

environmental requirements, and limiting factors (Service 1998b).

Eugenia koolauensis was historically known from Molokai and from Kaipapau Valley, Hanaimoa and Kahawainui Gulches, and a gully southeast of Kahuku on Oahu. Currently, this species is only found on Oahu in 12 occurrences on Federal, State, and private lands in Hanaimoa, Papali, Kaleleiki, Aimuu, Kaunala, Pahipahialua, Oio, and Palikea Gulches. A total of fewer than 70 individuals occur on Oahu (EDA Database 2001; GDSI 2001; HINHP Database 2001).

Eugenia koolauensis is found on gentle to steep slopes or ridges in mesic or dry forests dominated by *Metrosideros polymorpha* or *Diospyros* sp. from 57 to 437 m (187 to 1,433 ft) in elevation. Other associated native plant species include *Alyxia oliviformis*, *Bobea elatior*, *Carex meyenii*, *Dicranopteris linearis*, *Leptecophylla tameiameia*, *Myrsine lessertiana*, *Nestegis sandwicensis*, *Pleomele halapepe*, *Pouteria sandwicensis*, *Psydrax odorata*, or *Rauvolfia sandwicensis* (HINHP Database 2001; Service 1998b).

The major threats to *Eugenia koolauensis* on Oahu are habitat degradation by feral pigs; competition with nonnative plant species such as *Acacia confusa*, *Aleurites moluccana*, *Araucaria columnaris*, *Ardisia elliptica*, *Casuarina equisetifolia*, *Clidemia hirta*, *Cordyline fruticosa*, *Eucalyptus* sp., *Grevillea robusta*, *Hyptis pectinata*, *Lantana camara*, *Melia azedarach*, *Oplismenus hirtellus*, *Panicum maximum*, *Passiflora laurifolia* (yellow granadilla), *Passiflora suberosa*, *Psidium cattleianum*, *Schinus terebinthifolius*, *Syzygium cumini*, and *Toona ciliata*; and the limited numbers of this species, which make it vulnerable to extinction due to naturally caused events and reduced reproductive vigor (HINHP Database 2001; 59 FR 14482).

Euphorbia haeleeleana (Akoko)

Euphorbia haeleeleana, a member of the spurge family (Euphorbiaceae) and a short-lived perennial, is a dioecious (female and male flowers on separate plants) tree 3 to 14 m (10 to 46 ft) tall. This species is distinguished from others in the genus in that it is a tree and by the large leaves with prominent veins (Wagner *et al.* 1999).

Individual trees of *Euphorbia haeleeleana* bear only male or female flowers and must be cross-pollinated from a different tree to produce viable seed. This species sets fruit between August and October. Little else is known about its flowering cycles,

pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors (Service 1999; Wagner *et al.* 1999).

Euphorbia haeleeleana is known historically and currently from northwestern Kauai and the Waianae Mountains of Oahu. On Oahu, 8 occurrences of approximately 134 individuals are known from Keawaula Gulch, Kahanahaiki Valley, Kaumokunui-Kaumokuiki Ridge, and Alaieihe Gulch on Federal, State, and private lands (EDA Database 2001; GDSI 2001; HINHP Database 2001).

Euphorbia haeleeleana on Oahu is usually found in dry forest that is often dominated by *Diospyros* sp. at elevations between 156 and 586 m (512 and 1,922 ft). Associated native plant species include *Dodonaea viscosa*, *Erythrina sandwicensis*, *Pleomele* sp., *Psydrax odorata*, *Reynoldsia sandwicensis*, or *Sapindus oahuensis* (HINHP Database 2001).

The main threats to *Euphorbia haeleeleana* on Oahu are habitat degradation and/or destruction by wild and feral goats and pigs; predation by rats; fire; potential impacts from military activities; and competition with the nonnative plant species *Aleurites moluccana*, *Caesalpinia decapetala* (wait-a-bit), *Coffea arabica*, *Digitaria insularis* (sourgrass), *Ficus microcarpa*, *Grevillea robusta*, *Hyptis pectinata*, *Kalanchoe pinnata*, *Lantana camara*, *Leucaena leucocephala*, *Melia azedarach*, *Melinis minutiflora*, *Panicum maximum*, *Passiflora suberosa*, *Psidium cattleianum*, *Rivina humilis*, *Schinus terebinthifolius*, *Syzygium cumini*, and *Toona ciliata* (HINHP Database 2001).

Flueggea neowawraea (Mehamehame)

Flueggea neowawraea, a member of the spurge family (Euphorbiaceae) and a long-lived perennial, is a large dioecious tree up to 30 m (100 ft) tall 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 similar Hawaiian species in the family by its hairless, whitish lower leaf surfaces and round fruits (Hayden 1999; Service 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 its flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors (Hayden 1999; Service 1999).

Historically, *Flueggea neowawraea* was known from Oahu, Kauai, Maui, Molokai, and the island of Hawaii. Currently, it is known from Kauai, Oahu, Maui, and Hawaii. On Oahu, *Flueggea neowawraea* is known from 23 occurrences with a total of approximately 31 individuals on Federal, State, city, county, and private lands at Makua Valley, Makaha, Alaiheihe Gulch, Kaluaa Gulch, Makaleha Valley, Ekahanui Gulch, Pahole Gulch, Keaau Valley, Kahanahaiki Valley, Kaaawa Gulch, Waianae Kai, Palikea Gulch, Manuwai Gulch, Mohiaka Gulch, Kauhiuhi, Mikilua, and Lualualei (EDA Database 2001; GDSI 2001; HINHP Database 2001).

Flueggea neowawraea occurs on gulch slopes or ridge crests, or near streams, in dry or mesic forest at elevations of 323 to 1,006 m (1,059 to 3,300 ft). Associated native plant species include *Alyxia oliviformis*, *Antidesma platyphyllum*, *Antidesma pulvinatum*, *Bobea* sp., *Chamaesyce herbstii*, *Chamaesyce multifloris*, *Charpentiera* sp., *Claoxylon sandwicensis*, *Diospyros hillebrandii*, *Diospyros sandwicense*, *Erythrina sandwicensis*, *Hedyotis terminalis*, *Hibiscus arnottianus*, *Metrosideros polymorpha*, *Morinda trimera* (noni), *Myoporum sandwicense*, *Myrsine* sp., *Nestegis sandwicensis*, *Pipturus albidus*, *Pisonia sandwicensis*, *Pisonia umbellifera*, *Pittosporum* sp., *Pleomele* sp., *Psydrax odorata*, *Pteralyxia* sp., *Rauvolfia sandwicensis*, *Sapindus oahuensis*, and *Streblus pendulina* (Hayden 1999; HINHP Database 2001).

The primary threat to the continued existence of *Flueggea neowawraea* on Oahu is the black twig borer, which has affected all known *Flueggea neowawraea* plants. Other major threats include habitat degradation by feral pigs and goats; competition with the nonnative plant species *Ageratina riparia*, *Aleurites moluccana*, *Blechnum appendiculatum*, *Clidemia hirta*, *Ficus macrophylla*, *Ficus microcarpa*, *Grevillea robusta*, *Kalanchoe pinnata*, *Lantana camara*, *Melinis minutiflora*, *Paspalum conjugatum*, *Passiflora suberosa*, *Psidium* spp., *Rivina* sp., *Schinus terebinthifolius*, *Syzygium cumini*, and *Toona ciliata*; fire; predation by the Chinese rose beetle; the small occurrence size with its limited gene pool and depressed reproductive vigor, compounded by a requirement for cross-pollination because the species is dioecious; potential impacts from military activities; and predation of the fruit by rats (HINHP Database 2001; Service 1999).