

superba, *Cyanea truncata*, *Cyperus trachysanthos*, *Cyrtandra dentata*, *Cyrtandra polyantha*, *Cyrtandra subumbellata*, *Cyrtandra viridiflora*, *Delissea subcordata*, *Diellia erecta*, *Diellia falcata*, *Diellia unisora*, *Diplazium molokaiense*, *Dubautia herbstobatae*, *Eragrostis fosbergii*, *Eugenia koolauensis*, *Euphorbia haeleleana*, *Flueggea neowawraea*, *Gardenia mannii*, *Gouania meyenii*, *Gouania vitifolia*, *Hedyotis coriacea*, *Hedyotis degeneri*, *Hedyotis parvula*, *Hesperomannia arborescens*, *Hesperomannia arbuscula*, *Hibiscus brackenridgei*, *Isodendron laurifolium*, *Isodendron longifolium*, *Isodendron pyriforme*, *Labordia cyrtandrae*, *Lepidium arbuscula*, *Lipochaeta lobata* var. *leptophylla*, *Lipochaeta tenuifolia*, *Lobelia gaudichaudii* ssp. *koolauensis*, *Lobelia monostachya*, *Lobelia niihauensis*, *Lobelia oahuensis*, *Lysimachia filifolia*, *Mariscus pennatifolius*, *Marsilea villosa*, *Melicope lydgatei*, *Melicope pallida*, *Melicope saint-johnii*, *Myrsine juddii*, *Neraudia angulata*, *Nototrichium humile*, *Peucedanum sandwicense*, *Phlegmariurus nutans*, *Phyllostegia hirsuta*, *Phyllostegia kaalaensis*, *Phyllostegia mollis*, *Phyllostegia parviflora*, *Plantago princeps*, *Platanthera holochila*, *Pteris lidgatei*, *Sanicula mariversa*, *Sanicula purpurea*, *Schiedea hookeri*, *Schiedea kaalae*, *Schiedea kealiae*, *Schiedea nuttallii*, *Sesbania tomentosa*, *Silene lanceolata*, *Silene perlmanii*, *Solanum sandwicense*, *Spermolepis hawaiiensis*, *Stenogyne kanehoana*, *Tetramolopium filiforme*, *Tetramolopium lepidotum* ssp. *lepidotum*, *Tetraplasandra gymnocarpa*, *Trematolobelia singularis*, *Urera kaalae*, *Vigna o-wahuensis*, *Viola chamissoniana* ssp. *chamissoniana*, and *Viola oahuensis* is described in the "Background" section of this final rule.

All areas designated as critical habitat are within the historical range of the 99 species at issue and contain one or more of the physical or biological features (primary constituent elements) essential for the conservation of the species.

As described in the discussions for each of the 99 species for which we are designating critical habitat, we are defining the primary constituent elements on the basis of the habitat features of the areas from which the plant species are reported, as described by the type of plant community (e.g., mesic *Metrosideros polymorpha* forest), associated native plant species, locale information (e.g., steep rocky cliffs, talus slopes, gulches, stream banks), and elevation. The habitat features provide the ecological components required by the plant. The type of plant community

and associated native plant species indicate specific microclimate (localized climatic) conditions, retention and availability of water in the soil, soil microorganism community, and nutrient cycling and availability. The locale indicates information on soil type, elevation, rainfall regime, and temperature. Elevation indicates information on daily and seasonal temperature and sun intensity. Therefore, the descriptions of the physical elements of the locations of each of these species, including habitat type, plant communities associated with the species, location, and elevation, as described in the "SUPPLEMENTARY INFORMATION: Discussion of the Plant Taxa" section above, constitute the primary constituent elements for these species on the island of Oahu.

D. Criteria Used To Identify Critical Habitat

The lack of detailed scientific data on the life history of these plant species makes it impossible for us to develop a robust quantitative model (e.g., population viability analysis (National Research Council 1995)) to identify the optimal number, size, and location of critical habitat units to achieve recovery (Beissinger and Westphal 1998; Burgman *et al.* 2001; Ginzburg *et al.* 1990; Karieva and Wennergren 1995; Menges 1990; Murphy *et al.* 1990; Taylor 1995). However, based on the best information available at this time, including information on which the listing of and recovery plans for these species were based, we have concluded that the current size and distribution of the extant populations are not sufficient to expect a reasonable probability of long-term survival and recovery of these plant species.

For each of these species, the overall recovery strategy outlined in the approved recovery plans includes: (1) Stabilization of existing wild populations, (2) protection and management of habitat, (3) enhancement of existing small populations and reestablishment of new populations within historic range, and (4) research on species biology and ecology (Service 1994, 1995a, 1995b, 1996a, 1996b, 1996c, 1996d, 1997, 1998a, 1998b, 1999). Thus, the long-term recovery of these species is dependent upon the protection of existing population sites and suitable unoccupied habitat within their historic range.

The overall recovery goal stated in the recovery plans for each of these species includes the establishment of 8 to 10 populations with a minimum of 100 mature, reproducing individuals per population for long-lived perennials;

300 mature, reproducing individuals per population for short-lived perennials; and 500 mature, reproducing individuals per population for the annual. (Please note that there are some specific exceptions to this general recovery goal of 8 to 10 populations for species that are believed to be very narrowly distributed.) To be considered recovered, the populations of a multi-island species should be distributed among the islands of its known historic range (Service 1994, 1995a, 1995b, 1996a, 1996b, 1996c, 1996d, 1997, 1998a, 1998b, 1999). A population, for the purposes of this discussion and as defined in the recovery plans for these species, is a unit in which the individuals could be regularly cross-pollinated and influenced by the same small-scale events (such as landslides), and which contains a minimum of 100, 300, or 500 mature, reproducing individuals, depending on whether the species is a long-lived perennial, short-lived perennial, or annual.

Marsilea villosa, a short-lived perennial aquatic fern, was historically known from six populations on three different islands, Molokai, Oahu, and Niihau. This species is now extant only on Oahu and Molokai. Delisting objectives for this species include protection and stabilization of at least six (rather than 8 to 10) geographically distinct, self-sustaining populations (either three on Oahu and three on Molokai or three on Oahu, two on Molokai, and one on Niihau), stable or increasing population sizes, no active management needed, and self-maintenance of each population through two successive floods resulting in sexual reproduction. Delisting objectives for *Marsilea villosa* do not include a specific number of mature individuals per population because of its clonal nature, as it is extremely difficult to distinguish between individuals in clonal plant species (Service 1996a).

By adopting the specific recovery objectives enumerated above, the adverse effects of genetic inbreeding and random environmental events and catastrophes, such as landslides, hurricanes or tsunamis, which could destroy a large percentage of a species at any one time, may be reduced (Menges 1990; Podolsky 2001). These recovery objectives were initially developed by the HPPRCC and are found in all of the recovery plans for these species. While they are expected to be further refined as more information on the population biology of each species becomes available, the justification for these objectives is found in the current conservation biology