

Stachytarpheta dichotoma; trampling by humans on or near trails; and the risk of extinction due to the small number of occurrences (HINHP Database 2001; Service 1998b; 56 FR 55770).

Schiedea kaalae (NCN)

Schiedea kaalae, a short-lived perennial member of the pink family (Caryophyllaceae), has a short woody caudex less than 20 cm (8 in) long. This species can be distinguished from other members of its genus by its very short stems and its thick leaves with one conspicuous vein (Wagner *et al.* 1999).

This plant has been observed in flower from March through June. Based on field and greenhouse observations, *Schiedea kaalae* has bisexual flowers. A series of experimental self-pollinations, within-population crosses, and crosses among occurrences has demonstrated that *Schiedea kaalae* experiences moderately strong inbreeding depression. These results indicate that reductions in population size could result in expression of inbreeding depression among progeny, with potentially deleterious consequences for the long-term persistence of this species. Consistent with the evidence for inbreeding depression, *Schiedea kaalae* appears to be an out-crossing species. Under greenhouse conditions, flowers do not set seed unless hand-pollinated. In the field, this species was observed being visited by the introduced syrphid fly, *Simosyrphus grandicornis*. The fly did not appear to be foraging for nectar but may have been feeding on pollen. Individuals of *Schiedea kaalae* appear to be long-lived, but there is no evidence of regeneration from seed under field conditions. Seedlings of *Schiedea kaalae*, like those of other *Schiedea* species in mesic or wet sites, are apparently consumed by introduced slugs and snails, which have been observed feeding on *Schiedea membranacea*, a mesic forest species from Kauai. In contrast, *Schiedea* occurring in dry areas produce abundant seedlings following winter rains, presumably because dry areas have fewer nonnative predators. Little else is known about its flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors (Service 1998b; Weller and Sakai, unpublished data).

Historically, *Schiedea kaalae* was known from the north-central and south-central Waianae Mountains and the northern Koolau Mountains of Oahu. This species remains on State and private lands at Pahole Gulch, Kaluaa Gulch, Puu Kaa, Palawai Gulch, Maakua Gulch, Huliwai Gulch, and

Makaua Stream. The 7 known occurrences contain only 49 individuals (GDSI 2001; HINHP Database 2001).

Schiedea kaalae typically grows in deep shade on steep slopes, cliffs, and stream banks in diverse mesic and wet forests at elevations between 64 and 869 m (210 and 2,850 ft). Associated native species include *Alyxia oliviformis*, *Athyrium arnottii* (hoio), *Athyrium sandwichianum*, *Boehmeria grandis*, *Charpentiera* sp., *Claoxylon sandwicense*, *Cyrtandra calpidicarpa*, *Cyrtandra laxiflora*, *Diospyros hillebrandii*, *Dryopteris unidentata*, *Freycinetia arborea*, *Hedyotis acuminata*, *Nothoecstrum longifolium* (aiea), *Pipturus albidus*, *Pisonia sandwicensis*, *Pisonia umbellifera*, *Pouteria sandwicensis*, *Psychotria hathewayi*, *Selaginella arbuscula*, or *Xylosma hawaiiense* (maua) (HINHP Database 2001; Service 1998b).

The major threats to *Schiedea kaalae* are habitat degradation by feral pigs and goats; competition from the nonnative plant species *Ageratina adenophora*, *Ageratina riparia*, *Blechnum appendiculatum*, *Christella parasitica*, *Clidemia hirta*, *Cordyline fruticosa*, *Melinis minutiflora*, *Morella faya*, *Oplismenus hirtellus*, *Passiflora suberosa*, *Psidium cattleianum*, *Psidium guajava*, *Rubus rosifolius*, and *Schinus terebinthifolius*; fire; predation by introduced slugs and snails; and a risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of remaining individuals (HINHP Database 2001; Service 1998b).

Schiedea kealiae (Ma oli oli)

Schiedea kealiae, a short-lived perennial member of the pink family (Caryophyllaceae), is a subshrub with weakly ascending to sprawling stems that form loose clumps. The species is distinguished from others of this endemic Hawaiian genus by the length of the sepals and nectaries and by the stalkless glands found only on the flowering stalk (Wagner *et al.* 1999).

Schiedea kealiae has been observed in flower in December. A series of self-pollinations, within-population crosses, and crosses among occurrences has demonstrated that many related *Schiedea* species experience moderately strong inbreeding depression. These results indicate that reductions in population size could result in expression of inbreeding depression among progeny, with potentially deleterious consequences for the long-term persistence of the species. Individuals of *Schiedea kealiae* appear to be long-lived; however, there is no evidence of regeneration from seed

under field conditions. Seedlings of *Schiedea* species occurring in mesic or wet sites are apparently consumed by introduced slugs and snails, which have been observed feeding on *Schiedea membranacea*, a mesic forest species from Kauai. In contrast, *Schiedea* occurring in dry areas produce abundant seedlings following winter rains, presumably because dry areas have fewer nonnative predators. Little else is known about its flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors (Service 1998b; Weller and Sakai, unpublished data).

Historically, *Schiedea kealiae* was known from the northern Waianae Mountains and one collection from the Palikea area, near the southern end of the same mountain range. Currently, 4 occurrences totaling between 265 and 315 plants are located on the cliffs above Dillingham Airfield and Camp Erdman and at Kaena Point at the northern end of the Waianae Mountains. These occurrences are on private and State lands, as well as State lands under Federal jurisdiction (Army 2001b; GDSI 2001; HINHP Database 2001).

Schiedea kealiae is usually found on steep slopes and cliff faces and bases in dry remnant *Erythrina sandwicensis* forest at elevations between 46 and 341 m (151 and 1,118 ft). Associated native plant species include *Bidens* sp., *Hibiscus arnottianus*, *Lepidium bidentatum* (anaunau), *Lipochaeta remyi* (nehe), *Myoporum sandwicense*, *Plumbago zeylanica*, *Psydrax odorata*, *Sicyos* sp. (anunu), or *Sida fallax* (HINHP Database 2001).

The major threats to *Schiedea kealiae* are competition with the nonnative plant species *Leucaena leucocephala*, *Panicum maximum*, and *Schinus terebinthifolius*; predation by introduced slugs and snails; lack of a pollinator; and risk of extinction from naturally occurring events and/or reduced reproductive vigor due to the small number of existing occurrences. The Kaena Point occurrence is additionally threatened by naturally occurring rock slides and fire (HINHP Database 2001; Service 1998b; 61 FR 53089).

Silene perlmannii (NCN)

Silene perlmannii, a member of the pink family (Caryophyllaceae), is a short-lived perennial plant with stems that are woody at the base. It usually is much branched from the base and often forms clumps. It is the only species of the genus on Oahu and can be distinguished from other *Silene* species by its white petals and a calyx that is