reported from wet sites on coastal cliffs or talus slopes. Montane wet forests, occupying elevations between 915 and 1,830 m (3,000 and 6,000 ft), occur on the windward slopes and summits of the islands of Kauai, Oahu, Molokai, Maui, and Hawaii. The forests may be open- to closed-canopied, and may exceed 20 m (65 ft) in stature. Montane wet forests are usually dominated by several species of native trees and tree ferns. One of the proposed taxa, Platanthera holochila, has been reported from montane wet forest habitat. Montane bogs, found on Kauai, Molokai, Maui, and Hawaii, occur primarily on flat or gently sloping terrain with impervious substrates between 915 and 1,830 m (3,000 and 6,000 ft) in elevation. The vegetation of most of these bogs consists of an irregular, hummocky cushion of sedges. with Metrosideros polymorpha ('ohi'a) usually a codominant. Two of the proposed taxa, Platanthera holochila and Sanicula purpurea, have been reported from montane bog habitats. Hawaiian shrublands are also found from coastal to alpine elevations. The majority of Hawaiian shrubland types are in dry and mesic settings, or on cliffs and slopes too steep to support trees. Only one of the proposed taxa, Panicum niihauense, has been reported from coastal dry shrubland habitat, on Kauai.

The land that supports these 14 plant taxa is owned by various private parties, the City and County of Honolulu, the State of Hawaii (including State parks, forest reserves, natural area reserves, and Hawaiian Home Lands), and the Federal government (Department of Defense (DOD) and Department of the Interior).

## Discussion of the 14 Plant Taxa Proposed for Listing

Achyranthes mutica was first described by Asa Gray in 1867 based on a specimen collected on Kauai between 1851 and 1855 by Ezechiel Jules Remy, a French naturalist and ethnologist (St. John 1979, Wagner et al. 1990). Achyranthes nelsonii (St. John 1979) is considered to be synonymous with Achyranthes mutica by the authors of the current treatment of Hawaiian members of the family (Wagner et al. 1990).

Achyranthes mutica, a member of the amaranth family (Amaranthaceae), is a many-branched shrub with stems ranging from 30 to 60 centimeters (cm) (12 to 24 in.) long. The opposite leaves, usually 3.2 to 4 cm (1.3 to 1.6 in.) long and 1.5 to 2 cm (0.6 to 0.8 in.) wide, are inversely egg-shaped to elliptic or inversely lance-shaped. The stalkless flowers are arranged in spikes (flowers

directly attached to the main flower axis) that are 0.4 to 1.5 cm (0.2 to 0.6 in.) long. The petalless flowers are perfect (containing both female and male parts). The sepals are of unequal length, 3 to 4.2 mm (0.1 to 0.2 in.) long, and have sharply pointed tips. This species is distinguished from others in the genus by the shape and size of the sepals and by characteristics of the spike, which is short and congested (Wagner *et al.* 1990).

Historically Achyranthes mutica was known from three collections from opposite ends of the main archipelago, Kauai and Hawaii (Hawaii Heritage Program (HHP) 1994c1, 1994c2; Hawaii Plant Conservation Center (HPCC) 1992a). Currently this species is known only from the Keawewai Stream area in the Kohala Mountains of Hawaii on private land. Between 20 and 50 plants are growing at an elevation of about 920 m (3,030 ft) in an Acacia koaia (koai'a) lowland dry forest with Dodonaea viscosa ('a'ali'i), Myoporum sandwicense (naio), Nestegis sandwicensis (olopua), Osteomeles anthyllidifolia ('ulei), and Sophora chrysophylla (mamane) (HPCC 1992a).

The primary threats to the single remaining population of *Achyranthes mutica* are habitat degradation and/or destruction by ungulates such as cattle (*Bos taurus*) and feral goats (*Capra hircus*), competition with alien plant taxa, and a risk of extinction from naturally occurring events (such as landslides or hurricanes) and/or reduced reproductive vigor, due to the small number of existing individuals in a single remaining population (HPCC 1992a; Christa Russell, The Nature Conservancy of Hawaii (TNCH), pers. comm. 1994).

A botanist on the Russian vessel Rurik, Louis C.A. von Chamisso first collected Cenchrus agrimonioides on Oahu during a world exploring expedition between 1816 and 1817. Carl Bernhard von Trinius described the species several years later (Degener and Whitney 1937). Other published names considered synonymous with Cenchrus agrimonioides include Cenchrus calyculatus var. uniflorus, Cenchrus laysanensis, and Cenchrus pedunculatus (O'Connor 1990). Currently, two varieties are recognized—the nominate variety and variety *laysanensis*, described by F.B. Brown (Brown 1931).

Cenchrus agrimonioides, a member of the grass family (Poaceae), is a perennial grass with stems 0.3 to 2 m (1 to 6.7 ft) tall. The leaf blades, 20 to 40 cm (8 to 16 in.) long and 5 to 25 mm (0.2 to 1 in.) wide, are flat or folded and have a prominent midrib. The inflorescence

(flower cluster) is a raceme (an unbranched, indeterminate inflorescence with flowers arranged along the axis) 5 to 10 cm (2 to 4 in.) long, bearing cylindrical to lanceshaped burs 8 to 18 mm (0.3 to 0.7 in.) long. The burs are densely hairy with an outer series of numerous, somewhat spreading bristles. Each bur partially envelops one spikelet (ultimate flower cluster). This species is distinguished from others in the genus by the cylindrical to lance-shaped bur and the arrangement and position of the bristles. Cenchrus agrimonioides var. agrimonioides differs from var. *laysanensis* in generally having smaller burs, shorter stems, and narrower leaves (O'Connor 1990)

Historically Cenchrus agrimonioides var. agrimonioides was known from the following general areas—the Waianae Mountains of Oahu, Kaaukuu on Lanai, and the south slope of Haleakala and Ulupalakua on Maui. It may possibly have occurred on the island of Hawaii; undocumented observations of this taxon have been reported from unspecified locations on this island (HHP 1994d1 to 1994d14, Hillebrand 1888). Currently *Cenchrus* agrimonioides var. agrimonioides is known from Oahu and Maui. In the Waianae Mountains on Oahu, approximately 25 individuals are found in the following populations—Pahole Gulch in the State's Pahole Natural Area Reserve (NAR), Makaha-Waianae Kai Ridge on City and County of Honolulu land, Kahanahaiki Valley on State land leased by the DOD for the Makua Military Reservation, east Makaleha on State land, and Pualii drainage on private land in TNCH's Honouliuli Preserve (HHP 1994d1, 1994d8, 1994d11, 1994d12, 1994d14). On Maui, a patch of *Cenchrus agrimonioides* var. agrimonioides plants, 0.9 sq m (10 sq ft) in size, is known from State land within Kanaio NAR (Robert Hobdy, Division of Forestry and Wildlife (DOFAW), pers. comm. 1994). The total number of individuals statewide is fewer than 100. Cenchrus agrimonioides var. agrimonioides is usually found on dry rocky ridges or slopes, or ridges in mesic 'ohi'a-koa forest between 560 and 820 m (1,830 and 2,700 ft) in elevation. Associated plant taxa include Alyxia oliviformis (maile), Psydrax odoratum (alahe'e), Carex sp., Diospyros sp. (lama), and Eragrostis variabilis (kawelu) (HHP 1994d8, 1994d11, 1994d12, 1994d14; R. Hobdy, pers. comm. 1994).

The other variety of this species, Cenchrus agrimonioides var. laysanensis, was known historically from the northwestern Hawaiian islands