

nonnative plant species, such as *Leptospermum* sp. (NCN); depressed reproductive vigor due to a limited local gene pool; the probable loss of appropriate pollinators; and predation by slugs (*Midax gigetes*) (Service 1995; 56 FR 47686).

#### Multi-Island Species

*Adenophorus periens* (pendent kihi fern)

*Adenophorus periens*, a member of the grammitis family (Grammitidaceae), is a small, pendant, epiphytic (not rooted on the ground), and short-lived perennial fern. This species differs from other species in this endemic Hawaiian genus by having hairs along the pinna (leaflet) margins, pinnae at right angles to the midrib axis, placement of the sori on the pinnae, and by 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 (minute, reproductive dispersal unit of ferns and fern allies) may be dispersed by wind, water, or perhaps on the feet of birds or insects. *Adenophorus periens* spores lack a thick resistant coat, which may indicate their longevity is brief, probably measured in days at most. Additional information on reproductive cycles, longevity, specific environmental requirements, and limiting factors is not known (Linney 1989; Service 1999).

Historically, *Adenophorus periens* was known from Kauai, Oahu, and the island of Hawaii, with undocumented reports from Lanai and Maui. Currently, it is known from several locations on Kauai, Molokai, and Hawaii. On Lanai, it was last seen in the 1860s (GDSI 2000; HINHP Database 2000; Service 1999; 59 FR 56333).

This epiphytic species, usually growing on *Metrosideros polymorpha* trunks, is found in riparian banks of stream systems in well-developed, closed canopy that provides deep shade or high humidity in *M. polymorpha*-*Dicranopteris linearis*-*Diplopterygium pinnatum* wet forests, open *M. polymorpha* montane wet forest, or *M. polymorpha*-*D. linearis* lowland wet forest at elevations between 763 and 1,032 m (2,503 and 3,385 ft). Associated native plant species include *Broussaisia arguta*, *Cheirodendron trigynum*, *Clermontia* spp., *Freycinetia arborea*, *Hedyotis terminalis*, *Machaerina angustifolia* (uki), *Melicope* spp., *Psychotria* spp., *Sadleria* spp., or

*Syzygium sandwicensis* (ohia ha) (Linney 1989; Service 1999; 59 FR 56333; Kenneth Wood, National Tropical Botanical Garden, pers. comm., 2001).

Nothing is known of the threats to *Adenophorus periens* on the island of Lanai because the species was last seen there in the 1860s.

*Bidens micrantha* ssp. *kalealaha* (kookoolau)

*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 (Ganders and Nagata 1999; 57 FR 20772).

*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 and Maui. Currently, this species remains on East Maui and there is one Lanai occurrence in the Waiapaa Gulch area on privately owned land (Ganders and Nagata 1999; GDSI 2000; HINHP Database 2000; Service 1997; 57 FR 20772; HINHP Database 2000; R. Hobdy, pers. comm., 2002).

The habitat of *Bidens micrantha* ssp. *kalealaha* is gulch slopes in dry *Dodonaea viscosa* shrubland at elevations between 409 and 771 m (1,342 and 2,529 ft) (J. Lau, pers. comm., 2001).

The threats to this species on Lanai include habitat destruction by axis deer and mouflon sheep; competition from a variety of nonnative plant species; depressed reproductive vigor due to a limited local gene pool; and fire (Service 1997; 57 FR 20772).

*Bonamia menziesii* (NCN)

*Bonamia menziesii*, a short-lived perennial and a 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 (narrowed top of ovary), longer stems and petioles (a stalk that supports

a leaf), and rounder leaves (Austin 1999).

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

Historically, *Bonamia menziesii* was known from Kauai, Oahu, Molokai, West Maui, and Hawaii. Currently, this species is known from Kauai, Oahu, Maui, Hawaii, and Lanai. On Lanai, the three occurrences, containing a total of 14 individual plants, are found on privately owned land in the Ahakea and Kanepuu Units of Kanepuu Preserve, and on Puhielelu Ridge (GDSI 2000; HINHP Database 2000).

*Bonamia menziesii* is found in dry *Nestegis sandwicensis*-*Diospyros sandwicensis* forest and dry *Dodonaea viscosa* shrubland at elevations between 315 and 885 m (1,033 and 2,903 ft). Associated species include *Bobea* sp. (ahakea), *Dianella sandwicensis* (uki uki), *Diospyros sandwicensis*, *Erythrina sandwicensis*, *Hedyotis terminalis*, *Melicope* sp., *Metrosideros polymorpha*, *Myoporum sandwicense* (naio), *Nesoluma polynesicum*, *Nestegis sandwicensis* (olopua), *Pisonia* sp. (papala kepau), *Pittosporum* sp. (hoawa), *Pouteria sandwicensis*, *Psydrax odorata*, or *Rauvolfia sandwicensis* (HINHP Database 2000; 59 FR 56333).

The primary threats to this species on Lanai are habitat degradation and possible predation by mouflon sheep and axis deer; depressed reproductive vigor due to a limited local gene pool; competition with a variety of nonnative plant species, such as *Lantana camara*, *Leucaena leucocephala* or *Schinus terebinthifolius*; and a nonnative 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 male flower parts are produced before female parts, in this case, separated by several days; only five