

following associated native plant species: *Dryopteris wallichiana* (io nui); *Dodonaea viscosa*; *Leptecophylla tameiameiaiae*; *Rubus hawaiiensis*; or *Vaccinium reticulatum* (ohelo ai), at elevations between 1,451 and 2,184 m (4,760 and 7,164 ft) (R. Hobdy, pers. comm., 2001; Service 1997; 57 FR 20772).

The greatest immediate threat to the survival of this species is encroachment and competition from naturalized, nonnative vegetation, chiefly grasses and trees. Soil disturbance, caused by trampling cattle and rooting by feral pigs, also is a major threat as it destroys plants and facilitates the encroachment of competing species of naturalized plants. Other less important threats include browsing by cattle; fires; and pollen from nonnative pine trees, which at certain times of the year completely covers the stigmas of the geraniums, precluding any fertilization by its own pollen. The small number of individual plants increases the potential for extinction from random environmental events, and the limited gene pool may depress reproductive vigor (Funk 1982, 1988; Service 1997; 57 FR 20772).

Geranium multiflorum (Nohoanu)

Geranium multiflorum, a long-lived member of the geranium family (Geraniaceae), is a perennial many-branched shrub 1 to 3 m (3 to 10 ft) tall. Flowers are in clusters of 25 to 50 and have 5 white petals that are 10 to 15 millimeters (mm) (0.4 to 0.6 in) long with purple veins or bases. This species is distinguished from others of the genus by its white, regularly symmetrical flowers and by the shape and pattern of teeth on its leaf margins (Wagner *et al.* 1999).

Little is known about the life history of *Geranium multiflorum*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 1997; 57 FR 20772).

Historically, *Geranium multiflorum* was known from Ukulele, Waielele, and Waianapanapa on East Maui. This species is now known from Federal (Haleakala National Park), State (Hanawi NAR and Koolau Forest Reserve), and private lands within the East Maui Watershed Partnership in Haiku Ula, Kaliainui, Koolau Gap, between East Waiuaki and Kopiliula Streams, near Puu Alaea along Kalapawili Ridge, Kipahulu Valley, Waiakekeehia, and Haleakala Crater. The 13 known occurrences extend over a distance of about 10.5 by 5.5 km (6.5 by 3.5 mi). Due to the inaccessibility of the occurrences, and the difficulty in

determining the number of individuals (caused by the plant's multi-branched form), the total number of individuals of this species is not known; however, it probably does not exceed 3,000 plants (GDSI 2001; HINHP Database 2001; R. Hobdy, pers. comm., 2001; Service 1997; Warshauer 1998; 57 FR 20772).

Geranium multiflorum is found in wet or mesic *Metrosideros polymorpha* montane forest or alpine mesic forest, *Leptecophylla tameiameiaiae* shrubland, *Sophora chrysophylla* subalpine dry forest, open sedge swamps, fog-swept lava flows, or montane grasslands containing one or more of the following associated native plant species: *Coprosma montana* (pilo); *Dryopteris glabra* (hohui); *Dryopteris wallichiana*; *Hedyotis* spp.; *Rubus hawaiiensis*; *Sadleria cyatheoides*; or *Vaccinium* spp. (amau), at elevations between 1,499 and 2,710 m (4,918 and 8,890 ft) (HINHP Database 2001; Service 1997; Wagner *et al.* 1999; 57 FR 20772).

The major threat to *Geranium multiflorum* is competition with encroaching nonnative plant species, particularly *Rubus argutus* (prickly Florida blackberry). A potential threat is habitat destruction by feral pigs and goats in unfenced areas (Service 1997; 57 FR 20772).

Kanaloa kahoolawensis (Kohe malama malama o kanaloa)

Kanaloa kahoolawensis, a short-lived perennial member of the legume family (Fabaceae), is a densely branched shrub 0.75 to 1 m (2.5 to 3.5 ft) tall. The leaves are divided into three pairs of leaflets, with a leaf nectary (nectar-bearing gland) at the joint between each pair of leaflets. One to three inflorescences are found in the leaf axils (joint between leaf and stem), developing with the flush of new leaves. The inflorescence is a globose head with 20 to 54 white flowers. No other species of legume in Hawaii bears any resemblance to this species, which is why it is the only one in this genus (Lorence and Wood 1994; Service 2001).

Little is known about the life history of *Kanaloa kahoolawensis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (Service 2001; 64 FR 48307).

Kanaloa kahoolawensis was unknown to science until its discovery by Steve Perlman and Ken Wood of NTBG in 1992 on a steep rocky spire on the coast of Kahoolawe. The only known location of *K. kahoolawensis* is this rocky stack on the southern coast of Kahoolawe, in an area which is owned by the State of Hawaii. While there are no previous

records of the plant, pollen core studies on Oahu revealed a legume pollen that could not be identified but is most likely this species. The pollen cores indicate that this previously unidentified species was a codominant with *Dodonaea viscosa* and *Pritchardia* spp. from before 1210 B.C. to 1565 A.D., at which point *K. kahoolawensis* disappeared from the pollen record and *D. viscosa* and *Pritchardia* spp. declined dramatically. Only one occurrence with two living individuals is known (Athens *et al.* 1992; Athens and Ward 1993; Lorence and Wood 1994; Service 2001; 64 FR 48307; Paul Higashino, Kahoolawe Island Reserve Commission (KIRC), pers. comm., 2000).

The only known habitat is steep rocky talus slopes in mixed coastal shrubland at elevations between 0 and 305 m (0 and 1,000 ft) and containing one or more of the following associated native plant species: *Bidens mauensis* (kookoolau); *Capparis sandwichiana* (maiapilo); *Melanthera lamarum* (nehe); *Portulaca molokiniensis* (ihi); *Senna gaudichaudii* (kolomona); or *Sida fallax* (ilima) (Service 2001; 64 FR 48307; R. Hobdy, pers. comm., 2001).

The major threats to *Kanaloa kahoolawensis* are landslides and competition with the nonnative plant species *Emilia fosbergii* (pualele) and *Nicotiana glauca* (tree tobacco). Goats played a major role in the destruction of vegetation on Kahoolawe before they were removed, and *K. kahoolawensis* probably survived only because the rocky stack is almost completely separated from the island and inaccessible to goats. Rats are a potential threat to *K. kahoolawensis*, because the species has seeds similar in appearance and presentation to the seeds of the federally endangered *Caesalpinia kavaiensis* (uhihi), which are eaten by rats. Rats may have been the cause of the decline of this species over 400 years ago. Trampling and habitat degradation from introduced cats and native seabirds are also potential threats. Random environmental events and reduced reproductive vigor are also threats to this species, because only two individuals are known (Cuddihy and Stone 1990; Lorence and Wood 1994; Service 2001; 64 FR 48307; P. Higashino, pers. comm., 2000).

Lipochaeta kamolensis (Nehe)

Lipochaeta kamolensis, a short-lived perennial herb of the aster family (Asteraceae), has trailing or climbing stems that are woody at the base and reach a length of 0.3 to 3 m (1 to 10 ft). This species is distinguished from others of the genus by the simple leaves, which are pinnately lobed or cut, and by