

be of early Pleistocene origin. The Waterford Unit contains very high quality, hydrologically intact vernal pool complexes important for the conservation of *C. hooveri* (criterion 4). The unit is located primarily in southeastern Stanislaus County, extending on its eastern border into the low elevation foothills of the Sierra Nevada in Tuolumne County. It is geographically noteworthy (criterion 1) because known occurrences of *C. hooveri* are sparsely distributed in the southern Sierra Nevada foothills, and because these occurrences are highly disjunct from occurrences of the species in the northern portion of its range. This unit is over 140 mi (225 km) from the nearest units to the north. CDFG administers approximately 2 ac (0.8 ha), and the remaining land within this unit is privately owned.

*Unit 5, Turlock Unit, Stanislaus and Merced Counties (35,508 ac (14,370 ha))*

This unit contains occurrences of the species within large vernal pools on Meikle soils, including two of the seven known occurrences of *Chamaesyce hooveri* on the eastern margin of the San Joaquin Valley (Holland 1998; CNDDDB 2002). The unit also includes an occurrence of *C. hooveri* within the well-known Hickman pools in Stanislaus County. Not only does the Hickman pool complex contain one of the largest vernal lakes in California at more than 300 ac (121 ha), but it also exhibits tremendous biodiversity (criterion 2) (Medeiros 2002).

The Turlock Unit contains large intact and contiguous vernal pool grassland areas that help maintain connectivity between *Chamaesyce hooveri* habitat to the north and south (criterion 3). There are numerous vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths in this unit to sustain *C. hooveri* germination, growth, and reproduction. *Chamaesyce hooveri* populations in Stanislaus County typically flower from mid-June into October, whereas those in central Merced and Tulare Counties typically flower from late May through July (Alexander and Schlising 1997). The *C. hooveri* habitat in this unit is important to conserve phenotypic variation within the species and to maintain the geographic distribution of *C. hooveri* throughout its range (criteria 1 and 2). Vernal pools in the Turlock Unit are located in southeastern Stanislaus and northeastern Merced Counties. They extend from the San Joaquin Valley floor to the low-elevation foothills of the Sierra Nevada.

*Unit 7A, B, C, and D, Tulare Unit, Tulare County (23,537 ac (9,526 ha))*

This unit is geographically important because it supports almost 20 percent of the known occurrences of *Chamaesyce hooveri* (CNDDDB 2002). This unit also comprises the southern extent of the range of the species. Occurrences within this unit are more than 68 mi (110 km) distant from the nearest *C. hooveri* unit to the north. *Chamaesyce hooveri* populations in Tulare County typically flower from late May through July, whereas those in Stanislaus and Sacramento County typically flower from mid-June into October (Alexander and Schlising 1997). This phenotypic variation also suggests there may be regional differences between these and other occurrences in other portions of the species' range (criterion 2).

There are four subunits within the Tulare Unit located in northeastern Tulare County. The unit includes several protected areas (criterion 4), including the Sequoia Fields Ecological Reserve and the Stone Corral Ecological Reserve in Tulare County managed by CDFG (218 ac (88 ha)), as well as 33 ac (13 ha) of BLM land. Other areas within this unit are privately owned. This unit contains scattered vernal pool complexes in northwestern Tulare County.

*Orthocarpus campestris* var. *succulentus*

Fleshy owl's-clover is found usually in low plant numbers in seven naturally occurring widely scattered vernal pool complex areas in Fresno, Madera, San Joaquin, Stanislaus, and Tuolumne Counties in the San Joaquin Valley. Fleshy owl's-clover has a sporadic distribution within vernal pools, between vernal pools and between vernal pool complexes. The specific vernal pool characteristics that determine the suitability for fleshy owl's-clover germination and growth are unknown; however, it appears that the species seems to favor somewhat smaller, somewhat acidic vernal pools as compared to other vernal pool plants.

Fleshy owl's-clover occurrences are known from with an elevational variation of near 50 m (160 ft) to near 550 m (1,800 ft). Conserving a broad distribution of fleshy owl's-clover across its geographical and elevational distribution protects the natural environmental processes for the species and provides the best chance for retaining the species across the full extent of its range. The vernal pool types and soils associated with the six areas of concentration of fleshy owl's-clover differ across the geographic range

of the species; these differences lead to different species compositions and environmental conditions between fleshy owl's-clover occurrences. Providing for a mosaic of habitat types both between and among vernal pool species occurrences is essential to the species' conservation because it would include the full extent of the physical and environmental conditions for the species (Fugate 1992; Fugate 1998; Gonzales *et al.* 1996; Ikeda and Schlising 1990; Noss *et al.* 2002a; Platenkamp 1998; Zedler *et al.* 1979). The distribution of fleshy owl's-clover reflects a diversity of vernal pool habitat types and sizes that provide habitat for the species. We are uncertain about specific soils that may correlate with the presence of this species, although the species is irregularly found on Redding soil series. Vernal pool complexes that provide suitable habitat for this species include pools ranging in depth from 15 cm (6.0 in) to 25 cm (10.0 in), but the species is also found less frequently in shallower and deeper pools. Soil pH values for some of the vernal pools in Merced County occupied by fleshy owl's-clover range from 4.3 to 6.2. Although no comprehensive study has been conducted, Merced County some vernal pools occupied by fleshy owl's-clover vary in size from 80 sq m (0.02 ac) to 486 sq m (0.12 ac). Merced County contains the largest aggregations of fleshy owl's-clover, and the occurrences of the species are found on mild to strongly acidic soils on Laguna, Mehrten, North Merced Gravels, and Riverbank Formations as well as Ione, Merthen, and Valley Springs geological formations. The parent material of vernal pools greatly influences species' composition and hydrologic functioning of the vernal pool (Hanes and Stromberg 1998; Holland and Jain 1981, 1988). Although fleshy owl's-clover appears to prefer the more weathered acidic, higher-terrace vernal pool complexes that are composed of volcanic tuff sand quartzite parent materials, soils beneath vernal pools are extremely variable and are not the same as soils mapped by soil surveys, but are usually undescribed hydric inclusions that vary upon location (Holland and Dain 1990). The primary constituent elements of critical habitat for *Castilleja campestris* ssp. *succulenta* are the habitat components that provide:

(i) Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths and the adjacent upland margins of these depressions that sustain *Castilleja campestris* ssp. *succulenta* germination, growth, and reproduction, including but