at elevations between 1,069 and 1,615 m (3,506 and 5,297 ft) with one or more of the following associated native plant species: *Cheirodendron trigynum*, *Melicope* spp., *Alyxia oliviformis*, *Diplazium sandwichianum*, *Myrsine lessertiana*, or *Dicranopteris linearis* (J. Lau, pers. comm., 2001; Service 1996b; 57 FR 46325).

Nothing is known of the threats to *Phyllostegia mannii* on the island of Maui (Service 1996b; 57 FR 46325).

Phyllostegia mollis (NCN)

Phyllostegia mollis, a short-lived member of the mint family (Lamiaceae), grows as a nearly erect, densely hairy, nonaromatic, perennial herb. Leaves are oval in outline with rounded teeth. Flowers, usually in groups of six, are spaced along a stem; there are two shorter flowering stems directly below the main stem. The flowers have fused sepals and white petals fused into a tube and flaring into a smaller upper and a

larger lower lip. Fruits are fleshy, dark green to black nutlets. A suite of technical characteristics concerning the kind and amount of hair, the number of flowers in a cluster, and details of the various plant parts separate this species from other members of the genus (Wagner *et al.* 1990).

Individual *Phyllostegia mollis* plants live for approximately 5 years. The species is known to flower in late winter and spring. Little else is known about the life history of *Phyllostegia mollis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1998b; 56 FR 55770).

Historically, *Phyllostegia mollis* was known from Oahu, Molokai, and East Maui. Currently, this species is only known from Oahu and Maui. On East Maui, a single population of an unknown number of individuals remains on State (on the border of Kahikinui Forest Reserve and Department of Hawaiian Home Lands) land in Waiopai Gulch (Wagner *et al.* 1999; GDSI 2001; HINHP Database 2001; Service 1998b; 56 FR 55770).

Phyllostegia mollis typically grows on steep slopes and in gulches in mesic forests dominated by *Metrosideros polymorpha* and/or *Acacia koa* at elevations between 1,144 and 1,970 m (3,754 and 6,463 ft). Associated native plant species include *Cheirodendron trigynum*, *Melicope* spp., *Diplazium sandwichianum*, *Myrsine lessertiana*, and *Alyxia oliviformis* (J. Lau, pers. comm., 2001; Service 1998b; 56 FR 55770).

The major threats to *Phyllostegia mollis* are competition from the alien plant species *Rubus* spp. and *Schinus terebinthifolius*; and a risk of extinction of the only known population of this species on Maui due to random environmental events (Service 1998b; 56 FR 55770).

Phyllostegia parviflora (NCN)

Phyllostegia parviflora, a member of the mint family (Lamiaceae), is a perennial herb with forward-bending hairs on the stems and straight or slightly curved hairs on the flowering stalk. The species is distinguished from others of the genus by the egg-shaped to broadly egg-shaped leaves, leaf stalks usually 6 to 13.5 cm (2.4 to 5.3 in) long, and the lower corolla lip 6 to 9 mm (0.24 to 0.36 in) long. *Phyllostegia parviflora* var. *glabriuscula* has fewer glandular hairs in the inflorescence, less pubescent leaves, and usually unbranched inflorescences compared with *Phyllostegia parviflora* var. *parviflora*. *Phyllostegia parviflora* var.

lydgatei has shorter leaf stalks, spreading hairs on the leaf stalks, and fewer gland-tipped hairs in the inflorescence. At the time of listing of this species only two varieties were recognized, *glabriuscula* and *parviflora*. Subsequent to the final rule listing this species in 1996, we became aware of Wagner's (1999) taxonomic treatment of this group in which *P. parviflora* var. *lydgatei* was changed to variety status and recognized as distinct from *P. parviflora* var. *parviflora*. Wagner's (1999) treatment is cited in the supplement in the revised edition of the Manual of the Flowering Plants of Hawaii as the basis for recognizing *P. parviflora* var. *lydgatei*. This name change will be addressed in a future **Federal Register** notice (Wagner *et al.* 1999).

Historically *Phyllostegia parviflora* was known from three islands, Oahu, Hawaii, and Maui. This species is now known only from two populations on Oahu (HINHP Database 2001; GDSI 2001; Service 1999; 61 FR 53108).

Nothing is known of the preferred habitat of or native plant species associated with *Phyllostegia parviflora* on the island of Maui (Service 1999; 61 FR 53108; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Phyllostegia parviflora* on the island of Maui (Service 1999; 61 FR 53108).

Plantago princeps (laukahi kuahiwi)

Plantago princeps, a short-lived member of the plantain family (Plantaginaceae), is a small shrub or robust perennial herb. This species differs from other native members of the genus in Hawaii by its large branched stems, flowers at nearly right angles to the axis of the flower cluster, and fruits that break open at a point two-thirds from the base. The four varieties, *anomala*, *laxiflora*, *longibracteata*, and *princeps*, are distinguished by the branching and pubescence of the stems; the size, pubescence, and venation of the leaves; the density of the inflorescence; and the orientation of the flowers (Wagner *et al.* 1999).

Individuals have been observed in fruit from April through September. Little else is known about the life history of *Plantago princeps*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Plantago princeps is historically and currently found on Kauai, Oahu, Molokai, and Maui. It is no longer extant on the island of Hawaii. *Plantago princeps* var. *anomala* is currently

known from Kauai and Oahu; var. *longibracteata* is known from Kauai and Oahu; var. *princeps* is known from Oahu; and var. *laxiflora* is known from Molokai and Maui. On Maui, there are five populations of *Plantago princeps* var. *laxiflora*, with a total of 118 individuals, on Federal (Haleakala National Park) and privately owned lands within the East Maui Watershed Partnership. This variety is found at Kahoolewa Ridge, Nakalaloa Stream, Iao Valley near the Needle, Hanakauhi, the west side of Kaupo Gap, and Palikea Stream (Service 1999; 59 FR 56333; GDSI 2001; HINHP Database 2001).

On Maui, *Plantago princeps* var. *laxiflora* is typically found on basalt cliffs that are windblown with little vegetation in *Metrosideros polymorpha* lowland wet forest; or *Acacia koa-Metrosideros polymorpha* montane wet forest; or *Metrosideros polymorpha* montane wet shrubland at elevations between 281 and 2,539 m (922 and 8,329 ft) and containing one or more of the following associated native plant species: *Eragrostis variabilis*, *Hedyotis formosa*, *Dubautia plantaginea* spp. *humilis*, *Pipturus albidus*, *Perrottetia sandwicensis*, *Touchardia latifolia*, *Dryopteris* spp., various other ferns, *Cyanea* spp., and *Melicope ovalis*, *Bidens micrantha* ssp. *kalealaha*, *Chamaesyce celastroides*, *Styphelia tameiameia* or *Dubautia menziesii* (Service 1999; 59 FR 56333; HINHP Database 2001; R. Hobdy et al., pers. comm., 2001).

The primary threats to *Plantago princeps* var. *laxiflora* on Maui are herbivory and habitat degradation by feral pigs and goats and competition with various alien plant species (Service 1999; 59 FR 56333).

Platanthera holochila (NCN)

Platanthera holochila, a short-lived, perennial member of the orchid family (Orchidaceae), is an erect, deciduous herb. The stems arise from underground tubers, the pale green leaves are lance to egg-shaped and the greenish-yellow flowers occur in open spikes. This is the only species of this genus that occurs in the Hawaiian Islands (Wagner et al. 1999).

Little is known about the life history of *Platanthera holochila*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 61 FR 53108).

Historically, *Platanthera holochila* was known from Maui, Oahu, Molokai, and Kauai. Currently, *Platanthera holochila* is extant on Kauai, Molokai, and Maui. On Maui, four populations

with 22 individuals are reported on State (West Maui Forest Reserve) and privately owned lands within the West Maui Mountains Watershed Partnership and the East Maui Watershed Partnership from Kapalaoa Stream, Waihee River, the border of Lahaina and Wailuku Districts and Koolau Gap (GDSI 2001; HINHP Database 2001; Service 1999; 61 FR 53108).

Platanthera holochila is found in *Metrosideros polymorpha-Dicranopteris linearis* montane wet forest or *M. polymorpha* mixed montane bog or mesic scrubby *M. polymorpha* forest at elevations between 536 and 2,314 m (1,759 and 7,592 ft) containing one or more of the following associated native plant species: *Cibotium* spp., *Coprosma ernodeoides* (kukae nene), *Oreobolus furcatus*, *Styphelia tameiameia*, *Wikstroemia* spp., *Scaevola chamissoniana* (naupaka kuahiwi), *Sadleria* spp., *Deschampsia nubigena*, *Metrosideros polymorpha*, *Luzula hawaiiensis* (wood rush), *Sisyrinchium acre* (mauu laili), *Broussaia arguta*, *Clermontia* spp., *Lycopodium cernuum* (wawae iole), *Dubautia scabra* (naenae), *Polypodium pellucidum* (ae), *Morelotia gahniiiformis* (NCN), or *Vaccinium reticulatum* (Service 1999; 61 FR 53108; R. Hobdy et al., pers. comm., 2001).

The primary threats to *Platanthera holochila* on Maui are habitat degradation and/or destruction by feral pigs; landslides; competition with alien plant species; and a risk of extinction on Maui from naturally occurring events and/or reduced reproductive vigor due to the small number of remaining populations and individuals. Predation by slugs may also be a potential threat to this species (Service 1999; 61 FR 53108).

Pteris lidgatei (NCN)

Pteris lidgatei, a short-lived member of the maidenhair fern family (Adiantaceae), is a coarse perennial herb, 0.5 to 1 m (1.6 to 3.3 ft) tall. It has a horizontal rhizome 1.5 cm (0.6 in) thick and at least 10 cm (3.9 in) long when mature. The fronds, including the leaf stalks, are 60 to 95 cm (24 to 37 in) long and 20 to 45 cm (8 to 18 in) wide. The leafy portion of the frond is oblong-deltoid to broadly ovate-deltoid, thick, brittle, and dark gray-green. The sori are apparently marginal in position, either fused into long linear sori, or more typically separated into distinct shorter sori, with intermediate conditions being common. *Pteris lidgatei* can be distinguished from other species of *Pteris* in the Hawaiian Islands by the texture of its fronds and the tendency of the sori along the leaf margins to be broken into short segments instead of

being fused into continuous marginal sori (Wagner 1949; Wagner and Wagner 1992).

Little is known about the life history of *Pteris lidgatei*. Flowering cycles, pollination vectors, seed dispersal agents, specific environmental requirements, and limiting factors are unknown (Service 1998a; 59 FR 49025).

Historically, *Pteris lidgatei* was found on Oahu, Molokai, and Waihee on West Maui. Currently, this species is known from Oahu and Maui. Two populations with approximately 20 individuals occur on Maui on State (Kahakuloa section of the West Maui NAR) and privately owned lands within the West Maui Mountains Watershed Partnership north of Eke Crater and at Kaula (GDSI 2001; HINHP Database 2001; Service 1998a; 59 FR 49025).

This species grows on steep stream banks in wet *Metrosideros polymorpha-Dicranopteris linearis* montane forest at elevations between 201 and 1,717 m (659 and 5,633 ft) and containing one or more of the following native plant species: *Cibotium chamissoi* (hapuu), *Dicranopteris linearis*, *Elaphoglossum crassifolium* (ekaha), *Sadleria squarrosa* (amau), *Thelypteris cyatheoides*, or *Sphenomeris chusana* (palaa) (HINHP Database 2001; Service 1998a; 59 FR 49025; R. Hobdy et al., pers. comm., 2001).

The primary threats to *Pteris lidgatei* on Maui are the alien plants *Clidemia hirta*, *Tibouchina herbacea*, and *Ageratina adenophora*; habitat destruction by feral pigs; and a risk of extinction due to random environmental events (Service 1998a; 59 FR 49025).

Sanicula purpurea (NCN)

Sanicula purpurea, a short-lived member of the parsley family (Apiaceae), is a stout perennial herb, 8 to 36 cm (3 to 14 in) tall, arising from a massive perennial stem. The stems are tufted and branched, with the lower portion of the stem lying close to the ground, while the upper portion rises. The basal leaves are numerous and leathery in texture and are kidney-shaped or circular to egg-heart-shaped, with three to seven lobes. The leaf lobes are circular to inversely egg-shaped. The leaf veins are impressed on the upper surface and prominent on the lower surface. The leaf margins bear short, sharp teeth. The basal leaf stalks are slender and abruptly sheathed at the base. The leaves are palmately three-to five-lobed. The small purple, or cream-colored with a purple tinge, flowers occur in branched terminal clusters, each of which contains six to 10 flowers. Each flower cluster contains one to three perfect flowers and five to

seven staminate flowers. Below the inflorescence is a series of about 10 oblong or inversely lance-shaped bracts. The nearly spherical fruits are covered with prickles. This species is distinguished from others in the genus by the number of flowers per cluster and by the color of the petals (Constance and Affolter 1999).

Little is known about the life history of *Sanicula purpurea*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 61 FR 53108).

Historically and currently, *Sanicula purpurea* is known from Oahu and West Maui. On Maui, five populations totaling between 200 individuals are currently known on State (Kahakuloa and Honokawai sections of the West Maui NAR) and private lands within the West Maui Mountains Watershed Partnership north of Eke Crater and east of Kahakuloa Stream, south of Eke Crater, near Violet Lake, the ridge west of Puu Kukui, and Kahoolewa Ridge east of Puu Kukui (GSDI 2001; HINHP Database 2001; Service 1999; 61 FR 53108).

This species typically grows in open *Metrosideros polymorpha* mixed montane bogs at elevations between 1,195 and 1,764 m (3,921 and 5,787 ft) containing one or more of the following associated plant species *Styphelia tameiameia*, *Gahnia beecheyi* (NCN), *Geranium hillebrandii* (nohoanu), *Myrsine vaccinioides* (kolea), *Viola maviensis*, *Argyroxiphium caliginis* (eke silversword), *Plantago pachyphylla* (laukahi kuahiwi), *Lycopodium* spp., *Argyroxiphium grayanum* (green sword), *Lagenifera maviensis*, *Machaerina* spp., or *Oreobolus furcatus* (HINHP Database 2001; Service 1999; 61 FR 53108; R. Hobdy *et al.*, pers. comm., 2001).

Habitat degradation by feral pigs; a risk of extinction due to random environmental events, and/or reduced reproductive vigor due to the small number of existing populations; and slugs are the major threats to *Sanicula purpurea* (Service 1999; 61 FR 53108; HINHP Database 2001).

Schiedea hookeri (NCN)

Schiedea hookeri, a member of the pink family (Caryophyllaceae), is a sprawling or clumped perennial herb. The stems, 0.3 to 0.5 m (1 to 1.6 ft) long, curve slightly upward or lie close to the ground and often produce matted clumps. The thin, opposite leaves are narrowly lance-shaped to narrowly elliptic. The petalless, perfect flowers are borne in open branched

inflorescences, which are hairy, somewhat sticky, and 5 to 22 cm (2 to 9 in) long. The lance-shaped sepals are green to purple and 3 to 4.5 mm (1.2 to 1.8 in) long. The fruit is a capsule about 3 mm (0.1 in) long. This species is distinguished from others in this endemic Hawaiian genus by its open, hairy, and sometimes sticky inflorescence, and by the size of the capsules (Wagner *et al.* 1999).

Based on field and greenhouse observations, it is hermaphroditic, which means each individual has both male and female reproductive organs. Mature fruits have been observed in June and August. *Schiedea hookeri* appears to be an outcrossing species. Under greenhouse conditions, flowers do not set fruit unless pollinated. In the field, the species is presumed to be pollinated by insects, although none have been observed (a related species, *Schiedea lydgatei* on Molokai, is apparently pollinated by native, night-flying moths). A series of self-pollinations, intra-population crosses, and crosses among populations have demonstrated that *Schiedea hookeri* experiences moderately strong inbreeding depression. These results indicate that reductions in population size could result in expression of inbreeding depression among progeny, with deleterious consequences for the long-term persistence of this species. Individuals of *Schiedea hookeri* appear to be long-lived, but there is no evidence of reproduction from seed under field conditions. Seedlings of *Schiedea* occurring in mesic or wet sites are apparently consumed by introduced slugs and snails, which have been observed feeding on *Schiedea membranacea*, another mesic forest species that occurs on Kauai. In contrast to mesic-forest species, *Schiedea* occurring in dry areas produce abundant seedlings following winter rains, presumably because the drier sites have fewer alien consumers. *Schiedea hookeri* differs considerably through its range in potential for clonal growth. Plants from Kaluakauila Gulch are upright and show little potential for clonal spread. In contrast, clonal growth has been detected for individuals at Kaluaa Gulch, where the growth form is decumbent and plants apparently root at the nodes. Little else is known about the life history of *Schiedea hookeri*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Weller and Sakai, unpublished data; Service 1999; HINHP Database 2001; 61 FR 53108).

Historically, *Schiedea hookeri* was known from the Waianae Mountains of Oahu and from a single fragmentary collection from Haleakala on Maui that may represent *Schiedea menziesii* rather than *Schiedea hookeri*. Currently, this species is known only from Oahu (Service 1999; 61 FR 53108; HINHP Database 2001; EDA Database 2001).

Nothing is known of the preferred habitat of or native plant species associated with *Schiedea hookeri* on the island of Maui (Service 1999; 61 FR 53108; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Schiedea hookeri* on the island of Maui (Service 1999; 61 FR 53108).

Schiedea nuttallii (NCN)

Schiedea nuttallii, a member of the pink family (Caryophyllaceae), is a generally hairless, erect subshrub. This long-lived perennial species is distinguished from others in this endemic Hawaiian genus by its habit, length of the stem internodes, length of the inflorescence, number of flowers per inflorescence, and smaller leaves, flowers, and seeds (Wagner *et al.* 1999).

Little is known about the life history of *Schiedea nuttallii*. Based on field and greenhouse observations, it is hermaphroditic. Plants on Oahu have been under observation for 10 years, and they appear to be long-lived. *Schiedea nuttallii* appears to be an outcrossing species. Under greenhouse conditions, plants fail to set seed unless hand pollinated, suggesting that this species requires insects for pollination. Fruits and flowers are abundant in the wet season but can be found throughout the year. Little else is known about the life history of *Schiedea nuttallii*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 61 FR 53108).

Historically, *Schiedea nuttallii* was known from Kauai and Oahu and was reported from Maui. Currently, it is found on Kauai, Oahu, and Molokai (Service 1999; 61 FR 53108; HINHP Database 2001; GDSI 2001).

Nothing is known of the preferred habitat of or native plant species associated with *Schiedea nuttallii* on the island of Maui (Service 1999; 61 FR 53108; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Schiedea nuttallii* on the island of Maui (Service 1999; 61 FR 53108).

Sesbania tomentosa (ohai)

Sesbania tomentosa, a short-lived member of the legume family

(Fabaceae), is typically a sprawling shrub, but may also be a small tree. Each compound leaf consists of 18 to 38 oblong to elliptic leaflets which are usually sparsely to densely covered with silky hairs. The flowers are salmon tinged with yellow, orange-red, scarlet or rarely, pure yellow. *Sesbania tomentosa* is the only endemic Hawaiian species in the genus, differing from the naturalized *S. sesban* by the color of the flowers, the longer petals and calyx, and the number of seeds per pod (Geesink *et al.* 1999).

The pollination biology of *Sesbania tomentosa* is being studied by David Hopper, a graduate student in the Department of Zoology at the University of Hawaii at Manoa. His preliminary findings suggest that although many insects visit *Sesbania* flowers, the majority of successful pollination is accomplished by native bees of the genus *Hylaeus* and that populations at Kaena Point on Oahu are probably pollinator limited. Flowering at Kaena Point is highest during the winter-spring rains, and gradually declines throughout the rest of the year. Little else is known about the life history of *Sesbania tomentosa*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Historically, *Sesbania tomentosa* occurred on all eight of the main Hawaiian Islands and on the Northwestern Hawaiian Islands of Nihoa and Necker. Currently, *Sesbania tomentosa* occurs on Kauai, Oahu, Molokai, Kahoolawe, Maui, the island of Hawaii, Nihoa and Necker. On Maui, *S. tomentosa* is known from seven populations with a total of 83 individuals. The populations are located on State owned and/or leased land (Lihau section of West Maui NAR, Hana Forest Reserve, and Kanaio Training Area), under Federal jurisdiction (Kanaio National Guard Training Area) and on privately owned land within the East Maui Watershed Partnership and West Maui Mountains Watershed Partnership at Poelua Bay, Mokolea Point, between Kahakuloa Head and Puu Kahulianapa Mahinanui, Olowalu, Pimoe, south of Puu Puou. Off the south central coast of Kahoolawe, approximately 100 individuals of *S. tomentosa* are found on a small islet, Puu Koa, a State owned seabird sanctuary (R. Hobdy *in litt.* 2000; Service 1999; 59 FR 56333; GDSI 2001; HINHP Database 2001).

Sesbania tomentosa is found in windswept slopes, sea cliffs and cinder cones in *Scaevola sericea* coastal dry

shrublands at elevations between 0 and 608 m (0 and 1,993 ft) and containing one or more of the following associated native plant species: *Jacquemontia ovalifolia* ssp. *sandwicensis* (pauohiika), *Sida fallax*, *Diospyros sandwicensis*, *Lipochaeta integrifolia* (nehe), *Bidens* spp., or stunted *Dodonaea viscosa* (Service 1999; 59 FR 56333; HINHP Database 2001; R. Hobdy *et al.*, pers. comm., 2001).

The primary threats to *Sesbania tomentosa* on Maui are habitat degradation caused by competition with various alien plant species such as *Lantana camara*, *Waltheria indica* (uhaloa), and various grass species; feral cattle; lack of adequate pollination; seed predation by rats, mice and, potentially, alien insects; fire; and destruction by off-road vehicles and other human disturbances. Threats to *Sesbania tomentosa* on Kahoolawe include habitat degradation caused by competition with various alien plant species, erosion, and trampling by cats and seabirds (Service 1999; 59 FR 56333; P. Higashino, pers. comm., 2000).

Solanum incompletum (popolo ku mai)

Solanum incompletum, a short-lived perennial member of the nightshade family (Solanaceae), is a woody shrub. Its stems and lower leaf surfaces are covered with prominent reddish prickles or sometimes with yellow fuzzy hairs on young plant parts and lower leaf surfaces. The oval to elliptic leaves have prominent veins on the lower surface and lobed leaf margins. Numerous flowers grow in loose branching clusters with each flower on a stalk. This species differs from other native members of the genus by being generally prickly and having loosely clustered white flowers, curved anthers about 2 mm (0.08 in) long, and berries 1 to 2 cm (0.4 to 0.8 in) in diameter (Symon 1999).

Little is known about the life history of *Solanum incompletum*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Historically, *Solanum incompletum* was known from central and northeastern Lanai, scattered locations on Maui, and the island of Hawaii. According to David Symon (1999), the known distribution of *Solanum incompletum* also extended to the islands of Kauai and Molokai. Currently, *Solanum incompletum* is only known from the island of Hawaii (Service 1999; 59 FR 56333; HINHP Database 2001).

Nothing is known of the preferred habitat of or native plant species associated with *Solanum incompletum* on the island of Maui (Service 1999; 59 FR 56333; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Solanum incompletum* on the island of Maui (Service 1999; 59 FR 56333).

Spermolepis hawaiiensis (NCN)

Spermolepis hawaiiensis, a member of the parsley family (Apiaceae), is a slender annual herb with few branches. Its leaves, dissected into narrow, lance-shaped divisions, are oblong to somewhat oval in outline and grow on stalks. Flowers are arranged in a loose, compound umbrella-shaped inflorescence arising from the stem, opposite the leaves. *Spermolepis hawaiiensis* is the only member of the genus native to Hawaii. It is distinguished from other native members of the family by being a nonsucculent annual with an umbrella-shaped inflorescence (Constance and Affolter 1999).

Little is known about the life history of *Spermolepis hawaiiensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Historically, *Spermolepis hawaiiensis* was known from the islands of Kauai, Oahu, Lanai, and Hawaii. Currently, it is extant on Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii. On Maui, there are four known populations with hundreds to thousands of individuals on State (Lihau section of West Maui NAR and Kanaio NAR) and privately owned lands within the West Maui Mountains Watershed Partnership in Puu Hipa, south of Kanaha Stream, Olowalu, and Kanaio (Service 1999; 59 FR 56333; GDSI 2001; HINHP Database 2001; Charles Chimera, USGS Biological Research Division, pers. comm., 2000).

Spermolepis hawaiiensis is known from *Dodonaea viscosa* lowland dry shrubland at elevations between 221 and 742 m (725 and 2,434 ft) and containing one or more of the following associated native species: *Eragrostis variabilis*, *Wikstroemia* spp., *Erythrina sandwicensis*, *Diospyros* spp., *Pleomele* spp., *Lipochaeta lavarum*, *Sida fallax*, *Myoporum sandwicensis*, *Santalum ellipticum*, *Gouania hillebrandii*, or *Heteropogon contortus* (Service 1999; 59 FR 56333; HINHP Database 2001; C. Chimera, pers. comm., 2000; R. Hobdy *et al.*, pers. comm., 2001).

The primary threats to *Spermolepis hawaiiensis* on Maui are habitat degradation by feral goats, pigs, cattle,

and axis deer; competition with various alien plants, such as *Melinis repens* and *Lantana camara*; fire; and erosion, landslides, and rock slides due to natural weathering which result in the death of individual plants as well as habitat destruction (Service 1999; 59 FR 56333).

Tetramolopium arenarium (NCN)

Tetramolopium arenarium is a short-lived perennial and an upright, branched shrub in the sunflower family (Asteraceae). Alternate leaves are lance-shaped, hairy, glandular, and gray-green. This species is separated from other species of the genus in the Hawaiian Islands by several characters: upright habit; number of heads per flower cluster (five to 11); presence and type of glands and hairs; size of male ray flowers (1.3 to 2.2 mm (.002 to .009 in)); number of bisexual disk flowers (five to nine) and their maroon color; and a wide, two- to four-nerved fruit with white hairs at the tip. Three infra-specific species are recognized:

Tetramolopium arenarium ssp. *arenarium* var. *arenarium* (Maui and Hawaii), *T. arenarium* ssp. *arenarium* var. *confertum* (Hawaii), and *T. arenarium* ssp. *laxum* (Maui). These species are distinguished one from the other by a combination of characters. *T. arenarium* ssp. *arenarium* var. *confertum* and *T. arenarium* ssp. *laxum* have not been seen the late 1800s (Lowrey 1999).

Little is known about the life history of *Tetramolopium arenarium*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1996a; 59 FR 10305).

Tetramolopium arenarium was historically known from the islands of Maui and Hawaii. The taxon was considered extinct until *Tetramolopium arenarium* ssp. *arenarium* var. *arenarium* was recently rediscovered on the island of Hawaii. Both subspecies were last seen on Maui in the late 1800s (Service 1996a; 59 FR 10305; HINHP Database 2001; GDSI 2001).

Nothing is known about the preferred habitat of *Tetramolopium arenarium* on Maui (Service 1996a; 59 FR 10305; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Tetramolopium arenarium* on the island of Maui (Service 1996a; 59 FR 10305).

Tetramolopium remyi (NCN)

Tetramolopium remyi, a short-lived perennial member of the sunflower family (Asteraceae), is a much branched, decumbent (reclining, with the end ascending) or occasionally erect shrub

up to about 38 cm (15 in) tall. Its leaves are firm, very narrow, and with the edges rolled inward when the leaf is mature. There is a single flower head per branch. The heads are each comprised of 70 to 100 yellow disk and 150 to 250 white ray florets. The stems, leaves, flower bracts, and fruit are covered with sticky hairs.

Tetramolopium remyi has the largest flower heads in the genus. Two other species of the genus are known historically from Lanai, but both have purplish rather than yellow disk florets and from four to 60 rather than one flower head per branch (Lowrey 1999).

Tetramolopium remyi flowers between April and January. Field observations suggest that the population size of the species can be profoundly affected by variability in annual precipitation; the adult plants may succumb to prolonged drought, but apparently there is a seedbank in the soil that can replenish the population during favorable conditions. Such seed banks are of great importance for arid-dwelling plants to allow populations to persist through adverse conditions. The aridity of the area, possibly coupled with human-induced changes in the habitat and subsequent lack of availability of suitable sites for seedling establishment, may be a factor limiting population growth and/or expansion. Requirements of this taxon in these areas are not known, but success in greenhouse cultivation of these plants with much higher water availability implies that, although these plants are drought-tolerant, perhaps the dry conditions in which they currently exist are not optimum. Individual plants are probably not long-lived. Pollination is hypothesized to be possibly by butterflies, bees, or flies. Little else is known about the life history of *Tetramolopium remyi*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1995b; 56 FR 47686).

Historically, the species was known from the Lahaina area of West Maui and Lanai. Currently, *T. remyi* is known from two populations on Lanai. It was last seen on Maui in 1944 by E. Y. Hosaka (GDSI 2001; HINHP Database 2001; Service 1995b; 56 FR 47686).

On Maui, *Tetramolopium remyi* occurs in lowland dry shrubland on dry, exposed ridges or flats at elevations between 52 and 550 m (171 and 1,804 ft). Associated plant species include *Dodonaea viscosa*, *Heteropogon contortus*, *Bidens mauiensis*, *Bidens menziesii*, *Eragrostis atropioides* (lovegrass), *Lipochaeta heterophylla*

(NCN), or *Waltheria indica* (Service 1995b; 56 FR 47686; R. Hobdy *et al.*, pers. comm., 2001).

Nothing is known of the threats to *Tetramolopium remyi* on the island of Maui (Service 1995b; 56 FR 47686).

Vigna o-wahuensis (NCN)

Vigna o-wahuensis, a member of the legume family (Fabaceae), is a slender, twining, long-lived perennial herb with fuzzy stems. Each leaf is made up of three leaflets which vary in shape from round to linear, and are sparsely or moderately covered with coarse hairs. Flowers, in clusters of one to four, have thin, translucent, pale yellow or greenish yellow petals. The two lowermost petals are fused and appear distinctly beaked. The sparsely hairy calyx has asymmetrical lobes. The fruits are long slender pods that may or may not be slightly inflated and contain seven to 15 gray to black seeds. This species differs from others in the genus by its thin yellowish petals, sparsely hairy calyx, and thin pods which may or may not be slightly inflated (Geesink *et al.* 1999).

Little is known about the life history of *Vigna o-wahuensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1999; 59 FR 56333).

Historically, *Vigna o-wahuensis* was known from Niihau, Oahu, and on East Maui in Makawao, Waiakoa, and Haleakala, and at an unspecified site on West Maui. Currently, *Vigna o-wahuensis* is known from the islands of Molokai, Lanai, Kahoolawe, Maui, and Hawaii. There are no currently known populations on Niihau or Oahu. On the State owned island of Kahoolawe, there are a total of three populations with an unknown number of individuals in the Makaalae/Lua Kealialalo, the Puhi a Nanue area near a tidal pond, and on Lua Makika. On Maui, there is a single population of at least one individual on State owned land at Kamanamana (HINHP Database 2001; GDSI 2001; C. Chimera, pers. comm., 2000; Service 1999; 59 FR 56333).

On Kahoolawe and Maui, *Vigna o-wahuensis* occurs in dry to mesic grassland and shrubland at elevations between 0 and 50 m (0 and 164 ft) containing one or more of the following associated plant species: *Sida fallax*, *Chenopodium* spp., or *Chamaesyce* spp. (HINHP Database 2001; Service 1999; 59 FR 56333; R. Hobdy *et al.*, pers. comm., 2001).

The primary threats to *Vigna o-wahuensis* on Kahoolawe are competition with various alien plant

species, fire; and a risk of extinction due to random environmental events, and/or reduced reproductive vigor due to the small number of existing populations and individuals. The primary threats to this species on Maui are competition with the alien plant species *Lantana camara* and *Cenchrus ciliaris* (buffelgrass), and herbivory by axis deer and goats (Service 1999; 59 FR 56333).

Zanthoxylum hawaiiense (ae)

Zanthoxylum hawaiiense, a long-lived perennial, is a medium-size tree with pale to dark gray bark, and lemon-scented leaves in the rue family (Rutaceae). Alternate leaves are composed of three small triangular-oval to lance-shaped, toothed leaves (leaflets) with surfaces usually without hairs. *Zanthoxylum hawaiiense* is distinguished from other Hawaiian members of the genus by several characters: three leaflets all of similar size, one joint on lateral leaf stalk, and sickle-shape fruits with a rounded tip (Stone *et al.* 1999).

Little is known about the life history of *Zanthoxylum hawaiiense*. Flowering cycles, pollination vectors, seed

dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1996a; 59 FR 10305).

Historically, *Zanthoxylum hawaiiense* was known from the islands of Kauai, Molokai, Lanai, Hawaii, and southern and southwestern slopes of Haleakala on Maui. Currently, *Zanthoxylum hawaiiense* is extant on the islands of Kauai, Molokai, Maui, and Hawaii. This species is found on Maui in four populations with a total of 11 individuals on private and State (Makawao Forest Reserve and Department of Hawaiian Home Lands) owned lands at Kahakapao, and in the Hana District north and south of Jeep Trail and north of Kula Pipeline (GDSI 2001; HINHP Database 2001; Service 1996a; 59 FR 10305).

Zanthoxylum hawaiiense is reported from open lowland dry or mesic *Nestegis sandwicensis*-*Pleomele auwahiensis* forests, *Acacia koa*-*Pleomele auwahiensis* forest, or montane dry forest at elevations between 882 and 1,540 m (2,894 and 5,051 ft) containing one or more of the

following associated native species: *Metrosideros polymorpha*, *Diospyros sandwicensis*, *Pisonia* spp. (papala kepau), *Xylosma hawaiiensis*, *Santalum ellipticum*, *Alphitonia ponderosa*, *Osteomeles anthyllidifolia*, *Alectryon macrococcus*, *Charpentiera* spp., *Melicope* spp., *Dodonaea viscosa*, *Streblus pendulinus*, *Myrsine lanaiensis*, or *Sophora chrysophylla* (HINHP Database 2001; Service 1996a; 59 FR 10305; R. Hobdy *et al.*, pers. comm., 2001).

The threats to *Zanthoxylum hawaiiense* on Maui include browsing, grazing, and trampling by feral goats and cattle; competition with the alien plant species *Melia azedarach* (chinaberry), *Lantana camara*, and *Pennisetum clandestinum*; fire; human disturbance; and risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of populations (Service 1996a; 59 FR 10305).

A summary of populations and landownership for the 70 plant species reported from the islands of Maui and Kahoolawe is given in Table 3.

TABLE 3.—SUMMARY OF EXISTING POPULATIONS OCCURRING ON MAUI AND KAHOOLAWA, AND LANDOWNERSHIP FOR 70 SPECIES REPORTED FROM MAUI AND KAHOOLAWA.

Species	Number of current populations	Landownership		
		Federal	State	Private
<i>Acaena exigua</i>	0			
<i>Adenophorus periens</i>	0			
<i>Alectryon macrococcus</i>	7		X	X
<i>Argyroxiphium sandwicense</i> ssp. <i>macrocephalum</i>	4	X		X
<i>Asplenium fragile</i> var. <i>insulare</i>	1	X		X
<i>Bidens micrantha</i> ssp. <i>kalealaha</i>	3	X	X	
<i>Bonamia menziesii</i>	4		X	X
<i>Brighamia rockii</i>	0			
<i>Cenchrus agrimonioides</i>	2		X	
<i>Centaurium sebaeoides</i>	3		X	X
<i>Clermontia lindseyana</i>	2		X	X
<i>Clermontia oblongifolia</i> ssp. <i>mauiensis</i>	1			X
<i>Clermontia peleana</i>	0			
<i>Clermontia samuelii</i>	4	X	X	
<i>Colubrina oppositifolia</i>	2			X
<i>Ctenitis squamigera</i>	6		X	X
<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i>	3	X	X	X
<i>Cyanea glabra</i>	1			X
<i>Cyanea grimesiana</i> spp. <i>grimesiana</i>	2			X
<i>Cyanea hamatiflora</i> spp. <i>hamatiflora</i>	7	X	X	X
<i>Cyanea lobata</i>	4			X
<i>Cyanea mceldowneyi</i>	6		X	X
<i>Cyrtandra munroi</i>	4		X	X
<i>Delissea undulata</i>	0			
<i>Diellia erecta</i>	5		X	X
<i>Diplazium molokaiense</i>	4		X	X
<i>Dubautia plantaginea</i> spp. <i>humilis</i>	1			X
<i>Flueggea neowawraea</i>	3		X	X
<i>Geranium arboreum</i>	7	X	X	X
<i>Geranium multiflorum</i>	8	X	X	X
<i>Gouania vitifolia</i>	0			
<i>Hedyotis coriacea</i>	1		X	
<i>Hedyotis mannii</i>	1			X
<i>Hesperomannia arborescens</i>	2		X	X
<i>Hesperomannia arbuscula</i>	2			X

TABLE 3.—SUMMARY OF EXISTING POPULATIONS OCCURRING ON MAUI AND KAHOO LAWE, AND LANDOWNERSHIP FOR 70 SPECIES REPORTED FROM MAUI AND KAHOO LAWE.—Continued

Species	Number of current populations	Landownership		
		Federal	State	Private
<i>Hibiscus brackenridgei</i>	5		X	X
<i>Ischaemum byrone</i>	6		X	X
<i>Isodendron pyriform</i>	0			
<i>Kanaloa kahoolawensis</i>	1		X	
<i>Lipochaeta kamolensis</i>	1		X	
<i>Lysimachia lydgatei</i>	4		X	X
<i>Mariscus pennatiformis</i>	1		X	
<i>Melicope adscendens</i>	2		X	X
<i>Melicope balloui</i>	2	X		X
<i>Melicope knudsenii</i>	1		X	X
<i>Melicope mucronulata</i>	1			X
<i>Melicope ovalis</i>	1	X		
<i>Neraudia sericea</i>	3		X	X
<i>Nototrichium humile</i>	0			
<i>Peucedanum sandwicense</i>	3		X	X
<i>Phlegmariurus mannii</i>	7	X	X	X
<i>Phyllostegia mannii</i>	0			
<i>Phyllostegia mollis</i>	1		X	
<i>Phyllostegia parviflora</i>	0			
<i>Plantago princeps</i>	5	X		X
<i>Platanthera holochila</i>	3		X	X
<i>Pteris lidgatei</i>	2		X	X
<i>Remya mauiensis</i>	3		X	
<i>Sanicula purpurea</i>	5		X	X
<i>Schiedea haleakalensis</i>	2	X		
<i>Schiedea hookeri</i>	0			
<i>Schiedea nuttallii</i>	0			
<i>Sesbania tomentosa</i>	8	X	X	X
<i>Solanum incompletum</i>	0			
<i>Spermolepis hawaiiensis</i>	4		X	X
<i>Tetramolopium arenarium</i>	0			
<i>Tetramolopium capillare</i>	4		X	X
<i>Tetramolopium remyi</i>	0			
<i>Vigna o-wahuensis</i>	4		X	
<i>Zanthoxylum hawaiiense</i>	4		X	X

Previous Federal Action

Federal action on these plants began as a result of section 12 of the Act, which directed the Secretary of the Smithsonian Institution to prepare a report on plants considered to be endangered, threatened, or extinct in the United States. This report, designated as House Document No. 94-51, was presented to Congress on January 9, 1975. In that document, *Alectryon macrococcus* (as *Alectryon macrococcum* var. *macrococcum* and *Alectryon mahoe*), *Bonamia menziesii*, *Brighamia rockii*, *Clermontia lindseyana*, *Colubrina oppositifolia*, *Cyanea glabra* (as *Cyanea scabra* var. *variabilis*), *Cyanea lobata* (as *Cyanea baldwinii*), *Cyanea mceldowneyi*, *Flueggea neowawraea* (as *Drypetes phyllanthoides*), *Geranium arboreum*, *Geranium multiflorum* (as *Geranium multiflorum* var. *multiflorum*, var. *ovatifolium*, and var. *superbum*), *Hedyotis mannii* (as *Hedyotis thyrsoides* var. *thyrsoides*), *Hesperomannia arborescens* (as *Hesperomannia*

arborescens var. *bushiana* and var. *swezeyi*), *Hesperomannia arbuscula*, *Hibiscus brackenridgei* (as *Hibiscus brackenridgei* var. *brackenridgei*, var. *mokuleianus*, and var. "from Hawaii"), *Ischaemum byrone*, *Melicope balloui* (as *Pelea balloui*), *Melicope knudsenii* (as *Pelea multiflora*), *Melicope ovalis* (as *Pelea ovalis*), *Neraudia sericea* (as *Neraudia kahoolawensis*), *Nototrichium humile*, *Peucedanum sandwicense* (as *Peucedanum kauaiense*), *Phyllostegia mollis*, *Plantago princeps* (as *Plantago princeps* var. *elata*, var. *laxiflora*, var. *princeps*), *Remya mauiensis*, *Sesbania tomentosa* (as *Sesbania hobdyi* and *Sesbania tomentosa* var. *tomentosa*), *Vigna o-wahuensis* (as *Vigna sandwicensis* var. *heterophylla* and var. *sandwicensis*), and *Zanthoxylum hawaiiense* (as *Zanthoxylum hawaiiense* var. *citriodora*), were considered to be endangered; *Cyrtandra munroi*, *Diellia erecta*, and *Zanthoxylum hawaiiense* (as *Zanthoxylum hawaiiense* var. *hawaiiense* and var. *velutinosum*) were considered to be threatened; and, *Asplenium fragile* var. *insulare* (as

Asplenium fragile), *Bidens micrantha* ssp. *kalealaha* (as *Bidens distans* and *Bidens micrantha* spp. *kalealaha*), *Ctenitis squamigera*, *Diplazium molokaiense*, *Gouania vitifolia*, *Hedyotis coriacea*, *Isodendron pyriform*, *Melicope knudsenii* (as *Pelea knudsenii* and *Pelea tomentosa*), *Melicope mucronulata* (as *Pelea mucronulata*), *Phlegmariurus mannii* (as *Lycopodium mannii*), *Plantago princeps* (as *Plantago princeps* var. *acaulis*, var. *denticulata*, and var. *queleniana*), *Pteris lidgatei*, *Tetramolopium arenarium* (as *Tetramolopium arenarium* var. *arenarium*, var. *confertum*, and var. *dentatum*), *Tetramolopium capillare*, and *Tetramolopium remyi* were considered extinct. On July 1, 1975, we published notice in the **Federal Register** (40 FR 27823) of our 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 gave notice of our intention to review the status of the plant taxa named therein. As a result of that review, on June 16,

1976, we published a proposed rule in the **Federal Register** (41 FR 24523) to determine endangered status pursuant to section 4 of the Act for approximately 1,700 vascular plant taxa, including all of the above taxa considered to be endangered or thought to be extinct except for *Cyanea glabra* and *Cyrtandra munroi*; additionally, *Argyroxiphium sandwicense* ssp. *macrocephalum* (as *Argyroxiphium macrocephalum*) appeared in the 1976 proposed rule as endangered. The list of 1,700 plant taxa was assembled on the basis of comments and data received by the Smithsonian Institution and the Service

in response to House Document No. 94–51 and the July 1, 1975, **Federal Register** publication. General comments received in response to the 1976 proposal are summarized in an April 26, 1978, **Federal Register** publication (43 FR 17909). In 1978, amendments to the Act required that all proposals over 2 years old be withdrawn. A 1-year grace period was given to proposals already over 2 years old. On December 10, 1979, we 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. We published updated Notices of Review for plants on December 15, 1980 (45 FR 82479), September 27, 1985 (50 FR 39525), February 21, 1990 (55 FR 6183), September 30, 1993 (58 FR 51144), and February 28, 1996 (61 FR 7596). A summary of the status categories for these 70 plant species in the 1980–1996 notices of review can be found in Table 4(a). We listed the 70 species as endangered or threatened between 1991 and 1999. A summary of the listing actions can be found in Table 4(b).

TABLE 4(A).—SUMMARY OF CANDIDACY STATUS FOR 70 PLANT SPECIES FROM MAUI AND KAHOO LAWE.

Species	FEDERAL REGISTER notice of review				
	1980	1985	1990	1993	1996
<i>Acaena exigua</i>	C1	C1	C1		
<i>Adenophorus periens</i>	C1	C1	C1		
<i>Alectryon macrococcus</i>	C1	C1	C1		
<i>Argyroxiphium sandwicense</i> ssp. <i>macrocephalum</i>	C1	C1	C1		
<i>Asplenium fragile</i> var. <i>insulare</i>	C1*	C1*	C1		
<i>Bidens micrantha</i> ssp. <i>kalealaha</i>	C1	C1	C1		
<i>Bonamia menziesii</i>	C1	C1	C1		
<i>Brighamia rockii</i>	C1	C1	C1		
<i>Cenchrus agrimonioides</i>					
<i>Centaurium sebaeoides</i>			C1		
<i>Clermontia lindseyana</i>	C1	C1	C1		
<i>Clermontia oblongifolia</i> ssp. <i>mauiensis</i>			C1		
<i>Clermontia peleana</i>	3C	3C	C1		
<i>Clermontia samuelii</i>					
<i>Colubrina oppositifolia</i>	C1	C1	C1		
<i>Ctenitis squamigera</i>	C1*	C1*	C1*		
<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i>					C
<i>Cyanea glabra</i>					C
<i>Cyanea grimesiana</i> spp. <i>grimesiana</i>	C1	C1		C2	
<i>Cyanea hamatiflora</i> spp. <i>hamatiflora</i>					C
<i>Cyanea lobata</i>	C1	C1	C1		
<i>Cyanea mceldowneyi</i>	C1	C1	C1		
<i>Cyrtandra munroi</i>	C2	C2	C1		
<i>Delissea undulata</i>	C1	C1*	C1*	C2*	
<i>Diellia erecta</i>	C1	C1	C1		
<i>Diplazium molokaiense</i>	C1*	C1*	C1		
<i>Dubautia plantaginea</i> spp. <i>humilis</i>			C2	C2	C
<i>Flueggea neowawraea</i>	C1	C1	C1		
<i>Geranium arboreum</i>	C1	C1	C1		
<i>Geranium multiflorum</i>	C1	C1	C1		
<i>Gouania vitifolia</i>	C1*	C1*	C1*		
<i>Hedyotis coriacea</i>	C1	C1	C1		
<i>Hedyotis mannii</i>	C1	C1	C1		
<i>Hesperomannia arborescens</i>	C1	C1	C1		
<i>Hesperomannia arbuscula</i>	C1	C1	C1		
<i>Hibiscus brackenridgei</i>	C1	C1	C1		
<i>Ischaemum byrone</i>	C1	C1	C1		
<i>Isodendron pyrifolium</i>	C1*	C1*	3A		
<i>Kanaloa kahoolawensis</i>					C
<i>Lipochaeta kamolensis</i>	C1	C1	C1		
<i>Lysimachia lydgatei</i>			C1		
<i>Mariscus pennatiflorus</i>		C1	C1		
<i>Melicope adscendens</i>			3A		
<i>Melicope balloui</i>	C1	C1	C1*		
<i>Melicope knudsenii</i>	C1*	C1*	C1		
<i>Melicope mucronulata</i>	C1	C1	C1		
<i>Melicope ovalis</i>	C1	C1*	C1*		
<i>Neraudia sericea</i>	3A	3A	C1		
<i>Nototrichium humile</i>	C1	C1	3C		
<i>Peucedanum sandwicense</i>	C2	C2	C2		
<i>Phlegmariurus mannii</i>	C1	C1	C1		
<i>Phyllostegia mannii</i>			C1		

TABLE 4(A).—SUMMARY OF CANDIDACY STATUS FOR 70 PLANT SPECIES FROM MAUI AND KAHOO LAWE.—Continued

Species	FEDERAL REGISTER notice of review				
	1980	1985	1990	1993	1996
<i>Phyllostegia mollis</i>	C1	C1	C1		
<i>Phyllostegia parviflora</i>	C1	C1	C1		
<i>Plantago princeps</i>	C2	C2	C1		
<i>Platanthera holochila</i>	C1	C1	C1	C2	
<i>Pteris lidgatei</i>	C1	C1	C1		
<i>Remya mauiensis</i>	C1	C1			
<i>Sanicula purpurea</i>			C1		
<i>Schiedea haleakalensis</i>		C1	C1		
<i>Schiedea hookeri</i>				C2	
<i>Schiedea nuttallii</i>				C2	
<i>Sesbania tomentosa</i>	C1*	C1*	C1		
<i>Solanum incompletum</i>	C1*	C1*	C1		
<i>Spermolepis hawaiiensis</i>			C1		
<i>Tetramolopium arenarium</i>	C1*	C1*	3A		
<i>Tetramolopium capillare</i>	C1*	C1*	C1*		
<i>Tetramolopium remyi</i>	C1	C1	C1		
<i>Vigna o-wahuensis</i>	C1	C1	C1		
<i>Zanthoxylum hawaiiense</i>	C1	C1	C1		

Key:

C: Candidates: Species for which we have in file sufficient information on biological vulnerability and threats to support proposals to list them as endangered or threatened.

C1: Taxa for which the Service has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.

C1*: Taxa of known vulnerable status in the recent past that may already have become extinct.

C2: Taxa for which there is some evidence of vulnerability, but for which there are not enough data to support listing proposals at this time.

3A: Taxa for which the Service has persuasive evidence of extinction. If rediscovered, such taxa might acquire high priority for listing.

3C: Taxa that have proven to be more abundant or widespread than previously believed and/or those that are not subject to any identifiable threat.

FEDERAL REGISTER Notice of Review—1980: 45 FR 82479, 1985: 50 FR 39525, 1990: 55 FR 6183, 1993: 58 FR 51144, 1996: 61 FR 7596

TABLE 4(b).—SUMMARY OF LISTING ACTIONS FOR 70 PLANT SPECIES FROM MAUI AND KAHOO LAWE

Species	Federal status	Proposed rule		Final Rule		Proposed critical habitat	
		Date	Federal Register	Date	Federal Register	Date	Federal Register
<i>Acaena exigua</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20787	12/18/00	65 FR 79192
<i>Adenophorus periens</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	11/07/00, 12/29/00	65 FR 66808, 65 FR 83157
<i>Alectryon macrococcus</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	11/07/00, 12/18/00, 12/29/00	65 FR 66808, 65 FR 79192, 65 FR 83157
<i>Argyroxiphium sandwicense</i> ssp. <i>macrocephalum</i> .	T	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Asplenium fragile</i> var. <i>insulare</i>	E	06/24/93	58 FR 34231	09/09/94	59 FR 49025		
<i>Bidens micrantha</i> ssp. <i>kalealaha</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Bonamia menziesii</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	11/07/00, 12/18/00, 12/27/00	65 FR 66808, 65 FR 79192, 65 FR 82086
<i>Brighamia rockii</i>	E	09/20/91	56 FR 47718	10/08/92	57 FR 46325	12/29/00	65 FR 83157
<i>Cenchrus agrimonioides</i>	E	10/02/95	60 FR 51417	10/10/96	61 FR 53108	12/18/00	65 FR 79192
<i>Centaurium sebaeoides</i>	E	09/28/90	55 FR 39664	10/29/91	56 FR 55770	11/07/00, 12/18/00, 12/27/00, 12/29/00	65 FR 66808, 65 FR 79192, 65 FR 82086, 65 FR 83157
<i>Clermontia lindseyana</i>	E	12/17/92	57 FR 59951	03/04/94	59 FR 10305	12/18/00	65 FR 79192
<i>Clermontia oblongifolia</i> ssp. <i>mauiensis</i> .	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00, 12/27/00	65 FR 79192, 65 FR 82086
<i>Clermontia peleana</i>	E	12/17/92	57 FR 59951	03/04/94	59 FR 10305		
<i>Clermontia samuelii</i>	E	05/15/97	62 FR 26757	09/03/99	64 FR 48307	12/18/00	65 FR 79192
<i>Colubrina oppositifolia</i>	E	12/17/92	57 FR 59951	03/04/94	59 FR 10305	12/18/00	65 FR 79192
<i>Ctenitis squamigera</i>	E	06/24/93	58 FR 34231	09/09/94	59 FR 49025	12/18/00, 12/27/00, 12/29/00	65 FR 79192, 65 FR 83157
<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i> .	E	05/15/97	62 FR 26757	09/03/99	64 FR 48307	12/18/00	65 FR 79192
<i>Cyanea glabra</i>	E	05/15/97	62 FR 26757	09/03/99	64 FR 48307	12/18/00	65 FR 79192
<i>Cyanea grimesiana</i> ssp. <i>grimesiana</i>	E	10/02/95	60 FR 51417	10/10/96	61 FR 53108	12/18/00, 12/29/00, 12/27/00	65 FR 79192, 65 FR 83157, 65 FR 82086

TABLE 4(b).—SUMMARY OF LISTING ACTIONS FOR 70 PLANT SPECIES FROM MAUI AND KAHOO LAWE—Continued

Species	Federal status	Proposed rule		Final Rule		Proposed critical habitat	
		Date	Federal Register	Date	Federal Register	Date	Federal Register
<i>Cyanea hamatiflora</i> spp. <i>hamatiflora</i>	E	05/15/97	62 FR 26757	09/03/99	64 FR 48307	12/18/00	65 FR 79192
<i>Cyanea lobata</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Cyanea mceldowneyi</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Cyrtandra munroi</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00, 12/27/00	65 FR 79192, 65 FR 82086
<i>Delissea undulata</i>	E	06/27/94	59 FR 32946	10/10/96	61 FR 53124	11/07/00	65 FR 66808
<i>Diellia erecta</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	12/18/00, 12/29/00	65 FR 79192, 65 FR 83157
<i>Diplazium molokaiense</i>	E	06/24/93	58 FR 34231	09/09/94	59 FR 49025	12/18/00	65 FR 66808
<i>Dubautia plantaginea</i> spp. <i>humilis</i>	E	05/15/97	62 FR 26757	09/03/99	64 FR 48307	12/18/00	65 FR 79192
<i>Flueggea neowawraea</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	11/07/00, 12/18/00	65 FR 66808, 65 FR 79192
<i>Geranium arboreum</i>	E	01/23/91	56 FR 2490	05/13/92	57 FR 20589	12/18/00	65 FR 79192
<i>Geranium multiflorum</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Gouania vitifolia</i>	E	12/14/92	57 FR 39066	06/27/94	59 FR 32932	11/07/00,	65 FR 66808,
<i>Hedyotis coriacea</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Hedyotis mannii</i>	E	09/20/91	56 FR 47718	10/08/92	57 FR 46325	12/18/00, 12/27/00, 12/29/00	65 FR 79192, 65 FR 82086, 65 FR 83157
<i>Hesperomannia arborescens</i>	E	10/14/92	57 FR 47028	03/28/94	59 FR 14482	12/18/00, 12/29/00	65 FR 79192, 65 FR 83157
<i>Hesperomannia arbuscula</i>	E	09/28/90	55 FR 39664	10/29/91	56 FR 55770	12/18/00	65 FR 79192
<i>Hibiscus brackenridgei</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	12/18/00, 12/27/00	65 FR 79192, 65 FR 82086
<i>Ischaemum byrone</i>	E	12/17/92	57 FR 59951	03/04/94	59 FR 10305	12/18/00, 12/29/00	65 FR 79192, 65 FR 83157
<i>Isodendron pyriforme</i>	E	12/17/92	57 FR 59951	03/04/94	59 FR 10305	12/18/00	65 FR 79192
<i>Kanaloa kahoolawensis</i>	E	05/15/97	62 FR 26757	09/03/99	64 FR 48307	12/18/00	65 FR 79192
<i>Lipochaeta kamolensis</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Lysimachia lydgatei</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Mariscus pennatifolius</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	12/18/00	65 FR 79192
<i>Melicope adscendens</i>	E	05/11/93	58 FR 18073	12/05/94	59 FR 62346	12/18/00	65 FR 79192
<i>Melicope balloui</i>	E	05/11/93	58 FR 18073	12/05/94	59 FR 62346	12/18/00	65 FR 79192
<i>Melicope knudsenii</i>	E	10/30/91	56 FR 5562	02/25/94	59 FR 09304	11/07/00, 12/18/00	65 FR 66808, 65 FR 79192
<i>Melicope mucronulata</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00, 12/29/00	65 FR 79192, 65 FR 83157
<i>Melicope ovalis</i>	E	05/11/93	58 FR 18073	12/05/94	59 FR 62346	12/18/00	65 FR 79192
<i>Neraudia sericea</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	12/18/00, 12/29/00	65 FR 79192, 65 FR 83157
<i>Nototrichium humile</i>	E	10/02/95	60 FR 51398	10/10/96	61 FR 53089	NA	NA
<i>Peucedanum sandwicense</i>	T	10/30/91	56 FR 5562	02/25/94	59 FR 09304	11/07/00, 12/18/00, 12/29/00	65 FR 66808, 65 FR 79192, 65 FR 83157
<i>Phlegmariurus mannii</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Phyllostegia mannii</i>	E	09/20/91	56 FR 47718	10/08/92	57 FR 46325	12/29/00	65 FR 83157
<i>Phyllostegia mollis</i>	E	09/28/90	55 FR 39664	10/29/91	56 FR 55770	12/18/00	65 FR 79192
<i>Phyllostegia parviflora</i>	E	10/02/95	60 FR 51417	10/10/96	61 FR 53108	12/18/00	65 FR 79192
<i>Plantago princeps</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	11/07/00, 12/18/00, 12/29/00	65 FR 66808, 65 FR 79192, 65 FR 83157
<i>Platanthera holochila</i>	E	10/02/95	60 FR 51417	10/10/96	61 FR 53108	11/07/00, 12/18/00, 12/29/00	65 FR 66808, 65 FR 79192, 65 FR 83157
<i>Pteris lidgatei</i>	E	06/24/93	58 FR 34231	09/09/94	59 FR 49025	12/18/00	65 FR 79192
<i>Remya mauiensis</i>	E	10/02/89	54 FR 40447	01/14/91	56 FR 1450	12/18/00	65 FR 79192
<i>Sanicula purpurea</i>	E	10/02/95	60 FR 51417	10/10/96	61 FR 53108	12/18/00	65 FR 79192
<i>Schiedea haleakalensis</i>	E	05/24/91	56 FR 23842	05/15/92	57 FR 20772	12/18/00	65 FR 79192
<i>Schiedea hookeri</i>	E	10/02/95	60 FR 51417	10/10/96	61 FR 53108	12/18/00	65 FR 79192
<i>Schiedea nuttallii</i>	E	10/02/95	60 FR 51417	10/10/96	61 FR 53108	11/07/00, 12/29/00	65 FR 66808, 65 FR 79192,
<i>Sesbania tomentosa</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	11/07/00, 12/18/00,	65 FR 66808, 65 FR 79192,
<i>Solanum incompletum</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	11/07/00, 12/18/00,	65 FR 66808, 65 FR 79192,
<i>Spermolepis hawaiiensis</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	11/07/00, 12/18/00, 12/27/00	65 FR 66808, 65 FR 79192, 65 FR 82086,
<i>Tetramolopium arenarium</i>	E	12/17/92	57 FR 59951	03/04/94	59 FR 10305	12/18/00	65 FR 79192
<i>Tetramolopium capillare</i>	E	03/25/93	58 FR 16164	09/30/94	59 FR 49860	12/18/00	65 FR 79192

TABLE 4(b).—SUMMARY OF LISTING ACTIONS FOR 70 PLANT SPECIES FROM MAUI AND KAHOOLAWE—Continued

Species	Federal status	Proposed rule		Final Rule		Proposed critical habitat	
		Date	Federal Register	Date	Federal Register	Date	Federal Register
<i>Tetramolopium remyi</i>	E	09/17/90	55 FR 38236	09/20/91	56 FR 47686		
<i>Vigna o-wahuensis</i>	E	09/14/93	58 FR 48012	11/10/94	59 FR 56333	12/18/00, 12/27/00, 12/29/00	65 FR 79192, 65 FR 82086, 65 FR 83157
<i>Zanthoxylum hawaiiense</i>	E	12/17/92	57 FR 59951	03/04/94	59 FR 10305	11/07/00, 12/18/00, 12/29/00	65 FR 66808, 65 FR 79192, 66 FR 83157

Key: E= Endangered T= Threatened

Critical Habitat

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time the species is determined to be endangered or threatened. Our regulations (50 CFR 424.12(a)(1)) state that designation of critical habitat is not prudent when one or both of the following situations exist: (1) the species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of threat to the species, or (2) such designation of critical habitat would not be beneficial to the species. At the time each plant was listed, we determined that designation of critical habitat was prudent for six of these plants (*Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, and *Kanaloa kahoowawensis*) and not prudent for the other 64 plants because it would not benefit the plant or would increase the degree of threat to the species.

The not prudent determinations for these species, along with others, were challenged in *Conservation Council for Hawaii v. Babbitt*, 2 F. Supp. 2d 1280 (D. Haw. 1998). On March 9, 1998, the United States District Court for the District of Hawaii, directed us to review the prudency determinations for 245 listed plant species in Hawaii, including 64 of the 70 species reported from Maui and Kahoolawe. Among other things, the court held that, in most cases we did not sufficiently demonstrate that the species are threatened by human activity or that such threats would increase with the designation of critical habitat. The court also held that we failed to balance any risks of designating critical habitat against any benefits (*id.* at 1283–85).

Regarding our determination that designating critical habitat would have no additional benefits to the species above and beyond those already provided through the section 7 consultation requirement of the Act, the court ruled that we failed to consider the specific effect of the consultation requirement on each species (*id.* at 1286–88). In addition, the court stated that we did not consider benefits outside of the consultation requirements. In the court's view, these potential benefits include substantive and procedural protections. The court held that, substantively, designation establishes a "uniform protection plan" prior to consultation and indicates where compliance with section 7 of the Act is required. Procedurally, the court stated that the designation of critical habitat educates the public, State, and local governments and affords them an opportunity to participate in the designation (*id.* at 1288). The court also stated that private lands may not be excluded from critical habitat designation even though section 7 requirements apply only to Federal agencies. In addition to the potential benefit of informing the public, State, and local governments of the listing and of the areas that are essential to the species' conservation, the court found that there may be Federal activity on private property in the future, even though no such activity may be occurring there at the present (*id.* at 1285–88).

On August 10, 1998, the court ordered us to publish proposed critical habitat designations or non-designations for at least 100 species by November 30, 2000, and to publish proposed designations or non-designations for the remaining 145 species by April 30, 2002. *Conservation Council for Hawaii v. Babbitt*, 24 F. Supp. 2d 1074 (D. Haw. 1998).

At the time we listed *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, and *Kanaloa*

kahoowawensis (64 FR 48307) we determined that designation of critical habitat was prudent and that we would develop critical habitat designations for these six taxa, along with four others, at the same time we developed designations for the 245 Hawaiian plant species. This timetable was challenged in *Conservation Council for Hawaii v. Babbitt*, Civ. No. 99–00283 HG (D. Haw. Aug. 19, 1999, Feb. 16, 2000, and March 28, 2000). The court agreed that it was reasonable for us to integrate these ten Maui Nui (Maui, Lanai, Molokai, and Kahoolawe) plant taxa into the schedule established for designating critical habitat for the other 245 Hawaiian plants, but ordered us to publish proposed critical habitat designations for the 10 Maui Nui species with the first 100 plants from the group of 245 by November 30, 2000, and to publish final critical habitat designations by November 30, 2001.

On November 30, 1998, we published a notice in the **Federal Register** requesting public comments on our reevaluation of whether designation of critical habitat is prudent for the 245 Hawaiian plants at issue (63 FR 65805). The comment period closed on March 1, 1999, and was reopened from March 24, 1999, to May 24, 1999 (64 FR 14209). We received more than 100 responses from individuals, nonprofit organizations, the State Division of Forestry and Wildlife (DOFAW), county governments, and Federal agencies (U.S. Department of Defense-Army, Navy, Air Force). Only a few responses offered information on the status of individual plant species or on current management actions for one or more of the 245 Hawaiian plants. While some of the respondents expressed support for the designation of critical habitat for 245 Hawaiian plants, more than 80 percent opposed the designation of critical habitat for these plants. In general, these respondents opposed designation because they believed it will cause economic hardship, discourage cooperative projects, polarize

relationships with hunters, or potentially increase trespass or vandalism on private lands. In addition, commenters also cited a lack of information on the biological and ecological needs of these plants which, they suggested, may lead to designation based on guesswork. The respondents who supported the designation of critical habitat cited that designation would provide a uniform protection plan for the Hawaiian Islands; promote funding for management of these plants; educate the public and State government; and protect partnerships with landowners and build trust.

On December 29, 1999, we mailed letters to more than 130 landowners on the islands of Maui and Kahoolawe requesting any information considered germane to the management of any of the 70 plants on his/her property, and containing a copy of the November 30, 1998, **Federal Register** notice, a map showing the general locations of the species that may be on his/her property, and a handout containing general information on critical habitat. We received 20 written responses to our landowner mailing with varying types of information on their current land management activities. These responses included information on the following: the presence of fences or locked gates to restrict public access; access to the respondent's property by hunters or whether hunting is allowed on the property; ongoing weeding and rat control programs; and the propagation and/or planting of native plants. Some respondents stated that the plants of concern were not on her/his property. Only a few respondents expressed support for the designation of critical habitat. We held two open houses on the island of Maui, at the Lahaina Civic Center and the Wailuku Community Center on January 11 and 12, 2000, respectively, to meet one-on-one with local landowners and other interested members of the public. A total of 30 people attended the two open houses. In addition, we met with Maui County Division of Forestry and Wildlife staff to discuss their management activities on Maui.

On December 18, 2000, we published the second of the court-ordered prudency determinations and proposed critical habitat designations or non-designations for Maui and Kahoolawe plants (65 FR 79192). The prudency determinations and proposed critical habitat designations for Kauai and Niihau plants were published on November 7, 2000 (65 FR 66808), for Lanai plants on December 27, 2000 (65 FR 82086), and for Molokai plants on December 29, 2000 (65 FR 83157). All

of these proposed rules had been sent to the **Federal Register** by or on November 30, 2000, as required by the court orders. In those proposals, we determined that critical habitat was prudent and proposed designation of critical habitat for 61 species (*Alectryon macrococcus*, *Argyroxiphium sandwicense* ssp. *macrocephalum*, *Adenophorus periens*, *Bidens micrantha* ssp. *kalealaha*, *Bonamia menziesii*, *Brighamia rockii*, *Cenchrus agrimonoides*, *Centaurium sebaeoides*, *Clermontia lindseyana*, *Clermontia oblongifolia* ssp. *mauiensis*, *Clermontia samuelii*, *Colubrina oppositifolia*, *Ctenitis squamigera*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Cyanea lobata*, *Cyanea mceldowneyi*, *Cyrtandra munroi*, *Delissea undulata*, *Diellia erecta*, *Diplazium molokaiense*, *Dubautia plantaginea* ssp. *humilis*, *Flueggea neowawraea*, *Geranium arboreum*, *Geranium multiflorum*, *Hedyotis coriacea*, *Hedyotis mannii*, *Hesperomannia arborescens*, *Hesperomannia arbuscula*, *Hibiscus brackenridgei*, *Ischaemum byrone*, *Isodendron pyriformis*, *Kanaloa kahoolawensis*, *Lipochaeta kamolensis*, *Lysimachia lydgatei*, *Mariscus pennatifolius*, *Melicope adscendens*, *Melicope balloui*, *Melicope knudsenii*, *Melicope mucronulata*, *Melicope ovalis*, *Neraudia sericea*, *Peucedanum sandwicense*, *Phlegmariurus mannii*, *Phyllostegia mannii*, *Phyllostegia mollis*, *Plantago princeps*, *Platanthera holochila*, *Pteris lidgatei*, *Remya mauiensis*, *Sanicula purpurea*, *Schiedea haleakalensis*, *Schiedea nuttallii*, *Sesbania tomentosa*, *Spermolepis hawaiiensis*, *Tetramolopium capillare*, *Tetramolopium remyi*, *Vigna o-wahuensis*, and *Zanthoxylum hawaiiense*) that are reported from Maui and Kahoolawe as well as on Kauai, Niihau, Lanai, and Molokai. Critical habitat is proposed for 59 of these species on Maui and/or Kahoolawe at this time. Critical habitat is not proposed for *Adenophorus periens* and *Schiedea nuttallii* on Maui and Kahoolawe because we have not identified habitat essential to their conservation on these islands.

In the December 18, 2000, proposal we determined that it was prudent to designate approximately 13,574 ha (33,614 ac) of lands on the island of Maui and approximately 207 ha (512 ac) of lands on the island of Kahoolawe as critical habitat. The publication of the proposed rule opened a 60-day public comment period, which closed on February 16, 2001. On February 22,

2001, we published a notice (66 FR 11131) announcing the reopening of the comment period until April 2, 2001, on the proposal to designate critical habitat for 50 plants from Maui and Kahoolawe and a notice of a public hearing. On March 20, 2001, we held a public hearing at the Renaissance Wailea Beach Resort, Maui.

On October 3, 2001, we submitted a joint stipulation with Earth Justice Legal Defense Fund requesting extension of the court order for the final rules to designate critical habitat for plants from Kauai and Niihau (July 30, 2002), Maui and Kahoolawe (August 23, 2002), Lanai (September 16, 2002), and Molokai (October 16, 2002), citing the need to revise the proposals to incorporate or address new information and comments received during the comment periods. The joint stipulation was approved and ordered by the court on October 5, 2001. On January 28, 2002, we determined that designation of critical habitat was prudent for *Solanum incompletum* (67 FR 3940), a species reported from Maui as well as Kauai, Molokai, and Lanai. Designation of critical habitat is not proposed for this species on Maui because we have not identified habitat essential to its conservation on this island. Publication of this revised proposal for plants from Maui and Kahoolawe is consistent with the court-ordered stipulation.

Summary of Comments and Recommendations

In the December 18, 2000, proposed rule (65 FR 79192), we requested all interested parties to submit comments on the specifics of the proposal, including information, policy, and proposed critical habitat boundaries as provided in the proposed rule. The first comment period closed on February 16, 2001. We reopened the comment period from February 22, 2001, to April 2, 2001 (66 FR 11131), to accept comments on the proposed designations and to hold a public hearing on March 20, 2001, in Wailea, Maui.

We contacted all appropriate State and Federal agencies, county governments, elected officials, and other interested parties and invited them to comment. In addition, we invited public comment through the publication of notices in the following newspapers: the *Honolulu Advertiser* on December 28, 2000, and the *Maui News* on January 2, 2000. We received one request for a public hearing. We announced the date and time of the public hearing in letters mailed to all interested parties, appropriate State and Federal agencies, county governments, and elected officials, and in notices published in the

Honolulu Advertiser and in the *Maui News* newspapers on March 1, 2001. A transcript of the hearing held in Wailea, Maui on March 20, 2001, is available for inspection (see **ADDRESSES** section).

We requested three botanists who have familiarity with Maui and Kahoolawe plants to peer review the proposed critical habitat designations. All three peer reviewers submitted comments on the proposed critical habitat designations. Two of the peer reviewers supported the designation of critical habitat for the Maui and Kahoolawe plants while the third peer reviewer says we did a very ambitious and credible attempt but does not support or oppose the designation. Two of the peer reviewers did not support the methodology we used to identify critical habitat, i.e. identifying only occupied habitat for these species. The third reviewer thought that focusing on known locations was appropriate to meet the court orders. Two of the reviewers did not agree with the exclusion of areas from critical habitat designation due to on-going land management. One peer reviewer opined that recovery of the plants would also entail the establishment of new populations in addition to the currently existing populations. All three peer reviewers also provided updated biological information, critical review, and editorial comments.

We received a total of 5 oral comments, 18 written comments, and 6 comments both in written and oral form during the two comment periods. These included responses from two Federal agencies, seven State offices, and 22 private organizations or individuals. We reviewed all comments received for substantive issues and new information regarding critical habitat and the Maui and Kahoolawe plants. Of the 29 comments we received, 7 supported designation, 9 were opposed to it, and 13 provided information or declined to oppose or support the designation. Similar comments were grouped into eight general issues relating specifically to the proposed critical habitat designations. These are addressed in the following summary.

Issue 1: Biological Justification and Methodology

(1) *Comment:* The designation of critical habitat in unoccupied habitat is particularly important, since this may be the only mechanism available to ensure that Federal actions do not eliminate the habitat needed for the survival and recovery of extremely endangered species.

Our Response: We agree. Our recovery plans for these species (Service 1995a,

1995b, 1996a, 1996b, 1997, 1998a, 1998b, 1999, 2001) identify the need to expand existing populations and reestablish wild populations within historic range. We have revised the December 18, 2000, proposal to designate critical habitat for 50 plants from Maui and Kahoolawe to incorporate new information and address comments and new information received during the comment periods, including information on areas of potentially suitable unoccupied habitat for 61 plants from Maui and Kahoolawe.

(2) *Comment:* The data cited in the critical habitat proposal documenting the habitat losses and threats is questionable. We do not agree with the threats to the species as described in the proposed rule.

Our Response: In the December 18, 2000, proposal to designate critical habitat for 50 plants from Maui and Kahoolawe, we provided information on the status of and threats to the Maui and Kahoolawe plants. The threats to these species, and the species status, were documented in the listing rules for the Maui and Kahoolawe plants (56 FR 1450, 56 FR 47686, 56 FR 55770, 57 FR 20589, 57 FR 20772, 57 FR 20787, 57 FR 46325, 59 FR 9304, 59 FR 10305, 59 FR 14482, 59 FR 32932, 59 FR 49025, 59 FR 49860, 59 FR 56333, 59 FR 63436, 61 FR 53089, 61 FR 53108, 61 FR 53124, and 64 FR 48307), and in the recovery plans for these species (Service 1995a, 1995b, 1996a, 1996b, 1997, 1998a, 1998b, 1999, 2001), and in the supporting documentation in the files at the Pacific Islands Office (See **ADDRESSES** section).

(3a) *Comment:* The proposal provides very limited information on the criteria and data used to determine the areas proposed as critical habitat. (3b)

Comment: For example, failure to utilize recent collections at the herbaria of the B.P. Bishop Museum and the National Tropical Botanical Garden may result in incomplete knowledge of current known distributions and subsequently inadequate analysis for critical habitat designations. (3c) *Comment:* In situations where few species locations are currently known, pre-1970 locations may be used to identify suitable habitat for the species.

Our Response: When developing the December 18, 2000, proposal to designate critical habitat for 50 plants from Maui and Kahoolawe, we used the best scientific and commercial data available at the time, including but not limited to, information from the known locations, site-specific species information from the HINHP database, which includes information from collections housed at the herbarium of

B.P. Bishop Museum and the National Tropical Botanical Garden, and our own rare plant database; species information from the Center for Plant Conservation's (CPC) rare plant monitoring database housed at the University of Hawaii's Lyon Arboretum; the final listing rules for these species; information received at the two informational open houses held on Maui at the Lahaina Civic Center and the Wailuku Community Center on January 11 and 12, 2000, respectively; recent biological surveys and reports; our recovery plans for these species; information received in response to outreach materials and requests for species and management information we sent to all landowners, land managers, and interested parties on the islands of Maui and Kahoolawe; discussions with botanical experts; and recommendations from the Hawaii Pacific Plants Recovery Coordinating Committee (HPPRCC) (Service 1995a, 1995b, 1996a, 1996b, 1997, 1998a, 1998b, 1999, 2001; HPPRCC 1998; HINHP Database 2000, CPC *in litt.* 1999).

We have revised the proposed designations to incorporate new information and address comments and new information received during the comment periods. This additional information includes Geographic Information System (GIS) coverages (e.g., vegetation, soils, annual rainfall, elevation contours, land ownership); completed recovery plans; information received during the public comment periods and the public hearing, including information on recent plant collections housed at the B.P. Bishop Museum herbarium and the National Tropical Botanical Garden; and site-specific information from historical (pre-1970) collections (H. Oppenheimer, pers. comm., 2001; F. Duvall, pers. comm., 2001; M. Buck, *in litt.* 2001; 66 FR 11131).

(4a) *Comment:* We received comments that the proposed critical habitat designations were not specific enough, and were overly broad, and therefore, failed to comply with Congressional intent to restrict critical habitat to those areas "essential to the conservation of the species." (4b) *Comment:* The designation was not inclusive enough and failed to include areas that Maui and Kahoolawe plants have used and are necessary for recovery of the species.

Our Response: We used the best scientific information available to develop the December 18, 2000, proposal to designate critical habitat for 50 Maui and Kahoolawe plants. This information is detailed above in our response to Comment (3). Based on the information described above, we believe

we have identified those areas essential to the conservation of the Maui and Kahoolawe plant species at issue in this proposed rule.

(5) *Comment:* Some commenters were concerned that developed infrastructure (i.e., roads, buildings, etc.) on their property is within proposed critical habitat boundaries, even though it does not contain any habitat for listed plants.

Our Response: In defining critical habitat boundaries, we made an effort to avoid developed areas, such as towns and other similar lands, that are unlikely to contribute to the conservation of these species. However, the minimum mapping unit that we used to approximate our delineation of critical habitat for these species did not allow us to exclude all such developed areas. In addition, existing features and structures within the boundaries of the mapped unit, such as buildings, roads, aqueducts, railroads, telecommunications equipment, telemetry antennas, radars, missile launch sites, arboreta and gardens, heiau (indigenous places of worship or shrines), airports, other paved areas, lawns, and other rural residential landscaped areas do not contain one or more of the primary constituent elements and would be excluded under the terms of the proposed regulation. Therefore, unless a Federal action related to such features or structures indirectly affected nearby habitat containing the primary constituent elements, operation and maintenance of such features or structures generally would not be impacted by the designation of critical habitat.

(6a) *Comment:* The presence of non-native plants makes habitat unsuitable and inappropriate for designation as critical habitat. (6b) *Comment:* Expansion of plant populations in highly degraded ecosystems may be biologically impossible due to the lack of the habitat components needed for survival.

Our Response: The presence of non-native plant competitors does not preclude designation of an area as critical habitat, if the area contains the physical and biological features that are essential to the conservation of the species and that may require special management considerations or protection. We used the best available information, including expert scientific opinion, to identify the physical and biological features (type of plant community, associated species, and locale information such as rocky cliffs, talus slopes, stream banks) essential to the conservation of each species, and to identify potentially suitable habitat within the known historic range of each

species. Of the area identified as potentially suitable habitat for a species, only those areas within the least disturbed suitable habitat were proposed as critical habitat for the species. In addition, habitat restoration projects are underway in some of the areas proposed as critical habitat for one or more species, such as at Ulupalakua Ranch on the island of Maui. At this location, non-native plants are being removed and replaced with native species, some of which are endangered or threatened.

We invite comments from the public that provide information on potentially suitable habitat within the known historic range of each species and whether lands within the proposed critical habitat provide for the conservation of one or more of the species.

(7) *Comment:* The Service should propose critical habitat on Maui and Kahoolawe for 14 plants historically, but not currently, found there.

Our Response: Fourteen species (*Adenophorous periens*, *Brighamia rockii*, *Clermontia peleana*, *Delissea undulata*, *Gouania vitifolia*, *Isodendron pyriformis*, *Nototrichium humile*, *Phyllostegia mannii*, *Phyllostegia parviflora*, *Schiedea hookeri*, *Schiedea nuttallii*, *Solanum incompletum*, *Tetramolopium arenarium*, and *Tetramolopium remyi*) are known only from historical records on the islands of Maui or Kahoolawe. Critical habitat is proposed for six of these species (*Brighamia rockii*, *Gouania vitifolia*, *Isodendron pyriformis*, *Nototrichium humile*, *Phyllostegia mannii*, and *Tetramolopium remyi*) for which we have identified the physical and biological features that are considered essential to their conservation on the island of Maui. We also will consider proposing designation of critical habitat for these six species within their historical range on other Hawaiian islands. Critical habitat is not proposed for eight species (*Adenophorous periens*, *Clermontia peleana*, *Delissea undulata*, *Phyllostegia parviflora*, *Schiedea hookeri*, *Schiedea nuttallii*, *Solanum incompletum*, or *Tetramolopium arenarium*) which no longer occur on the islands of Maui or Kahoolawe, and for which we did not identify habitat essential to their conservation on these islands. All areas proposed as critical habitat are within the historical range of one or more of the 61 species at issue and contain one or more of the physical or biological features (primary constituent elements) essential for the conservation of one or more of the species.

Critical habitat is proposed for *Asplenium fragile* var. *insulare*, which has been recently rediscovered on Maui. Critical habitat is proposed at this time for *Asplenium fragile* var. *insulare* on Maui based on new information and information received during the comment periods on the December 18, 2000, proposal.

Issue 2: Site-specific Biological Comments

(8a) *Comment:* Even though species are presumed to be extinct, given the frequency with which Hawaiian species are rediscovered, it is inappropriate not to designate critical habitat for any species addressed in this proposal. (8b) *Comment:* Critical habitat should be designated for *Acaena exigua* because habitats have not been adequately surveyed and this species may still be extant in the wild.

Our Response: We have revised the December 18, 2000, proposal to designate critical habitat for 61 plants from Maui and Kahoolawe to incorporate new information, and/or address comments and new information received during the comment periods.

Fourteen species (*Adenophorous periens*, *Brighamia rockii*, *Clermontia peleana*, *Delissea undulata*, *Gouania vitifolia*, *Isodendron pyriformis*, *Nototrichium humile*, *Phyllostegia mannii*, *Phyllostegia parviflora*, *Schiedea hookeri*, *Schiedea nuttallii*, *Solanum incompletum*, *Tetramolopium remyi*, and *Tetramolopium arenarium*) are known only from historical records on the islands of Maui or Kahoolawe. Critical habitat is proposed for six of these species (*Brighamia rockii*, *Gouania vitifolia*, *Isodendron pyriformis*, *Nototrichium humile*, *Phyllostegia mannii*, and *Tetramolopium remyi*) for which we have identified the physical and biological features that are considered essential to their conservation on the island of Maui. Critical habitat is not proposed for eight species (*Adenophorous periens*, *Clermontia peleana*, *Delissea undulata*, *Phyllostegia parviflora*, *Schiedea hookeri*, *Schiedea nuttallii*, *Solanum incompletum*, or *Tetramolopium arenarium*) which no longer occur on the islands of Maui or Kahoolawe and for which we have not identified habitat essential to their conservation on these islands.

No change is made here to the prudence determination for *Acaena exigua*, a species known only from Mt. Waialeale on Kauai and Puu Kukui on Maui, published in the December 18, 2000, proposal (65 FR 79192). *Acaena exigua* has not been seen on Kauai for over 100 years. This species was last

observed at Puu Kukui on Maui in 1999 and has not been observed in this area in subsequent surveys (H. Oppenheimer, pers. comm., 2001). In addition, this species is not known to be in storage or under propagation. Given these circumstances, we determined that designation of critical habitat for *Acaena exigua* was not prudent because such designation would be of no benefit to this species. If this species is rediscovered, we may revise this proposal to incorporate or address new information as new data becomes available (See 16 U.S.C. § 1532 (5) (B); 50 CFR 424.13(f)).

(9) *Comment:* One commenter requested that critical habitat designation skirt and not include any portion of the Hana or Kalaupapa Airports or any other airport.

Our Response: In defining critical habitat boundaries, we made an effort to avoid developed areas, such as towns and other similar lands, that are unlikely to contribute to the conservation of these species. However, the minimum mapping unit that we used to approximate our delineation of critical habitat for these species did not allow us to exclude all such developed areas. In addition, existing features and structures within the boundaries of the mapped unit, such as buildings, roads, aqueducts, railroads, telecommunications equipment, telemetry antennas, radars, missile launch sites, arboreta and gardens, heiau (indigenous places of worship or shrines), airports, other paved areas, lawns, and other rural residential landscaped areas do not contain one or more of the primary constituent elements and would be excluded under the terms of this proposed regulation. We have revised the proposed designations published in the December 18, 2000, proposal for Maui and Kahoolawe plants to incorporate new information, and/or address comments and new information received during the comment periods. The Hana and Kalaupapa Airports were removed from the revised proposed critical habitat designations for Maui and Molokai.

(10) *Comment:* The State of Hawaii identified specific areas that they thought should not be designated as critical habitat.

Our Response: During the public comment periods for the December 18, 2000, proposal for plants from Maui and Kahoolawe, we received written comments and a map showing the DOFAW's vegetation classes and recommended critical habitat units. We have revised the December 18, 2000, proposed designations to incorporate new information, and address

comments and new information received during the comment periods, including information received from DOFAW.

We evaluated DOFAW's comments on a species-by-species basis and incorporated information that was consistent with our methodology for identifying critical habitat as defined by the Act. DOFAW recommended deletion of some of the proposed critical habitat units on State lands as they do not believe these areas are suitable for the recovery of some species because they (DOFAW) would not be able to manage these areas with their limited staff and funding. Because DOFAW's basis for identifying areas for deletion was made on their ability to manage these areas, their mapping of habitat is distinct from the regulatory designation of critical habitat as defined by the Act.

Issue 3: Legal Issues

(11) *Comment:* The Service failed to comply with court deadlines set forth in both *Conservation Council for Hawaii v. Babbitt*, 24 F. Supp. 1074 (D.Haw. 1998), and *Conservation Council for Hawaii v. Babbitt*, Civ. No. 99-00283 (D.Haw. Mar. 28, 2000)

Our Response: The proposed rules for plants from Kauai, Niihau, Maui, Kahoolawe, Lanai, and Molokai had been sent to the **Federal Register** by or on November 30, 2000, as required by the court orders. On October 3, 2001, we submitted a joint stipulation with Earth Justice Legal Defense Fund requesting extension of the court orders for the final rules to designate critical habitat for plants from Kauai and Niihau, Maui and Kahoolawe, Lanai, and Molokai, citing the need to revise the proposals to incorporate or address new information and comments received during the comment periods. The joint stipulation was approved and ordered by the court on October 5, 2001. Publication of this revised proposal for plants from Maui and Kahoolawe is consistent with the court-ordered stipulation.

(12) *Comment:* Critical habitat designation is a duplicative regulatory environmental process of already-existing Federal and State environmental statutes such as the National Environmental Policy Act (NEPA) and Chapter 343 (Environmental Impact Statements), Hawaii Revised Statutes.

Our Response: Designation of critical habitat is not required by NEPA nor the Chapter 343 (Environmental Impact Statements), Hawaii Revised Statutes. We are required to designate critical habitat under section 4 of the Act. Section 7(a) of the Act requires Federal

agencies to ensure that actions they fund, authorize, or carry out do not jeopardize the continued existence of a listed species or destroy or adversely modify its critical habitat.

Issue 4: Section 7 Consultation Issues

(13) *Comment:* One commenter was concerned that using Federal funds to make improvements to the existing infrastructure and facilities at Waiianapanapa State Park may require a section 7 consultation.

Our Response: Critical habitat designation does not affect activities on State or private lands unless some sort of Federal permit, license, or funding is involved. Therefore, unless a Federal action related to such features or structures indirectly affected nearby habitat containing the primary constituent elements, operation and maintenance of such features or structures generally would not be impacted by the designation of critical habitat. The Federal agency providing the funds to make improvements to existing infrastructure and facilities at state parks would consult with us under section 7 of the Act to ensure that actions they fund are not likely to jeopardize the continued existence of any listed species or result in the destruction of adverse modification of critical habitat.

(14) *Comment:* Does section 7 apply to State and county agencies with permit authority such as the Hawaii Pollution Discharge Elimination system permit issued by the State of Hawaii and authorized by the Environmental Protection Agency, Special Management Area permits, and programs administered under the Natural Resources Conservation Service or the Coastal Zone Management Program?

Our Response: Section 7 of the Act requires each Federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species, or result in the destruction or adverse modification of critical habitat. Section 7 also requires that Federal agencies consult with us if their actions may affect a listed species. State or county agencies are not required to consult with us under section 7 of the Act if their programs are not authorized, permitted, or funded by a Federal agency.

The Environmental Protection Agency (EPA) may delegate the National Pollutant Discharge Elimination System (NPDES) permit authority to the State. Therefore, any individual permit that is issued by the State of Hawaii is not subject to section 7 consultation. Instead, procedures in the January 2001

Memorandum of Understanding between the Service and the EPA would apply. These procedures provide for us to notify EPA of any concerns we may have with individual permits, and the EPA would take corrective action if an individual permit has severe enough impacts on a listed species or designated critical habitat and the State fails to correct the problem. The Natural Resources Conservation Service (NRCS) does consult with us on projects and specific actions that they fund, authorize, or permit. The Coastal Zone Management Program (CZM Program) is administered by the National Oceanic and Atmospheric Administration (NOAA). NOAA has delegated implementation of the CZM Program in Hawaii to the State of Hawaii Department of Business, Economic Development, and Tourism (DBEDT). The individual decisions by the State's CZM Program are not subject to section 7 consultation. However, the State's CZM Program is not relieved of its responsibilities under section 9 of the Act.

(15) *Comment:* We are concerned that critical habitat designation will trigger additional compliance requirements under the State of Hawaii endangered species law.

Our Response: There is no State equivalent of critical habitat designation under the State of Hawaii's endangered species law. However, the Federal Endangered Species Act of 1973, as amended, is applicable to all States of the United States, including the State of Hawaii.

Issue 5: Mapping and Primary Constituent Elements

(16a) *Comment:* The designated areas are too large. (16b) *Comment:* The units are not large enough, and don't allow for changes that occur during known environmental processes. (16c)

Comment: The 586-meter radius is arbitrary and may not work for all species, natural communities, and habitats. (16d) *Comment:* The highly irregular and fragmented shape of proposed units make it difficult to determine if projects are within critical habitat.

Our Response: We have revised the proposed designations published in the December 18, 2000, proposal for Maui and Kahoolawe plants to incorporate new information and address comments and new information received during the comment periods. Areas that contain habitat essential to conservation were identified and delineated on a species-by-species basis. When species units overlapped, we combined units for ease of mapping (see also Methods section).

The areas we are proposing to designate as critical habitat provide some or all of the habitat components essential for the conservation of 61 plant species from Maui and Kahoolawe.

(17) *Comment:* Requests were made to modify specific units in order to avoid areas where existing projects (*i.e.*, agricultural lands with irrigation infrastructure) are planned or may occur.

Our Response: In defining critical habitat boundaries in the revised proposal, we made an effort to avoid developed areas, such as towns and other similar lands, that are unlikely to contribute to the conservation of these species. However, the minimum mapping unit that we used to approximate our delineation of critical habitat for these species did not allow us to exclude all such developed areas. In addition, existing features and structures within the boundaries of the mapped unit, such as buildings, roads, aqueducts, telecommunications equipment, telemetry antennas, radars, missile launch sites, arboreta and gardens, heiau (indigenous places of worship or shrines), airports, other paved areas, and other rural residential landscaped areas do not contain one or more of the primary constituent elements and would be excluded under the terms of this proposed regulation. Therefore, unless a Federal action related to such features or structures indirectly affected nearby habitat containing the primary constituent elements, operation and maintenance of such features or structures generally would not be impacted by the designation of critical habitat. We invite comments from the public that provide information on areas where existing and future projects are planned or may occur and how these projects may be affected by the designation of critical habitat.

(18) *Comment:* The discussion of each critical habitat unit should also indicate which species rely upon that unit for future reintroduction efforts.

Our Response: We have revised the December 18, 2000, proposal based on new information and information received during the comment periods. In this revised proposal, the description of each critical habitat unit (see *Descriptions of Critical Habitat Units*) includes information regarding species which rely upon that unit for recovery efforts, including future reintroduction efforts in currently unoccupied units.

(19) *Comment:* According to the **Federal Register**, *Alectryon macrococcus*, *Bidens micrantha* ssp. *kalealaha*, *Diellia erecta*, *Geranium arboreum*, *Lipochaeta kamolensis*, *Melicope mucronulata*, *Phlegmariurus*

mannii, and *Phyllostegia mollis* are considered gulch dwelling species. One commenter recommended that map unit polygons be limited to the pali as part of the designation process in Units N, Nn, Oo, Qq, and Ss.

Our Response: In accordance with section 4(b)(2) of the Act and regulations at 50 CFR 424.12, in determining which areas to propose as critical habitat, we are required to base critical habitat determinations on the best scientific and commercial data available and to consider those physical and biological features (primary constituent elements) that are essential to the conservation of the species and that may require special management considerations or protection.

As described in the discussions for each of the 61 species for which we are proposing critical habitat, very little is known about the specific physical and biological requirements of these species. As such, we are proposing to define the primary constituent elements on the basis of the habitat features of the areas the plant species are reported from, as described by the type of plant community, associated native plant species, locale information (*e.g.*, steep rocky cliffs, talus slopes, stream banks, gulches), and elevation. Locale information, such as gulch habitat, is only one of the four factors used to describe primary constituent elements of each species.

In the revised proposed designation of critical habitat for plants on Maui proposed critical habitat for *Alectryon macrococcus*, *Bidens micrantha* ssp. *kalealaha*, *Diellia erecta*, *Geranium arboreum*, *Lipochaeta kamolensis*, *Melicope mucronulata*, *Phlegmariurus mannii*, and *Phyllostegia mollis* is included in critical habitat units which cover more than a single species (*i.e.*, multi-species units). These multi-species units are not homogenous or uniform in nature and may encompass a number of plant community types and locales, including gulches, pali, talus slopes, etc.

Issue 6: Definition of Critical Habitat

(20) *Comment:* Critical habitat is being designated in otherwise protected areas, such as State conservation lands, the island of Kahoolawe, and State parks. Managers should have the opportunity to implement management actions that would avoid the additional regulatory burden of critical habitat.

Our Response: In the December 18, 2000, proposal we examined all currently occupied sites containing one or more of the primary constituent elements considered essential to the conservation of the Maui and

Kahoolawe plant species to determine if additional special management considerations or protection are required above those currently provided. We reviewed all available management information on these plants at these sites, including published reports and surveys; annual performance and progress reports; management plans; grants; memoranda of understanding and cooperative agreements; State of Hawaii, DOFAW planning documents; internal letters and memos; biological assessments and environmental impact statements; and section 7 consultations. Additionally, each public (*i.e.*, county, State, or Federal government holdings) and private landowner on the islands of Maui and Kahoolawe with a known occurrence of one of the plant species was contacted by mail. We reviewed all information received in response to our landowner mailing and open houses held at two locations (Lahaina and Wailuku) on the island of Maui on January 20 and 21, 2000, respectively. When clarification was required on the information provided to us, we followed up with a telephone contact. Because of the large amount of land on the island of Maui under State of Hawaii jurisdiction, we met with staff from Maui's DOFAW office to discuss their current management for the plants on their lands. And, we contacted the State's Department of Hawaiian Home Lands regarding management for the plants on lands under their jurisdiction. In addition, we reviewed new biological information and public comments received during the public comment periods and at the public hearing.

With regard to the areas newly proposed for designation in this revised proposal, we have also reviewed any management information available to us at this time. In addition, we are requesting information on management of these lands during the comment period.

Based upon review of the information available to us at this time, we have not been able to find that management on these State lands is adequate to preclude proposed designations of critical habitat. We are aware that the State of Hawaii and other private landowners are considering the development of land management plans or agreements that may promote the conservation of endangered and threatened plant species on the islands of Maui and Kahoolawe. We support these efforts, and we view such plans as important in helping meet species recovery goals, and ultimately can result in delisting of the species. We intend to work closely with any interested landowner or land

manager in the development of conservation planning efforts for these, and other, endangered and threatened plants. If new information indicates any of these areas should not be included in the critical habitat designations because they no longer meet the definition of critical habitat, we may revise the proposed critical habitat designations in this proposal to exclude these areas. We agree that implementation of management actions for the conservation of these species should proceed; however, both the Act and the relevant court orders require us to proceed with designation at this time based on the best information available.

(21) *Comment:* Since critical habitat threats are being addressed, funding is available, and management plans are in place, the State Department of Hawaiian Homelands (DHHL) requests exclusion from designation in Units N, O, Oo, Qq, and Ww.

Our Response: In the December 18, 2000, proposal we examined all currently occupied sites containing one or more of the primary constituent elements considered essential to the conservation of the Maui and Kahoolawe plant species to determine if additional special management considerations or protection are required above those currently provided. As described above (see *Our Response to Comment 20*) we reviewed all available management information on these plants at these sites and all information received in response to our landowner mailing and two open houses. In addition, we reviewed new biological information and public comments received during the public comment periods and at the public hearing.

With regard to the areas proposed for designation by this revised proposal, we have also reviewed any management information available to us at this time. In addition, we are requesting information on management of these lands during the comment period.

Based upon review of the information available to us at this time, we have not been able to find that management on these State DHHL lands is adequate to preclude proposed designations of critical habitat. We are aware that the State of Hawaii and other private landowners are considering the development of land management plans or agreements that may promote the conservation of endangered and threatened plant species on the islands of Maui and Kahoolawe. We support these efforts, and we view such plans as important in helping meet species recovery goals, and ultimately can result in delisting of the species. We intend to

work closely with any interested landowner or land manager in the development of conservation planning efforts for these, and other, endangered and threatened plants. If new information indicates any of these areas should not be included in the critical habitat designations because they no longer meet the definition of critical habitat, we may revise the proposed critical habitat designations in this proposal to exclude these areas.

(22) *Comment:* Additional layers of legal protection, in the case of Kahoolawe, are unnecessary. Hawaii State law has established Kahoolawe as a permanent natural and cultural reserve with habitat restoration as a key stated purpose (H.R.S. Chapter 6-K, H.A.R. Chapter 13-260, and Kahoolawe Archaeological District, listed March 18, 1981). Existing plans for Kahoolawe include a number of agreements, protocols, and management plans to guide protection and restoration of threatened and endangered species and native plant communities. Clean up of Kahoolawe by the Navy will continue through 2003, and could be detrimentally impacted by designation. Therefore, in consideration of the above, please exempt Kahoolawe from designation.

Our Response: In June 1998, the State of Hawaii Kahoolawe Island Reserve Commission developed an environmental restoration plan for Kahoolawe (Social Science Research Institute, University of Hawaii 1998). The plan, however, does not address specific management actions to protect and conserve endangered plant species, specifically *Kanaloa kahoolawensis*, *Hibiscus brackenridgei*, *Sesbania tomentosa*, and *Vigna o-wahuensis*, four species historically reported from Kahoolawe. While the island is isolated and remote, and access is restricted due to the presence of unexploded ordnance hazards, this action alone is not sufficient to indicate that additional special management is not required for the listed plant species, and areas on the island are included within the revised proposed critical habitat units for *Kanaloa kahoolawensis*, *Hibiscus brackenridgei*, *Sesbania tomentosa*, and *Vigna o-wahuensis*.

We invite comments from the public that provide information on how clean-up of Kahoolawe by the Navy could be detrimentally impacted by designation and information on management that promotes the conservation of endangered and threatened plants on Kahoolawe. If new information indicates any of the proposed areas should not be included in the critical habitat designations because they no

longer meet the definition of critical habitat (see *Our Response to Comment 19*), we may revise the proposed critical habitat designations in this proposal to exclude these areas.

(23) *Comment:* We urge the Service not to exclude managed areas, such as Waikamoi and Kapunakea Preserves, Puu Kukui Watershed Management Area, the upper area of Hanawi Natural Area Reserve, and Haleakala National Park, since doing so would violate the ESA.

Our Response: We have determined that the private lands within Waikamoi Preserve and Kapunakea Preserve do not meet the definition of critical habitat in the Act (§ 3(5)(A)), and we are not proposing designation of these lands as critical habitat in the revised proposal. Because the preserves and the continuing management plans being implemented for these plants and their habitats within the preserves provide a conservation benefit to the species and are permanently protected and managed, these lands meet the three criteria (described above in *Our Response to Comment 19*) for determining that an area is not in need of special management. However, should the status of either of these preserves change, for example by non-renewal of a partnership agreement or termination of Natural Area Partnership (NAP) funding, we will reconsider whether it then meets the definition of critical habitat. If so, we have the authority to propose to amend critical habitat to include such area at that time. 50 CFR 424.12(g).

In the December 18, 2000, proposal we determined that lands within the Puu Kukui Watershed Management Area on Maui were adequately managed for the conservation of the listed species that occur on those lands and were not in need of special management considerations or protection. Therefore, we determined that these lands did not meet the definition of critical habitat in the Act, and we did not propose designation of these lands as critical habitat. However, during the comment periods on the December 18, 2000, proposal we received information from the Watershed Supervisor that funding for the conservation and management of the listed plant species on lands within Puu Kukui Watershed Management Area was not adequate nor assured. In the revised proposal we have determined that lands within Puu Kukui Watershed Management Area are in need of special management considerations or protection and thus meet the definition of critical habitat in the Act. Therefore, lands within Puu Kukui Watershed Management Area are

included within the proposed designation of critical habitat on Maui for one or more species.

We have determined that the State land within the upper Hanawi Natural Area Reserve (NAR) does not meet the definition of critical habitat in the Act (§ 3(5)(A)), and we are not proposing designation of this land as critical habitat in the revised proposal. Because these plants and their habitats within the upper areas of Hanawi NAR (above 1,525 m (5,000 ft)) are permanently protected and managed and because the continued successful management of this area is assured, this area meets the three criteria (described above in *Our Response to Comment 22*) for determining that an area is not in need of special management or protection. Should the status of this reserve change, for example by revocation or modification of the NAR, we will reconsider whether it then meets the definition of critical habitat. If so, we have the authority to propose to amend critical habitat to include such area at that time. 50 CFR 424.12(g).

In the December 18, 2000, proposal we determined that lands within Haleakala National Park (Park) were adequately managed for the conservation of the listed species that occur on those lands and were not in need of special management considerations or protection. Therefore, we determined that these lands did not meet the definition of critical habitat in the Act, and we did not propose designation of these lands as critical habitat. However, during the comment periods on the December 18, 2000, proposal we received information from the Park Superintendent that funding for the conservation and management of the listed plant species on lands within Haleakala National Park was not adequate nor assured. In the revised proposal we have determined that lands within the Park are in need of special management considerations or protection and thus meet the definition of critical habitat in the Act. Therefore, lands within the Park are included within the proposed designation of critical habitat on Maui for one or more species.

(24) *Comment:* All areas essential to the recovery of the species, regardless of management, should be designated as critical habitat.

Our Response: Pursuant to § 3(5)(A) of the Endangered Species Act the term "critical habitat" for a threatened and endangered species means—(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on

which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

(25) *Comment:* Designation of critical habitat will provide additional benefit to managed lands when unoccupied habitat occurs on these lands, and when these lands are threatened by Federal actions.

Our Response: The primary regulatory effect of critical habitat is the section 7 requirement that Federal agencies refrain from taking any action that destroys or adversely affects critical habitat. The designation of unoccupied habitat may provide an additional benefit to the species by triggering section 7 consultation in new areas where it would not otherwise occur because, for example, it is or has become unoccupied or the occupancy is in question. In the revised proposal we have proposed critical habitat in areas which are essential for the conservation of the species within its historical range though the species may not occur there currently. The proposed critical habitat includes lands under State, private, or Federal ownership or administration. A few of the species are reported from Federal lands or lands that are administered by a Federal agency (e.g., *Argyroxiphium sandwicense* ssp. *macrocephalum*, *Melicope balloui*, *Melicope ovalis*, and *Schiedea haleakalensis* within Haleakala National Park) while most of the species are reported exclusively from non-federal lands with currently no known or limited Federal activities. However, there could be Federal actions affecting these lands in the future.

(26a) *Comment:* Designation of Haleakala National Park would further protect threatened and endangered plants from Federal actions inside the Park. (26b) *Comment:* Designating critical habitat would prevent Federal actions taking place outside managed areas from impacting habitat found within managed areas, such as the impacts of the proposed Kahului Airport expansion on Haleakala National Park.

Our Response: In the December 18, 2000, proposal we determined that lands within the Park were adequately managed for the conservation of the listed species that occur on those lands and were not in need of special

management considerations or protection. Therefore, we determined that these lands did not meet the definition of critical habitat in the Act, and we did not propose designation of these lands as critical habitat. However, during the comment periods on the December 18, 2000, proposal we received information from the Park Superintendent that funding for the conservation and management of the listed plant species on lands within Haleakala National Park was not adequate nor assured. Therefore, we have determined that lands within Haleakala National Park are in need of special management considerations or protection and thus meet the definition of critical habitat in the Act.

The primary regulatory effect of critical habitat is the section 7 requirement that Federal agencies refrain from taking any action that destroys or adversely affects critical habitat. Federal agencies must consult with the Service to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the survival of a listed species or result in the destruction or adverse modification of critical habitat. By consulting with us, an agency can usually minimize or avoid any potential conflicts with listed species and their critical habitat, and the proposed project may be undertaken.

In the formal consultation for the Kahului Airport expansion project we concurred that the airport improvement project, which included a mandatory state of the art alien species interdiction facility, was not likely to jeopardize listed species nor adversely affect designated critical habitat for *Gouania hillebrandii* on the island of Maui. According to the local FAA office, the expansion project has been canceled mainly because of concerns of the local community, including the hotel industry, regarding the type of growth and development that characterizes Honolulu. There is no indication that the project has been canceled due to endangered species or critical habitat issues.

(27) *Comment:* The Service should not exclude from critical habitat any areas subject to conservation measures on non-Federal lands (e.g. Safe Harbor Agreements, Habitat Conservation Plans, etc.).

Our Response: Currently, there are no Habitat Conservation Plans (HCPs) or Safe Harbor Agreements (SHAs) that include any of the plant species at issue in this proposal as covered species, so no such areas have been excluded from this proposal.

Issue 7: Effects of Designation

(28a) *Comment:* Designation of critical habitat will result in restrictions on subsistence hunting and State hunting programs funded under the Federal Aid in Wildlife Restoration Program (Pittman-Robertson program). (28b) *Comment:* Hunting and recreational opportunities need to be considered when designating critical habitat. (28c) *Comment:* The designation of critical habitat will result in restrictions on subsistence hunting and access.

Our Response: The designation of critical habitat imposes no regulatory restrictions on actions occurring on State or other non-Federal lands, unless the action is undertaken, funded, or authorized by a Federal agency. Recreational, commercial, and subsistence activities, including hunting, on non-Federal lands are not regulated or restricted by this critical habitat designation. We believe that game bird and mammal hunting in Hawaii is an important recreational and cultural activity, and we support the continuation of this tradition. The designation of critical habitat would not impose restrictions on State hunting regulations except to the extent federal funding is involved. However, Federal agencies are required to consult with us under section 7 of the Act on actions they carry out, fund, or authorize that might destroy or adversely modify critical habitat. This requirement applies to us and includes funds distributed by the Service to the State through the Federal Aid in Wildlife Restoration Program (Pittman-Robertson Program). Under the Act, activities funded by us or other Federal agencies cannot result in jeopardy to listed species, and they cannot adversely modify or destroy critical habitat. It is well documented that game mammals affect listed plant and animal species. In such areas, we believe it is important to develop and implement sound land management programs that provide both for the conservation of listed species and for continued game hunting. We are committed to working closely with the State and other interested parties to ensure that game management programs that receive Federal funding are implemented consistent with this need.

(29) *Comment:* The designation of critical habitat will disrupt air service at Hana Airport and have detrimental effects on its residents.

Our Response: Hana Airport is not included in the proposed critical habitat designation in the revised proposal as it does not contain one or more of the primary constituent elements for the

species at issue and thus is not essential for their conservation.

(30) *Comment:* Critical habitat could be the first step toward making the area a national park or refuge.

Our Response: Critical habitat designation does not in any way create a wilderness area, preserve, national park, or wildlife refuge, nor does it close an area to human access or use. Its regulatory implications apply only to activities sponsored at least in part by Federal agencies. Land uses such as logging, grazing, and recreation that would not be affected if they do not involve Federal permitting or funding. Critical habitat designations do not constitute land management plans.

(31a) *Comment:* The designation of critical habitat constitutes an encumbrance, results in "downzoning" of the property, and will allow lawsuits by environmental groups. Therefore, critical habitat will have a negative economic impact and cause a decrease in land values, and is a tactic often used as a prelude to "taking".

Our Response: The majority of this land (77 percent) and all of the land on Kahoolawe is within the State Conservation District where State land-use controls already severely limited development and most activities. Approximately 23 percent of this land is within the State Agricultural District where only activities such as crops, livestock, grazing, and accessory structures and farmhouses are allowed. While the potential exists for a decrease in property values for privately owned agricultural land suitable for eventual development if a perception develops that a critical habitat designation will restrict future land use, we believe this potential decrease in value is purely speculative and to our knowledge has never occurred in Hawaii or the continental U.S.

Because current zoning limits land use activities within the proposed critical habitat areas and only activities with a Federal involvement that will destroy or adversely modify critical habitat will be affected and in such cases we must identify reasonable and prudent alternatives, we don't believe this is a prelude to a "taking." In addition, we will conduct an economic analysis and in the final rule, we may exclude areas from critical habitat if the impact of designation outweighs the benefit of designation.

We expect that this situation will rarely be reached because the Act provides mechanisms, through section 7 consultation, to resolve apparent conflicts between proposed Federal actions, including Federal funding or permitting of actions on private land,

and the requirement that destruction or adverse modification of critical habitat be avoided. Based on our experience with section 7 consultations for all listed species, virtually all projects—including those that, in their initial proposed form, would result in jeopardy or adverse modification—can be implemented successfully with, at most, the adoption of reasonable and prudent alternatives, which by definition must be economically feasible and within the scope of authority of the Federal agency involved in consultation.

Issue 8: Economic Issues

(32) *Comment:* We should have been directly contacted for our opinions on the economic impacts of critical habitat designation.

Our Response: We will conduct an analysis of the economic impacts of designating these areas as critical habitat prior to a final determination. When completed, we will announce the availability of the draft economic analysis with a notice in the **Federal Register**, and we will open a 30-day public comment period on the draft economic analysis and proposed rule at that time. We will mail letters to landowners and other interested parties and publish a notice in the *Maui News* newspaper announcing the availability of and seeking public comment on the draft economic analysis and proposed rule. We encourage anyone who has information or opinions concerning the economic impacts of this proposal to provide them to us.

(33) *Comment:* The Service failed to properly consider the economic (e.g., costs associated with section 7 consultation, project delays, etc.) and other impacts (special management protections on private lands) of designating particular areas as critical habitat.

Our Response: We will conduct an analysis of the economic impacts of designating these areas as critical habitat prior to a final determination. When completed, we will announce the availability of the draft economic analysis with a notice in the **Federal Register**, and we will open a 30-day public comment period on the draft economic analysis and proposed rule at that time (see response to *Comment 23*, above).

Summary of Changes From the Previous Proposal

We originally determined that designation of critical habitat was prudent for 37 plants from the islands of Maui and Kahoolawe on December 18, 2000. In a previous proposal, published on November 7, 2000, we

determined that designation of critical habitat was prudent for 11 plants that are reported from Maui and Kahoolawe as well as from Kauai and Niihau. In addition, at the time we listed *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, and *Kanaloa kahoolawensis*, on September 3, 1999, we determined that designation of critical habitat was prudent for these six taxa from Maui and Kahoolawe. No change is made to these 54 prudency determinations in this revised proposal and they are hereby incorporated by reference (64 FR 48307; 65 FR 66808; 65 FR 79192).

In the December 18, 2000, proposal, we determined that critical habitat was not prudent for *Acaena exigua*, a species endemic to Maui, because it had not been seen recently in the wild, and no viable genetic material of this species was known to exist. No change is made here to the December 18, 2000, prudency determination for this species and it is hereby incorporated by reference (65 FR 79192).

In the December 18, 2000, proposal we proposed designation of critical habitat for 50 plants from the islands of Maui and Kahoolawe. These species are: *Alectryon macrococcus*, *Bidens micrantha* ssp. *kalealaha*, *Bonamia mientiesii*, *Cenchrus agrimonioides*, *Centaurium sebaeoides*, *Clermontia lindseyana*, *Clermontia oblongifolia* ssp. *mauiensis*, *Clermontia samuelii*, *Colubrina oppositifolia*, *Ctenitis squamigera*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Cyanea lobata*, *Cyanea mceldowneyi*, *Cyrtandra munroi*, *Diellia erecta*, *Diplazium molokaiense*, *Dubautia plantaginea* ssp. *humilis*, *Flueggea neowawraea*, *Geranium arboreum*, *Geranium multiflorum*, *Hedyotis coriacea*, *Hedyotis mannii*, *Hesperomannia arboreascens*, *Hesperomannia arbuscula*, *Hibiscus brackenridgei*, *Ischaemum byrone*, *Kanaloa kahoolawensis*, *Lipochaeta kamolensis*, *Lysimachia lydgatei*, *Mariscus pennatifolmis*, *Melicope adscendens*, *Melicope knudsenii*, *Melicope mucronulata*, *Neraudia sericea*, *Peucedanum sandwicense*, *Phlegmariurus mannii*, *Phyllostegia mollis*, *Platago princeps*, *Platanthera holochila*, *Pteris lidgatei*, *Remya mauiensis*, *Sanicula purpurea*, *Sesbania tomentosa*, *Spermolepis hawaiiensis*, *Tetramolopium capillare*, *Vigna o-wahuensis*, and *Zanthoxylum hawaiiense*. In this proposal, we have revised the proposed designations for these 50 plants based on new

information received during the comment periods. In addition, we incorporate new information, and address comments and new information received during the comment periods on the December 18, 2000, proposal.

In the December 18, 2000, proposal, we did not propose critical habitat for four species (*Argyroxiphium sandwicense* ssp. *macrocephalum*, *Melicope balloui*, *Melicope ovalis*, and *Schiedea haleakalensis*) found only in Waikamoi Preserve and/or Haleakala National Park. We determined that these lands did not meet the definition of critical habitat in the Act. However, during the comment periods on the December 18, 2000, proposal, we received information from the Park Superintendent that funding for the conservation and management of the listed plant species on lands within Haleakala National Park was not adequate nor assured. Therefore, we have determined that lands within Haleakala National Park are in need of special management considerations or protection and thus meet the definition of critical habitat in the Act, and we have proposed designation of critical habitat for *Argyroxiphium sandwicense* ssp. *macrocephalum*, *Melicope balloui*, *Melicope ovalis*, and *Schiedea haleakalensis* within Haleakala National Park.

In the December 18, 2000, proposal, we did not propose designation of critical habitat for 14 species that no longer occur on Maui and Kahoolawe but are reported from one or more other islands. We determined that critical habitat was prudent for eight of these species (*Adenophorus periens*, *Brighamia rockii*, *Delissea undulata*, *Isodendron pyriformium*, *Phyllostegia mannii*, *Schiedea nuttallii*, *Solanum incompletum*, and *Tetramolopium remyi*) in other proposed rules published on November 7, 2000 (Kauai), December 27, 2000 (Lanai), December 29, 2000 (Molokai), and January 28, 2002 (Kauai revised proposal). No change is made to these prudency determinations for these eight species in this proposal and they are hereby incorporated by reference (65 FR 79192; 65 FR 82086; 65 FR 83158; and 67 FR 3940). In this proposal, we propose designation of critical habitat for *Brighamia rockii*, *Isodendron pyriformium*, *Phyllostegia mannii*, and *Tetramolopium remyi* on the island of Maui, based on new information and information received during the comment periods on the December 18, 2000, proposal. Critical habitat is not proposed for *Adenophorus periens*, *Delissea undulata*, *Schiedea nuttallii*, and *Solanum incompletum* on the

islands of Maui and Kahoolawe because we did not identify habitat essential to their conservation on these islands.

In this proposal, we determine that critical habitat is prudent for *Asplenium fragile* var. *insulare*, a species recently rediscovered on Maui and for which a prudency determination has not been made previously. Critical habitat is proposed at this time for *Asplenium fragile* var. *insulare* on Maui based on new information and information received during the comment periods on the December 18, 2000, proposal.

In this proposal, we determine that critical habitat is prudent for six other species (*Clermontia peleana*, *Gouania vitifolia*, *Nototrichium humile*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium*) for which prudency determinations have not been made previously, and that no longer occur on Maui but are reported from one or more other islands. These six plants were listed as endangered species under the Endangered Species Act of 1973, as amended (Act) between 1994 and 1996. At the time each plant was listed, we determined that designation of critical habitat was not prudent because designation would increase the degree of threat to the species and/or would not benefit the plant. In this proposal, we determine that designation of critical habitat is prudent for these six species because we believe that such designation would be beneficial to these species. Critical habitat is proposed at this time for *Gouania vitifolia* and *Nototrichium humile*, on Maui based on new information and information received during the comment periods on the December 18, 2000, proposal. Critical habitat is not proposed for *Clermontia peleana*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium* on the island of Maui because we did not identify habitat essential to their conservation on this island.

In this proposal, we propose designation of critical habitat for 61 species: *Alectryon macrococcus*, *Argyroxiphium sandwicense* ssp. *macrocephalum*, *Asplenium fragile* var. *insulare*, *Bidens micrantha* ssp. *kalealaha*, *Bonamia menziesii*, *Brighamia rockii*, *Cenchrus agrimonoides*, *Centaurium seabaeoides*, *Clermontia lindseyana*, *Clermontia oblongifolia* ssp. *mauiensis*, *Clermontia samuelii*, *Colubrina oppositifolia*, *Ctenitis squamigera*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Cyanea lobata*, *Cyanea mceldowneyi*, *Cyrtandra munroi*, *Diellia erecta*,

Diplazium molokaiense, *Dubautia plantaginea* ssp. *humilis*, *Flueggea neowawraea*, *Geranium arboreum*, *Geranium multiflorum*, *Gouania vitifolia*, *Hedyotis coriacea*, *Hedyotis mannii*, *Hesperomannia arborescens*, *Hesperomannia arbuscula*, *Hibiscus brackenridgei*, *Ischaemum byrone*, *Isodendron pyrifolium*, *Kanaloa kahoolawensis*, *Lipochaeta kamolensis*, *Lysimachia lydgatei*, *Mariscus pennatiflorus*, *Melicope adscendens*, *Melicope balloui*, *Melicope knudsenii*, *Melicope mucronulata*, *Melicope ovalis*, *Neraudia sericea*, *Nototrichium humile*, *Peucedanum sandwicense*, *Phlegmariurus mannii*, *Phyllostegia mannii*, *Phyllostegia mollis*, *Plantago princeps*, *Platanthera holochila*, *Pteris lidgatei*, *Remya mauiensis*, *Sanicula purpurea*, *Schiedea haleakalensis*, *Sesbania tomentosa*, *Spermolepis hawaiiensis*, *Tetramolopium capillare*, *Tetramolopium remyi*, *Vigna owahuensis*, and *Zanthoxylum hawaiiense* on the islands of Maui and Kahoolawe, based on new information and information received during the comment period on the December 18, 2000, proposal. Critical habitat is not proposed for 8 species: *Adenophorus periens*, *Clermontia peleana*, *Delissea undulata*, *Phyllostegia parviflora*, *Schiedea hookeri*, *Schiedea nuttallii*, *Solanum incompletum*, and *Tetramolopium arenarium* on the islands of Maui or Kahoolawe because we did not identify habitat essential to their conservation on these islands. Critical habitat is not proposed for *Acaena exigua*, for which we determined, on December 18, 2000, that critical habitat designation is not prudent because this species has not been seen recently in the wild, and no viable genetic material of this species is known. No change is made to that determination here.

Based on a review of new biological information and public comments received, we have revised our December 18, 2000, proposal to incorporate the following changes in addition to those described above: changes in our approach to delineate proposed critical habitat (see *Criteria Used to Identify Critical Habitat*); adjustment and refinement of previously identified critical habitat units to more accurately follow the natural topographic features and to avoid inessential landscape features (agricultural crops, urban or rural development) without primary constituent elements; and, inclusion of new areas within the proposed critical habitat units that are essential for the conservation of one or more of the 61 plant species, including portions of

Federal land within Haleakala National Park.

Critical Habitat

Critical habitat is defined in section 3 of the Act as—(i) the specific areas within the geographic 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 geographic 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 that are necessary to bring an endangered or a threatened species to the point at which listing under the Act is no longer necessary.

Critical habitat receives protection under section 7 of the Act through the prohibition against destruction or adverse modification of critical habitat with regard to actions carried out, funded, or authorized by a Federal agency. Section 7 also requires conferences on Federal actions that are likely to result in the destruction or adverse modification of proposed critical habitat. Aside from the added protection that may be provided under section 7, the Act does not provide other forms of protection to lands designated as critical habitat. Because consultation under section 7 of the Act does not apply to activities on private or other non-Federal lands that do not involve a Federal nexus, critical habitat designation would not afford any additional regulatory protections under the Act.

Critical habitat also provides non-regulatory benefits to the species by informing the public and private sectors of areas that are important for species recovery and where conservation actions would be most effective. Designation of critical habitat can help focus conservation activities for a listed species by identifying areas that contain the physical and biological features that are essential for the conservation of that species, and can alert the public as well as land-managing agencies to the importance of those areas. Critical habitat also identifies areas that may require special management considerations or protection, and may help provide protection to areas where significant threats to the species have been identified to help to avoid accidental damage to such areas.

In order to be included in a critical habitat designation, the habitat must

first be "essential to the conservation of the species." Critical habitat designations identify, to the extent known using the best scientific and commercial data available, habitat areas that provide at least one of the physical or biological features essential to the conservation of the species (primary constituent elements, as defined at 50 CFR 424.12(b)). Section 3(5)(C) of the Act states that not all areas that can be occupied by a species should be designated as critical habitat unless the Secretary determines that all such areas are essential to the conservation of the species. Our regulations (50 CFR 424.12(e)) also state that, "The Secretary shall designate as critical habitat areas outside the geographic area presently occupied by the species only when a designation limited to its present range would be inadequate to ensure the conservation of the species."

Section 4(b)(2) of the Act requires that we take into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. We may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in extinction of the species.

Our Policy on Information Standards Under the Endangered Species Act, published on July 1, 1994 (59 FR 34271), provides criteria, establishes procedures, and provides guidance to ensure that our decisions represent the best scientific and commercial data available. It requires that our biologists, to the extent consistent with the Act and with the use of the best scientific and commercial data available, use primary and original sources of information as the basis for recommendations to designate critical habitat. When determining which areas are critical habitat, a primary source of information should be the listing rule for the species. Additional information may be obtained from a recovery plan, articles in peer-reviewed journals, conservation plans developed by States and counties, scientific status surveys and studies, and biological assessments or other unpublished materials.

Section 4 requires that we designate critical habitat based on what we know at the time of designation. Habitat is often dynamic, and species may move from one area to another over time. Furthermore, we recognize that designation of critical habitat may not include all of the habitat areas that may eventually be determined to be necessary for the recovery of the species. For these reasons, critical

habitat designations do not signal that habitat outside the designation is unimportant or may not be required for recovery. Areas outside the critical habitat designation will continue to be subject to conservation actions that may be implemented under section 7(a)(1) and to the regulatory protections afforded by the section 7(a)(2) jeopardy standard and the section 9 prohibitions, as determined on the basis of the best available information at the time of the action. Federally funded or assisted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, HCPs, or other species conservation planning efforts if new information available to these planning efforts calls for a different outcome.

A. Prudency Redeterminations

We originally determined that designation of critical habitat was prudent for 37 plants from the islands of Maui and Kahoolawe on December 18, 2000. These species are: *Argyroxiphium sandwicense* ssp. *macrocephalum*, *Bidens micrantha* ssp. *kalealaha*, *Cenchrus agriminoides*, *Clermontia lindseyana*, *Clermontia oblongifolia* ssp. *mauiensis*, *Colubrina oppositifolia*, *Ctenitis squamifera*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyanea lobata*, *Cyanea mceldowneyi*, *Cyrtandra munroi*, *Diellia erecta*, *Diplazium molokaiense*, *Geranium arboreum*, *Geranium multiflorum*, *Hedyotis coriacea*, *Hedyotis mannii*, *Hesperomannia arborescens*, *Hesperomannia arbuscula*, *Hibiscus brackenridgei*, *Ischaemum byrone*, *Lipochaeta kamolensis*, *Lysmachia lydgatei*, *Mariscus pennatifolius*, *Melicope ascendens*, *Melicope balloui*, *Melicope mucronulata*, *Melicope ovalis*, *Neraudia sericea*, *Phlegmariurus mannii*, *Phyllostegia mollis*, *Pteris lidgatei*, *Remya mauiensis*, *Sanicula purpurea*, *Schiedea haleakalensis*, *Tetramolopium capillare*, and *Vigna owahuensis*. In a previous proposal, published on November 7, 2000, we determined that designation of critical habitat was prudent for 11 plants (*Alectryon macrococcus*, *Bonamia menziesii*, *Centaurium sebaeoides*, *Flueggea neowawrae*, *Melicope knudsenii*, *Peucedanum sandwicense*, *Plantago princeps*, *Platanthera holochila*, *Sesbania tomentosa*, *Spermolepis hawaiiensis*, *Zanthoxylum hawaiiense*) that are reported from Maui and Kahoolawe as well as from Kauai

and Niihau. In addition, at the time we listed *Clermontia samuelii*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, and *Kanaloa kahoolawensis*, on September 3, 1999, we determined that designation of critical habitat was prudent for these six taxa from Maui and Kahoolawe. No change is made to these 54 prudency determinations in this revised proposal and they are hereby incorporated by reference (64 FR 48307; 65 FR 66808; 65 FR 79192).

No change is made here to the prudency determination for *Acaena exigua*, a species known only from Mt. Waialeale on Kauai and Puu Kukui on Maui, published in the December 18, 2000, proposal and hereby incorporated by reference (65 FR 79192). *Acaena exigua* has not been seen on Kauai for over 100 years. This species was last observed at Puu Kukui on Maui in 1999 and has not been observed in this area in subsequent surveys (H. Oppenheimer, pers. comm., 2001). In addition, this species is not known to be in storage or under propagation. Given these circumstances, we determined that designation of critical habitat for *Acaena exigua* was not prudent because such designation would be of no benefit to this species. If this species is rediscovered, we may revise this proposal to incorporate or address new information as new data becomes available (See 16 U.S.C. 1532 (5) (B); 50 CFR 424.13(f)).

In the December 18, 2000, proposal we did not determine prudency nor propose designation of critical habitat for 14 species that we believed no longer occurred on Maui and Kahoolawe but were reported from one or more other islands. We determined that critical habitat was prudent for eight of these species (*Adenophorus periens*, *Brighamia rockii*, *Delissea undulata*, *Isodendron pyriformium*, *Phyllostegia mannii*, *Schiedea nuttallii*, *Solanum incompletum*, and *Tetramolopium remyi*) in other proposed rules published on November 7, 2000 (Kauai), December 27, 2000 (Lanai), December 29, 2000 (Molokai), and January 28, 2002 (Kauai revised proposal). No change is made to these prudency determinations for these eight species in this proposal and they are hereby incorporated by reference (65 FR 66808, 65 FR 82086, 65 FR 83158, and 67 FR 3940). In this proposal, we propose designation of critical habitat for *Brighamia rockii*, *Isodendron pyriformium*, *Phyllostegia mannii*, and *Tetramolopium remyi* on the island of Maui, based on new information and information received during the

comment periods on the December 18, 2000, proposal. Critical habitat is not proposed for *Adenophorus perieni*, *Delissea undulata*, *Schiedea nuttallii*, and *Solanum incompletum* on the islands of Maui and Kahoolawe because we did not identify habitat essential to their conservation on these islands.

To determine whether critical habitat would be prudent for *Asplenium fragile* var. *insulare*, a species recently rediscovered on Maui and for which a new prudency determination has not yet been made, we analyzed the potential threats and benefits for this species in accordance with the court orders. This plant was listed as an endangered species under the Act in 1994. At the time *Asplenium fragile* var. *insulare* was listed, we determined that designation of critical habitat was not prudent because designation would increase the degree of threat to the species and/or would not benefit the plant. We examined the evidence available for this species and have not, at this time, found specific evidence of taking, vandalism, collection, or trade of this species or of similar species. Consequently, while we remain concerned that these activities could potentially threaten *Asplenium fragile* var. *insulare* in the future, consistent with applicable regulations (50 CFR 424.12(a)(1)(i)) and the court's discussion of these regulations, we do not find that this species is currently threatened by taking or other human activity, which would be exacerbated by the designation of critical habitat.

In the absence of finding that critical habitat would increase threats to a species, if there are any benefits to critical habitat designation, then a prudent finding is warranted. The potential benefits include: (1) Triggering section 7 consultation in new areas where it would not otherwise occur because, for example, it is or has become unoccupied or the occupancy is in question; (2) focusing conservation activities on the most essential areas; (3) providing educational benefits to State or county governments or private entities; and (4) preventing people from causing inadvertent harm to the species.

In the case of *Asplenium fragile* var. *insulare*, there would be some benefits to critical habitat. The primary regulatory effect of critical habitat is the section 7 requirement that Federal agencies refrain from taking any action that destroys or adversely affects critical habitat. *Asplenium fragile* var. *insulare* is reported from private, State, and Federal lands on Maui and Hawaii (Federal lands include Haleakala National Park on Maui, and Hawaii Volcanoes National Park and the U.S. Army's Pohakuloa Training Area on the

island of Hawaii). While a critical habitat designation for habitat currently occupied by *Asplenium fragile* var. *insulare* would not likely change the section 7 consultation outcome, since an action that destroys or adversely modifies such critical habitat would also be likely to result in jeopardy to the species, there may be instances where section 7 consultations would be triggered only if critical habitat were designated. There may also be some educational or informational benefits to the designation of critical habitat. Educational benefits include the notification of landowner(s), land managers, and the general public of the importance of protecting the habitat of this species and dissemination of information regarding its essential habitat requirements. Therefore, we propose that designation of critical habitat is prudent for *Asplenium fragile* var. *insulare*.

To determine whether critical habitat would be prudent for six other species (*Clermontia peleana*, *Gouania vitifolia*, *Nototrichium humile*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium*) for which prudency determinations have not been made previously, and that no longer occur on Maui but are reported from one or more other islands, we analyzed the potential threats and benefits for these species in accordance with the court's order. These six plants were listed as endangered species under the Act between 1994 and 1996. At the time each plant was listed, we determined that designation of critical habitat was not prudent because designation would increase the degree of threat to the species or would not benefit the plant. We examined the evidence now available for these six species and have not, as this time, found specific evidence of taking, vandalism, collection, or trade of these species or of similar species. Consequently, while we remain concerned that these activities could potentially threaten *Clermontia peleana*, *Gouania vitifolia*, *Nototrichium humile*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium* in the future, consistent with applicable regulations (50 CFR 424.12(a)(1)(i)) and the court's discussion of these regulations, we do not find that these species are currently threatened by taking or other human activity, which would be exacerbated by the designation of critical habitat.

In the absence of finding that critical habitat would increase threats to a species, if there are any benefits to critical habitat designation, then a prudent finding is warranted. The potential benefits include: (1) Triggering section 7

consultation in new areas where it would not otherwise occur because, for example, it is or has become unoccupied or the occupancy is in question; (2) focusing conservation activities on the most essential areas; (3) providing educational benefits to State or county governments or private entities; and (4) preventing people from causing inadvertent harm to the species.

In the case of *Clermontia peleana*, *Gouania vitifolia*, *Nototrichium humile*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium*, there would be some benefits to critical habitat. The primary regulatory effect of critical habitat is the section 7 requirement that Federal agencies refrain from taking any action that destroys or adversely affects critical habitat. Three of these species, *Nototrichium humile*, *Schiedea hookeri*, and *Tetramolopium arenarium*, are reported from Federal lands or lands that are administered by a Federal agency on other islands (*Nototrichium humile* and *Schiedea hookeri* are reported from the U.S. Army's Makua Military Reservation and Schofield Barracks Military Reservation, and the U.S. Navy's Lualualei Naval Magazine on the island of Oahu; *Tetramolopium arenarium* is reported from the U.S. Army's Pohakuloa Training Area on the island of Hawaii) where actions are subject to section 7 consultation. Although *Gouania vitifolia* and *Phyllostegia parviflora* are located exclusively on non-Federal lands with limited Federal activities on the islands of Hawaii and/or Oahu, there could be Federal actions affecting these lands in the future. *Clermontia peleana* was observed in the wild as recently as 1998 on the island of Hawaii on Federal (Hakalau National Wildlife Refuge) and State lands. This species was not relocated in surveys conducted in 1999; however, viable genetic material is in propagation at the State's Volcano Rare Plant Facility on the island of Hawaii, and recovery objectives for this species include propagation and outplanting of propagated individuals within its historic range (Service 1996a). While a critical habitat designation for habitat currently occupied by *Gouania vitifolia*, *Nototrichium humile*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium* would not likely change the section 7 consultation outcome, since an action that destroys or adversely modifies such critical habitat would also be likely to result in jeopardy to the species, there may be instances where section 7 consultations would be triggered only if critical habitat were designated. Critical habitat

may also trigger section 7 consultations for *Clermontia peleana* that would not otherwise occur. There may also be some educational or informational benefits to the designation of critical habitat. Educational benefits include the notification of landowner(s), land managers, and the general public of the importance of protecting the habitat of these species and dissemination of information regarding their essential habitat requirements. Therefore, we propose that designation of critical habitat is prudent for *Clermontia peleana*, *Gouania vitifolia*, *Nototrichium humile*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium*.

B. Methods

As required by the Act (section 4(b)(2)) and regulations at 50 CFR 424.12, we used the best scientific data available to determine areas that are essential to conserve *Adenophorus periens*, *Alectryon macrococcus*, *Argyroxiphium sandwicense* ssp. *macrocephalum*, *Asplenium fragile* var. *insulare*, *Bidens micrantha* ssp. *kalealaha*, *Bonamia menziesii*, *Brighamia rockii*, *Cenchrus agrimonoides*, *Centaurium sebaeoides*, *Clermontia lindseyana*, *Clermontia oblongifolia* ssp. *mauiensis*, *Clermontia peleana*, *Clermontia samuelii*, *Colubrina oppositifolia*, *Ctenitis squamigera*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Cyanea lobata*, *Cyanea mceldowneyi*, *Cyrtandra munroi*, *Delissea undulata*, *Diellia erecta*, *Diplazium molokaiense*, *Dubautia plantaginea* ssp. *humilis*, *Flueggea neowawraea*, *Geranium arboreum*, *Geranium multiflorum*, *Gouania vitifolia*, *Hedyotis coriacea*, *Hedyotis mannii*, *Hesperomannia arborescens*, *Hesperomannia arbuscula*, *Hibiscus brackenridgei*, *Ischaemum byrone*, *Isodendron pyrifolium*, *Kanaloa kahoolawensis*, *Lipochaeta kamolensis*, *Lysimachia lydgatei*, *Mariscus pennatifolius*, *Melicope adscendens*, *Melicope balloui*, *Melicope knudsenii*, *Melicope mucronulata*, *Melicope ovalis*, *Neraudia sericea*, *Nototrichium humile*, *Peucedanum sandwicense*, *Phlegmariurus mannii*, *Phyllostegia mannii*, *Phyllostegia mollis*, *Phyllostegia parviflora*, *Plantago princeps*, *Platanthera holochila*, *Pteris lidgatei*, *Remya mauiensis*, *Sanicula purpurea*, *Schiedea haleakalensis*, *Schiedea hookeri*, *Schiedea nuttallii*, *Sesbania tomentosa*, *Solanum incompletum*, *Spermolepis hawaiiensis*, *Tetramolopium arenarium*, *Tetramolopium capillare*,

Tetramolopium remyi, *Vigna o-wahuensis*, and *Zanthoxylum hawaiiense*. This information included the known locations; site-specific species information from the HINHP database and our own rare plant database; species information from the CPC's rare plant monitoring database housed at the University of Hawaii's Lyon Arboretum; island-wide GIS coverages (e.g. vegetation, soils, annual rainfall, elevation contours, land ownership); the final listing rules for these 69 species; the December 18, 2000, proposal; information received during the public comment periods and the public hearing; recent biological surveys and reports; our recovery plans for these species; information received in response to outreach materials and requests for species and management information we sent to all landowners, land managers, and interested parties on the islands of Maui and Kahoolawe; discussions with botanical experts; and recommendations from the HPPRCC (see also the discussion below) (Service 1995a, 1995b, 1996a, 1996b, 1997, 1998a, 1998b, 1999, 2001; HPPRCC 1998; HINHP Database 2000, CPC *in litt.* 1999; 65 FR 79192; R. Hobdy *et al.*, *in litt.* 2001; J. Lau, *in litt.* 2001).

In 1994, the HPPRCC initiated an effort to identify and map habitat it believed to be important for the recovery of 282 endangered and threatened Hawaiian plant species. The HPPRCC identified these areas on most of the islands in the Hawaiian chain, and in 1999, we published them in our *Recovery Plan for the Multi-Island Plants* (Service 1999).

The HPPRCC expects there will be subsequent efforts to further refine the locations of important habitat areas and that new survey information or research finding may also lead to additional refinements of identifying and mapping of habitat important for the recovery of these species.

The HPPRCC identified essential habitat areas for all listed, proposed, and candidate plant species and evaluated species of concern to determine if essential habitat areas would provide for their habitat needs. However, the HPPRCC's mapping of habitat is distinct from the regulatory designation of critical habitat as defined by the Act. More data has been collected since the recommendations made by the HPPRCC in 1998. Much of the area that was identified by the HPPRCC as inadequately surveyed has now been surveyed in some way. New location data for many species has been gathered. Also, the HPPRCC identified areas as essential based on species clusters (areas that included listed

species as well as candidate species and species of concern) while we have only delineated areas that are essential for the conservation of the 61 listed species at issue. As a result, the proposed critical habitat designations in this proposed rule include not only some habitat that was identified as essential in the 1998 recommendations but also habitat that was not identified as essential in those recommendations.

C. Primary Constituent Elements

In accordance with section 3(5)(A)(i) of the Act and regulations at 50 CFR 424.12, in determining which areas to propose as critical habitat, we are required to base critical habitat determinations on the best scientific and commercial data available and to consider those physical and biological features (primary constituent elements) that are essential to the conservation of the species and that may require special management considerations or protection. Such requirements include, but are not limited to, space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

In the December 18, 2000, proposal, we determined that the designation of critical habitat was prudent for 37 plant species known currently from the islands of Maui or Kahoolawe and in that proposal we identified the physical and biological features that are considered essential to the conservation of the 37 species on the islands of Maui or Kahoolawe (65 FR 79192). In a previous proposal, published on November 7, 2000, we determined that designation of critical habitat was prudent for 11 plants (*Alectryon macrococcus*, *Bonamia menziesii*, *Centaurium sebaeoides*, *Flueggea neowawrae*, *Melicope knudsenii*, *Peucedanum sandwicense*, *Plantago princeps*, *Platanthera holochila*, *Sesbania tomentosa*, *Spermolepis hawaiiensis*, *Zanthoxylum hawaiiense*) that are reported from Maui and Kahoolawe as well as from Kauai and Niihau. In the December 18, 2000, proposal, we identified the physical and biological features that are considered essential to the conservation of these 11 species on the islands of Maui or Kahoolawe (65 FR 79192). In addition, at the time we listed *Clermontia samuelii*, *Cyanea copelandii* ssp.

haleakalaensis, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Dubautia plantaginea* ssp. *humilis*, and *Kanaloa kahoolawensis*, on September 3, 1999, we determined that designation of critical habitat was prudent for these six taxa from Maui and Kahoolawe. In the December 18, 2000, proposal, we identified the physical and biological features that are considered essential to the conservation of these six species on the islands of Maui or Kahoolawe (65 FR 79192). Based on new information and information received regarding the physical and biological features that are considered essential to the conservation of these 54 species during the comment periods on the December 18, 2000, proposal, we have revised the physical and biological features that are considered essential to the conservation of these 54 plant species on the islands of Maui and Kahoolawe.

In other proposals published on December 27, 2000, December 29, 2000, or on January 28, 2002, we determined that the designation of critical habitat was prudent for eight species (*Adenophorus periens*, *Brighamia rockii*, *Delissea undulata*, *Isodendron pyriformis*, *Phyllostegia mannii*, *Schiedea nuttallii*, *Solanum incompletum*, and *Tetramolopium remyi*) that no longer occur on Maui and Kahoolawe but are reported from one or more other islands. Based on new information and information received during the comment periods on the December 18, 2000, proposal regarding the physical and biological features (*i.e.* locale information, elevation, vegetation, and associated species) that are considered essential to the conservation of four of these eight species, we have identified the physical and biological features that are considered essential to the conservation of *Brighamia rockii*, *Isodendron pyriformis*, *Phyllostegia mannii*, and *Tetramolopium remyi* on the island of Maui. We are unable to identify these features for *Adenophorus periens*, *Delissea undulata*, *Schiedea nuttallii*, and *Solanum incompletum* on the island of Maui because information on these features for these species on Maui is not available at this time. Therefore, we were not able to identify the specific areas outside the geographic areas occupied by these species at the time of their listing (unoccupied habitat) that are essential for the conservation of *Adenophorus periens*, *Delissea undulata*, *Schiedea nuttallii*, and *Solanum incompletum* on the island of Maui. However, proposed critical habitat designations for *Adenophorus periens*, *Delissea undulata*, and

Schiedea nuttallii were included in proposals published on November 7, 2000, or December 29, 2000 (65 FR 66808; 65 FR 83158). In addition, we will consider proposing designation of critical habitat for *Adenophorus periens*, *Delissea undulata*, *Schiedea nuttallii*, and *Solanum incompletum* within the historic range for each species on other Hawaiian Islands.

In this proposal, we determine that the designation of critical habitat is prudent for *Asplenium fragile* var. *insulare*, a species recently rediscovered on Maui and for which a prudency determination has not been made previously. Based on new information received on the rediscovered population in Kalialinui regarding the physical and biological features (such as locale information, vegetation type, elevational range, and associated species) that are considered essential to the conservation of *Asplenium fragile* var. *insulare* we have identified the physical and biological features that are considered essential to the conservation of *Asplenium fragile* var. *insulare* on the island of Maui.

In this proposal, we determine that the designation of critical habitat is prudent for six species (*Clermontia peleana*, *Gouania vitifolia*, *Nototrichium humile*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium*) for which prudency determinations have not been made previously, and that no longer occur on Maui but are reported from one or more other islands. Based on new information and information received regarding the physical and biological features that are considered essential to the conservation of *Gouania vitifolia* and *Nototrichium humile* during the comment periods on the December 18, 2000, proposal, we have identified the physical and biological features that are considered essential to the conservation of these two species on the island of Maui. These features include locale information, elevational range, vegetation type, and associated species for both *Gouania vitifolia* and *Nototrichium humile*. Information on the locale, elevational range, vegetation type, and associated species for *Clermontia peleana*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium* is not available at this time and thus we are unable to identify these features for *Clermontia peleana*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium* on the island of Maui. Therefore, we were not able to identify the specific areas outside the geographic areas occupied by these species at the time of their listing

(unoccupied habitat) that are essential for the conservation of *Clermontia peleana*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium* on the island of Maui. However, we will consider proposing designation of critical habitat for *Clermontia peleana*, *Phyllostegia parviflora*, *Schiedea hookeri*, and *Tetramolopium arenarium* within the historic range for each species on other Hawaiian Islands.

All areas proposed as critical habitat are within the historical range of one or more of the 61 species at issue and contain one or more of the physical or biological features (primary constituent elements) essential for the conservation of one or more of the species.

As described in the discussions for each of the 61 species for which we are proposing critical habitat, we are proposing to define the primary constituent elements on the basis of the habitat features of the areas from which the plant species are reported, as described by the type of plant community, associated native plant species, locale information (*e.g.*, steep rocky cliffs, talus slopes, stream banks), and elevation. The habitat features provide the ecological components required by the plant. The type of plant community and associated native plant species indicates specific microclimate conditions, retention and availability of water in the soil, soil microorganism community, and nutrient cycling and availability. The locale provides information on soil type, elevation, rainfall regime, and temperature. Elevation indicates information on daily and seasonal temperature and sun intensity. Therefore, the descriptions of the physical elements of the locations of each of these species, including habitat type, plant communities associated with the species, location, and elevation, as described in the *Supplementary Information: Discussion of the Plant Taxa* section above, constitute the primary constituent elements for these species on the islands of Maui and Kahoolawe.

D. Criteria Used to Identify Critical Habitat

In the December 18, 2000, proposal we defined the primary constituent elements based on the general habitat features of the areas in which the plants currently occur such as the type of plant community the plants are growing in, their physical location (*e.g.*, steep rocky cliffs, talus slopes, stream banks), and elevation. The areas we proposed to designate as critical habitat provided some or all of the habitat components essential for the conservation of the 61

plant species. Specific details regarding the delineation of the proposed critical habitat units were given in the December 18, 2000, proposal (65 FR 79192). In that proposal, we did not include potentially suitable unoccupied habitat that is important to the recovery of the 61 species due to our limited knowledge of the historical range (the geographical area outside the area presently occupied by the species) and our lack of more detailed information on the specific physical or biological features essential for the conservation of the species.

However, following publication of the December 18, 2000 (65 FR 79192), proposal we received new information regarding the physical and biological features, such as locale information, elevational range, vegetation type, and associated species that are considered essential for the conservation of many of these 61 species and information on potentially suitable habitat within the historical range for many of these species. Based on a review of this new biological information and public comments received following publication of the other three proposals to designate critical habitat for Hawaiian plants on Kauai and Niihau (65 FR 66808), Lanai (65 FR 82086), and Molokai (65 FR 83158), we have reevaluated the manner in which we delineated proposed critical habitat. In addition, we met with members of the HPPRCC and State, Federal, and private entities to discuss criteria and methods to delineate critical habitat units for these Hawaiian plants.

While the lack of detailed scientific data on the life history of these plant species makes it impossible for us to develop a robust quantitative model (e.g., population viability analysis (NRC 1995)) to identify the optimal number, size, and location of critical habitat units to achieve recovery (Beissinger and Westphal 1998; Burgman *et al.* 2001; Ginzburg *et al.* 1990; Karieva and Wennergren 1995; Menges 1990; Murphy *et al.* 1990; Taylor 1995), at this time, and consistent with the listing of these species and their recovery plans, the best available information leads us to conclude that the current size and distribution of the extant populations are not sufficient to expect a reasonable probability of long-term survival and recovery of these plant species. Therefore, we used available information, including expert scientific opinion, to identify potentially suitable habitat within the known historic range of each species.

We considered several factors in the selection and proposal of specific boundaries for critical habitat for these

61 species. For each of these species, the overall recovery strategy outlined in the approved recovery plans includes the following components: (1) stabilization of existing wild populations, (2) protection and management of habitat, (3) enhancement of existing small populations and reestablishment of new populations within historic range, and (4) research on species' biology and ecology (Service 1995a, 1995b, 1996a, 1996b, 1997, 1998a, 1998b, 1999, 2001). Thus, the long-term recovery of these species is dependent upon the protection of existing population sites and potentially suitable unoccupied habitat within historic range.

The overall recovery goal stated in the recovery plans for each of these species includes the establishment of 8 to 10 populations with a minimum of 100 mature individuals per population for long-lived perennial species, 300 individuals per population for short-lived perennial species, and 500 mature individuals per population for annual species. There are some specific exceptions to this general recovery goal of 8 to 10 populations for species that are believed to historically have occurred as one large, scattered population (e.g., *Argyroxiphium sandwicense* ssp. *macrocephalum* (Service 1997)), and the proposed critical habitat designations reflect this exception for this species. To be considered recovered, each population of a species endemic to the islands of Maui or Kahoolawe should occur on the island to which it is endemic, and likewise the populations of a multi-island species should be distributed among the islands of its known historic range (Service 1995a, 1995b, 1996a, 1996b, 1997, 1998a, 1998b, 1999, 2001). A population, for the purposes of this discussion and as defined in the recovery plans for these species, is a unit in which the individuals could be regularly cross-pollinated, influenced by the same small-scale events (such as landslides), and containing 100, 300, or 500 individuals, depending on whether the species is a long-lived perennial, short-lived perennial, or annual.

By adopting these specific recovery objectives enumerated here, the adverse effects of genetic inbreeding and random environmental events and catastrophes, such as landslides, hurricanes, or tsunamis, that could destroy a large percentage of the species at any one time may be reduced (Menges 1990; Podolsky 2001). These recovery objectives were initially developed by the HPPRCC and are found in all of the recovery plans for these species. While they are expected to be further refined as more

information on the population biology of each species becomes available, the justification for these objectives is found in the current conservation biology literature addressing the conservation of rare and endangered plants and animals (Beissinger and Westphal 1998; Burgman *et al.* 2001; Falk *et al.* 1996; Ginzburg *et al.* 1990; Hendrix and Kyhl 2000; Karieva and Wennergren 1995; Luijten *et al.* 2000; Meffe and Carroll 1996; Podolsky 2000; Menges 1990; Murphy *et al.* 1990; Quintana-Ascencio and Menges 1996; Taylor 1995; Tear *et al.* 1995; Wolf and Harrison 2001). The overall goal of recovery in the short-term is a successful population that can carry on basic life-history processes, such as establishment, reproduction, and dispersal, at a level where the probability of extinction is low. In the long-term, the species and its populations should be at a reduced risk of extinction and be adaptable to environmental change through evolution and migration.

The long-term objectives, as reviewed by Pavlik (1996), require from 50 to 2,500 individuals per population, based largely on research and theoretical modeling on endangered animals, since much less research has been done on endangered plants. Many aspects of a species life history are typically considered to determine guidelines for species interim stability and recovery, including longevity, breeding system, growth form, fecundity, ramet (a plant that is an independent member of a clone) production, survivorship, seed duration, environmental variation, and successional stage of the habitat. Hawaiian species are poorly studied, and the only one of these characteristics that can be uniformly applied to all Hawaiian plant species is longevity (*i.e.*, long-lived perennial, short-lived perennial, and annual). In general, long-lived woody perennial species would be expected to be viable at population levels of 50 to 250 individuals per population, while short-lived perennial species would be viable at population levels of 1,500 to 2,500 individuals or more per population. These population numbers were refined for Hawaiian plant species by the HPPRCC (1994) due to the restricted distribution of suitable habitat typical of Hawaiian plants and the likelihood of smaller genetic diversity of several species that evolved from one single introduction. For recovery of Hawaiian plants, the HPPRCC recommended a general recovery guideline of 100 mature individuals per population for long-lived perennial species, 300 individuals per population for short-lived perennial

species, and 500 individuals per population for annual species.

For *Argyroxiphium sandwicense* ssp. *macrocephalum*, the recovery goal is one population of greater than 50,000 individuals. This is based on the best scientific judgment of Hawaiian botanical experts, including HPPRCC members, who developed the recovery plan for this species, that this species probably occurred historically as one single population (Service 1997). The large number of total individuals is based on the more detailed knowledge available on the life history of this species, including the fact that it is a monocarpic species (only flowering once before dying), requires 15 to 50 years to mature, and must be cross-pollinated from a genetically different plant to produce viable seeds (Loope and Medeiros 1994, Carr *et al.* 1986). All of these characteristics indicate the need for more individuals in order to maintain a genetically diverse, viable population (Pavlik 1996).

The HPPRCC also recommended the conservation and establishment of 8 to 10 populations to address the numerous risks to the long-term survival and conservation of Hawaiian plant species. However, as explained above, the recovery goal for *Argyroxiphium sandwicense* ssp. *macrocephalum* is one population, rather than 8 to 10 populations, of greater than 50,000 individuals. Although absent the detailed information inherent to the types of PVA models described above (Burgman *et al.* 2001), this approach employs two widely recognized and scientifically accepted goals for promoting viable populations of listed species—(1) creation or maintenance of multiple populations so that a single or series of catastrophic events cannot destroy the whole listed species (Luijten *et al.* 2000; Menges 1990; Quintana-Ascencio and Menges 1996); and (2) increasing the size of each population in the respective critical habitat units to a level where the threats of genetic, demographic, and normal environmental uncertainties are diminished (Hendrix and Kyhl 2000; Luijten *et al.* 2000; Meffe and Carroll 1996; Podolsky 2000; Service 1997; Tear *et al.* 1995; Wolf and Harrison 2001). In general, the larger the number of populations and the larger the size of each population, the lower the probability of extinction (Raup 1991; Meffe and Carroll 1996). This basic conservation principle of redundancy applies to Hawaiian plant species. By maintaining 8 to 10 viable populations in the several proposed critical habitat units, the threats represented by a fluctuating environment are alleviated

and the species has a greater likelihood of achieving long-term survival and conservation. Conversely, loss of one or more of the plant populations within any critical habitat unit could result in an increase in the risk that the entire listed species may not survive and recover.

Due to the reduced size of suitable habitat areas for these Hawaiian plant species, they are now more susceptible to the variations and weather fluctuations affecting quality and quantity of available habitat, as well as direct pressure from hundreds of species of non-native plants and animals. Establishing and conserving 8 to 10 viable plant populations on one or more islands within the historic range of the species will provide each species with a reasonable expectation of persistence and eventual recovery, even with the high potential that one or more of these populations will be eliminated by normal or random adverse events, such as hurricanes which occurred in 1982 and 1992 on Kauai, fires, and alien plant invasions (HPPRCC 1994; Luijten *et al.* 2000; Mangel and Tier 1994; Pimm *et al.* 1998; Stacey and Taper 1992). We conclude that designation of adequate suitable habitat for 8 to 10 populations as critical habitat is essential to give the species a reasonable likelihood of long-term survival and recovery, based on currently available information.

In summary, the long-term survival and recovery requires the designation of critical habitat units on one or more of the Hawaiian islands with suitable habitat for 8 to 10 populations of each plant species except *Argyroxiphium sandwicense* ssp. *macrocephalum* as explained above. Some of this habitat is currently not known to be occupied by these species. To recover the species, it will be necessary to conserve suitable habitat in these unoccupied units, which in turn will allow for the establishment of additional populations through natural recruitment or managed reintroductions. Establishment of these additional populations will increase the likelihood that the species will survive and recover in the face of normal and stochastic events (e.g., hurricanes, fire, and non-native species introductions) (Pimm *et al.* 1998; Stacey and Taper 1992; Mangel and Tier 1994).

In this proposal, we have defined the primary constituent elements based on the general habitat features of the areas from which the plants are reported, from such as the type of plant community the plants are reported from, the associated native plant species, the physical location (e.g., steep rocky cliffs, talus slopes, streambanks), and elevation. The areas we are proposing to

designate as critical habitat provide some or all of the habitat components essential for the conservation of the 61 plant species.

Changes in our approach to delineate proposed critical habitat units were incorporated in the following manner:

1. We focused on designing units representative of the known current and historical geographic and elevational range of each species;

2. Proposed critical habitat units would allow for expansion of existing wild populations and reestablishment of wild populations within historic range, as recommended by the recovery plans for each species; and

3. Critical habitat boundaries were delineated in such a way that areas with overlapping occupied or suitable unoccupied habitat could be depicted clearly (multi-species units).

We began by creating rough units for each species by screen digitizing polygons (map units) using ArcView (ESRI), a computer GIS program. The polygons were created by overlaying current and historic plant location points onto digital topographic maps of each of the islands.

The resulting shape files (delineating historic range and potential, suitable habitat) were then evaluated. Elevation ranges were further refined, and land areas identified as not suitable for a particular species (i.e., not containing the primary constituent elements) were avoided. The resulting shape files for each species then were considered to define all suitable habitat on the island, including occupied and unoccupied habitat.

These shape files of suitable habitat were further evaluated. Several factors were then used to delineate the proposed critical habitat units from these land areas. We reviewed the recovery objectives as described above and in recovery plans for each of the species to determine if the number of populations and population size requirements needed for conservation would be available within the critical habitat units identified as containing the appropriate primary constituent elements for each species. For multi-island species multiple populations of each taxon were identified on islands where they now occur or occurred historically. Because of the need to propose critical habitat on an island by island basis for multi-island species we evaluated the historical distribution of each multi-island species throughout Hawaii, to the best of our ability. We expect to refine proposed areas for these multi-island species once all the proposed rules for the Hawaiian Islands are published. This refinement will be

based on an evaluation on what is essential to the species on these islands throughout its historical distribution. Of the areas identified as potentially suitable habitat, only those areas within the least-disturbed suitable habitat and that were determined were proposed as critical habitat. A population for this purpose is defined as a discrete aggregation of individuals located a sufficient distance from a neighboring aggregation such that the two are not affected by the same small-scale events and are not believed to be consistently cross-pollinated. In the absence of more specific information indicating the appropriate distance to assure limited cross-pollination, we are using a distance of 1,000 m (3,281 ft) based on our review of current literature on gene flow (Barret and Kohn 1991; Fenster and Dudash 1994; Havens 1998; M.H. Schierup and F.B. Christiansen 1996).

Using the above criteria, we delineated the proposed critical habitat for each species. When species units overlapped, we combined units for ease of mapping. Such critical habitat units encompass a number of plant communities. Using satellite imagery and parcel data, we then eliminated areas that did not contain the appropriate vegetation, associated native plant species, or elevations such as cultivated agriculture fields, housing developments, or other areas that are unlikely to contribute to the conservation of one or more of the 61 plant species. Geographic features (ridge lines, valleys, streams, coastlines, etc.) or man-made features (roads or obvious land use) that created an obvious boundary for a unit were used as unit area boundaries. We also used watershed delineations to dissect very large proposed critical habitat units in order to simplify the unit mapping and their descriptions.

Within the critical habitat boundaries, section 7 consultation is necessary and adverse modification could occur if the primary constituent elements are affected. Therefore, not all activities within critical habitat would trigger an adverse modification conclusion. In defining critical habitat boundaries, we made an effort to avoid developed areas, such as towns and other similar lands, that are unlikely to contribute to the conservation of the 61 species. However, the minimum mapping unit that we used to approximate our delineation of critical habitat for these species did not allow us to exclude all such developed areas. In addition, existing features and structures within the boundaries of the mapped unit, such as buildings, roads, aqueducts, telecommunications equipment,

telemetry antennas, radars, missile launch sites, arboreta and gardens, heiau (indigenous places of worship or shrines), airports, other paved areas, and other rural residential landscaped areas do not contain one or more of the primary constituent elements and would be excluded under the terms of this proposed regulation. Federal actions limited to those areas, therefore, would not trigger a section 7 consultation, unless they affect the species and/or primary constituent elements in adjacent critical habitat.

In summary, for most of these species we utilized the approved recovery plan guidance to identify appropriately sized land units containing suitable occupied and unoccupied habitat. Based on the best available information, we believe these areas constitute the habitat necessary to provide for the conservation of these 61 species.

E. Managed Lands

Currently occupied and historically known sites containing one or more of the primary constituent elements considered essential to the conservation of these 61 plant species were examined to determine if additional special management considerations or protection are required above those currently provided. We reviewed all available management information on these plants at these sites, including published reports and surveys; annual performance and progress reports; management plans; grants; memoranda of understanding and cooperative agreements; DOFAW planning documents; internal letters and memos; biological assessments and environmental impact statements; and section 7 consultations. Additionally, each public (*i.e.*, county, State, or Federal government holdings) and private landowner on the islands of Maui and Kahoolawe with a known occurrence of one of the 61 species was contacted by mail. We reviewed all information received in response to our landowner mailing and open houses held at two locations (the Lahaina Civic Center and the Wailuku Community Center) on the island of Maui on January 11 and 12, 2000, respectively. When clarification was required on the information provided to us, we followed up with a telephone contact. Because of the large amount of land on the island of Maui under State of Hawaii jurisdiction, we met with staff from the DOFAW office in Maui to discuss their current management for the plants on their lands. We also contacted the State's DHHL regarding management for the plants on lands under their jurisdiction (any species of aquatic life,

wildlife, or plant that is federally listed as endangered or threatened is State listed as well). In addition, we reviewed new biological information and public comments received during the public comment periods and at the public hearing.

Pursuant to the definition of critical habitat in section 3 of the Act, the primary constituent elements as found in any area so designated must also require "special management considerations or protections." Adequate special management or protection is provided by a legally operative plan that addresses the maintenance and improvement of the essential elements and provides for the long-term conservation of the species. We consider a plan adequate when it: (1) Provides a conservation benefit to the species (*i.e.*, the plan must maintain or provide for an increase in the species' population or the enhancement or restoration of its habitat within the area covered by the plan); (2) provides assurances that the management plan will be implemented (*i.e.*, those responsible for implementing the plan are capable of accomplishing the objectives, have an implementation schedule and/or have adequate funding for the management plan); and (3) provides assurances the conservation plan will be effective (*i.e.*, it identifies biological goals, has provisions for reporting progress, and is of a duration sufficient to implement the plan and achieves the plan's goals and objectives). If an area is covered by a plan that meets these criteria, it does not constitute critical habitat as defined by the Act because the primary constituent elements found there are not in need of special management.

In determining and weighing the relative significance of the threats that would need to be addressed in management plans or agreements, we considered the following:

(1) The factors that led to the listing of the species, as described in the final rules for listing each of the species. Effects of clearing and burning for agricultural purposes and of invasive non-native plant and animal species have contributed to the decline of nearly all endangered and threatened plants in Hawaii (Smith 1985; Howarth 1985; Stone 1985; Wagner *et al.* 1985; Scott *et al.* 1986; Cuddihy and Stone 1990; Vitousek 1992; Service 1995a, 1995b, 1996a, 1996b, 1997, 1998a, 1998b, 1999, 2001; Loope 1998).

Current threats to these species include non-native grass and shrub-carried wildfire; browsing, digging, rooting, and trampling from feral ungulates (including goats, deer, and