

The habitat of the only known occurrence of *Chamaesyce deppeana* is windward-facing ridge crests, cliff faces, and mixed native cliffs with such plant species as *Bidens sandwicensis* (kookoolau) or *Metrosideros polymorpha* between 274 and 661 m (899 and 2,168 ft) elevation (HINHP Database 2001).

The major threats to the single known occurrence of *Chamaesyce deppeana* are competition for water, space, light, and nutrients with the nonnative plant species *Casuarina equisetifolia* (common ironwood), *Paspalum conjugatum*, and *Schinus terebinthifolius*; and extinction due to naturally caused events because of the limited number of individuals and restricted range. Fire and impact by humans threaten the species as well (HINHP Database 2001; Service 1998b; 59 FR 14482).

Chamaesyce herbstii (Akoko)

Chamaesyce herbstii, a member of the spurge family (Euphorbiaceae) and a short-lived perennial, is a small tree ranging from 3 to 8 m (10 to 26 ft) tall with thin, leathery leaves arranged in pairs on the same plane. This species is distinguished from others in the genus by the length of the flowering stalk and the color of the angular fruits (Koutnik and Huft 1999).

Chamaesyce herbstii has been observed in flower year-round in January, May, July, September, and October. Little else is known about its flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors (Service 1998b).

Historically, *Chamaesyce herbstii* was known from scattered occurrences in the northern and central Waianae Mountains on the island of Oahu. Currently, this species is known from 4 occurrences with between 162 and 164 individuals in the central and northern Waianae Mountains, South Ekahanui Gulch, Pahole (Kukuiula) Gulch, Kapuna Gulch, and West Makaleha-Central Makaleha. These occurrences are found on private and State lands (Geographic Decision Systems International (GDSI) 2001; HINHP Database 2001).

Chamaesyce herbstii typically grows in shaded gulch bottoms and slopes in mesic *Acacia koa*-*Metrosideros polymorpha* lowland forests or diverse mesic forests at elevations between 435 and 886 m (1,427 and 2,906 ft). Associated plant species include *Antidesma platyphyllum*, *Coprosma* sp., *Diplazium sandwichianum*, *Hedyotis* sp., *Hibiscus arnottianus* var. *arnottianus* (kokio keokeo), *Melicope* sp.

(alani), *Morinda trimera* (noni), *Pipturus albidus*, *Pouteria sandwicensis* (alaa), *Pteralyxia* sp. (kaulu), *Urera glabra* (opuhe), or *Xylosma* sp. (maua) (HINHP Database 2001; EDA, in litt. 2001).

The primary threats to *Chamaesyce herbstii* are habitat degradation and/or destruction by feral pigs; competition with nonnative plant species such as *Clidemia hirta*, *Grevillea robusta*, *Passiflora suberosa*, *Psidium cattleianum*, and *Schinus terebinthifolius*; potential fire; a risk of extinction from naturally occurring events (such as hurricanes) and/or reduced reproductive vigor due to the small number of remaining occurrences (HINHP Database 2001; Service 1998b; 61 FR 53089).

Chamaesyce kuwaleana (Akoko)

Chamaesyce kuwaleana, a member of the spurge family (Euphorbiaceae) and a short-lived perennial, is an erect shrub 20 to 90 cm (8 to 36 in) tall with leaves arranged in two rows along the stem. This species is distinguished from other species of the genus in its habitat by its stalked, oval to rounded leaves with untoothed margins and by the bent stalk supporting the small fruit capsule (Koutnik and Huft 1999).

Chamaesyce kuwaleana bears fruit in spring and early summer and has usually finished fruiting by fall. No further information is available on flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors (56 FR 55770).

Historically, *Chamaesyce kuwaleana* was known from the central Waianae Mountains and Moku Manu Island off the eastern coast of Oahu. This species is currently known only from Kauaopuu Peak, Mauna Kuwale, Waianae Kai-Lualualei Ridge, Puu Kailio, and Kauaopuu in the Waianae Mountains, on Federal and State lands. The 5 occurrences contain around 2,000 individuals (GDSI 2001; HINHP Database 2001; Koutnik and Huft 1999).

Chamaesyce kuwaleana typically grows in thin guano soil on basaltic rock, on arid, exposed volcanic cliffs, on dry or mesic rocky ridges, or on sparsely vegetated slopes between sea level and 596 m (0 to 1,955 ft) elevation. Associated native species include *Artemisia* sp. (hinahina), *Bidens* sp. (kookoolau), *Carex* sp. (NCN), *Chamaesyce* sp. (akoko), *Dodonaea viscosa*, *Heteropogon contortus*, *Plectranthus parviflorus* (ala ala wai nui), *Schiedea* sp. (NCN), or *Sida fallax* (HINHP Database 2001; Koutnik and Huft 1999; Service 1998b).

The major threats to *Chamaesyce kuwaleana* are competition from the

nonnative plant species *Cenchrus ciliaris* (buffelgrass), *Kalanchoe pinnata*, *Leucaena leucocephala*, *Melinis repens*, *Opuntia* sp. (prickly pear), and *Schinus terebinthifolius*; fire; two-spotted leafhoppers (*Saphonia rufofascia*); and the small number of occurrences, which makes the species highly vulnerable to extinction from random environmental events (HINHP Database 2001; Service 1998b; 56 FR 55770).

Chamaesyce rockii (Akoko)

Chamaesyce rockii, a member of the spurge family (Euphorbiaceae) and a short-lived perennial, is usually a compact shrub or sometimes a small tree typically ranging from 0.5 to 2 m (1.6 to 6.6 ft) tall, but in protected sites it has been known to reach 4 m (13 ft) in height. This species differs from others in the genus in that it has large, red, capsular fruit (Koutnik and Huft 1999).

Chamaesyce rockii has been observed fruiting in February. Little else is known about its flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors (Service 1998b).

Chamaesyce rockii was known historically from scattered occurrences along the Koolau Mountains on the island of Oahu. Today, 20 occurrences are located in Waikakalua Gulch, Kaukonahua-Kahana summit area, Punaluu-Kaluanui, Peahinaia Trail Laie-Kaipapau-Kawai Nui junction area, Puu Keahiakahoe, Halawa Trail, summit ridge between Aiea Ridge Trail and Waimano Trail, Ewa Forest Reserve, Halemano Gulch, Kawaiiiki-Opaaula Ridge, Puu Kainapuaa, Kawai Iki Stream, Maakua Gulch, and Kaipapau-Loloa Ridge, on State, Federal, and private lands. Currently the total number of plants is estimated to be between 641 and 773 (EDA Database 2001; GDSI 2001; HINHP Database 2001).

Chamaesyce rockii typically grows on gulch slopes, gulch bottoms, and ridge crests in wet *Metrosideros polymorpha*-*Dicranopteris linearis* (uluhe) forest and shrubland between 208 and 871 m (682 and 2,857 ft) in elevation. Associated plant species include *Bidens* sp., *Antidesma platyphyllum*, *Broussaisia arguta*, *Cibotium* sp. (hapuu), *Coprosma longifolia* (pilo), *Diplopterygium pinnatum* (uluhe lau nui), *Dubautia laxa* (naenae pua melemele), *Hedyotis terminalis*, *Machaerina* sp., *Melicope* spp., *Myrsine juddii* (kolea), *Psychotria* spp. (kopiko), and *Wikstroemia* sp. (akia) (HINHP Database 2001).

The primary threats to *Chamaesyce rockii* are habitat degradation and/or destruction by feral pigs; trail clearing;