

geologic formations for sites where *L. conjugens* occurs have not yet been determined. Most occurrences are found at elevations of 6 to 200 ft (2 to 61 m), but the recently discovered Monterey County occurrences are at 400 ft (122 m), and one Napa County occurrence is at 1,460 ft (445 m) elevation (CNDDDB 2002).

The soil types that maintain vernal pool habitats for *Lasthenia conjugens* have not yet been identified for most localities. The soil series from which this species is known are Aiken, Antioch, Concepcion, Conejo, Crispin, Haire, Linne, Los Robles, Rincon, Solano, and San Ysidro, plus the Arnold-Santa Ynez, Hambright-rock outcrop, and Los Osos complexes. Soil textures, where known, are clays or loams. At least in Solano County and on the shores of San Francisco Bay, *L. conjugens* grows in alkaline or saline-alkaline sites (Baye, in litt. 2000a, 2000b; CNDDDB 2002).

Further discussion on the life history and habitat characteristics of *Lasthenia conjugens* can be found in the final rule to list the species (62 FR 33029; June 18, 1997).

Chamaesyce hooveri

Chamaesyce hooveri (Hoover's spurge) was originally named *Euphorbia hooveri* based on a specimen collected by Robert Hoover in Yettum, Tulare County (Wheeler 1940). Koutnik (1985) placed the species in the genus *Chamaesyce* as *C. hooveri*.

Chamaesyce hooveri is an annual herb of the spurge family (*Euphorbiaceae*). The species trails along the ground, forming gray-green mats 2 to 40 in (5 to 100 cm) in diameter (Broyles 1987, Stone *et al.* 1988). The stems are hairless and contain milky sap. The tiny (0.08 to 0.20 in (2 to 5 mm)) leaves are opposite, rounded to kidney-shaped, with an asymmetric base and a toothed margin. In the genus *Chamaesyce*, the structures that appear to be flowers actually are groups of flowers; each group is referred to as a cyathium (Koutnik 1993).

CNDDDB (2002) includes 30 occurrences of *Chamaesyce hooveri*. Of these, one each in Tehama and Tulare Counties are classified as extirpated; two others, in Butte and Tehama Counties, may no longer occur because this species was not observed for 2 consecutive years (Stone *et al.* 1988; CNDDDB 2002). The Vina Plains of Tehama and Butte Counties contain 14 (54 percent) of the 26 extant occurrences of *C. hooveri* (CNDDDB 2002) in an area approximately 35 mi² (91 km²) in size (Stone *et al.* 1988). One other site in the same region is near Chico in Butte County. Seven of the 26 extant

occurrences are in the Southern Sierra Foothills Vernal Pool Region, including 5 in the Visalia-Yettum area of Tulare County and 2 in the Hickman-La Grange area of Stanislaus County. Three other occurrences are on the Sacramento National Wildlife Refuge in Glenn County, which is in the Solano-Colusa Vernal Pool Region. The one other extant occurrence is on the Bert Crane Ranch in Merced County, which is within the San Joaquin Valley Vernal Pool Region (Keeler-Wolf *et al.* 1998; CNDDDB 2002).

Vernal pools from which *Chamaesyce hooveri* has been reported are classified as Northern Hardpan and Northern Claypan vernal pools (Sawyer and Keeler-Wolf 1995). The pools supporting this species vary in size from 0.47 to 600 ac (0.19 to 243 ha), with a median area of 1.43 ac (0.58 ha) (Stone *et al.* 1988). Many occurrences consist of multiple pools that vary in area and depth, yet not all pools at a site support *C. hooveri*. Deeper pools apparently provide better habitat for this species because the duration of inundation is longer. This species may occur along the margins or in the deepest portions of the dried pool bed (Stone *et al.* 1988; Alexander and Schlising 1997). A particularly important feature of *C. hooveri* microhabitat, at least in the deeper pools, is that it is nearly devoid of other vegetation, and thus competition from other plants is reduced (Stone *et al.* 1988).

Vernal pools supporting *Chamaesyce hooveri* occur mostly on alluvial fans or terraces of ancient rivers or streams, with a few on the rim of the Central Valley basin. It is found on a wide variety of soils, ranging in texture from clay to sandy loam. Soil series include Anita, Laniger, Lewis, Madera, Meikle, Riz, Tuscan, Whitney, and Willows. All of these soils may not equally support the habitat requirements for this species, however. For example, in one Vina Plains pool, *C. hooveri* grew primarily in the portion that was underlain by Tuscan loam, but was nearly absent from the portion underlain by Anita clay (Alexander and Schlising 1997).

In the Sacramento Valley, occupied pools are on acidic soils over iron-silica cemented hardpan. Most pools supporting *Chamaesyce hooveri* in the San Joaquin Valley are on neutral to saline-alkaline soils over lime-silica cemented hardpan or claypan (Broyles 1987; Stone *et al.* 1988; Sawyer and Keeler-Wolf 1995; CNDDDB 2002). Occurrences have been reported from elevations ranging from 85 ft (26 m) in Glenn County to 420 ft (128 m) in Tehama County (CNDDDB 2002).

Further discussion on the life history and habitat characteristics of *Chamaesyce hooveri* can be found in the final rule to list the species (62 FR 14338).

Castilleja campestris ssp. *succulenta*

Robert Hoover (1936a) first described this species as *Orthocarpus campestris* var. *succulentus* (fleshy owl's-clover). The type specimen had been collected at Ryer, in Merced County. Robert Hoover (1968) subsequently raised its rank and assigned it the name *Orthocarpus succulentus*. Chuang and Heckard (1991) reconsidered the taxonomy of *Orthocarpus* and related genera. Based on floral morphology (external structure or form), seed morphology, and chromosome number, they transferred many species into the genus *Castilleja*. Furthermore, they determined that the appropriate rank for this species was as a subspecies of *Castilleja campestris* (field owl's-clover) and assigned the plant the scientific name *Castilleja campestris* ssp. *succulenta* (Chuang and Heckard 1991).

Castilleja campestris ssp. *succulenta* is a hemiparasitic (partly parasitic) annual herb belonging to the snapdragon family (Scrophulariaceae). The plant has erect or decumbent (laying on the ground with the tip turned upward) stems up to 12 in (30 cm) long. The stems are usually unbranched and without hairs. The leaves at the base of the stem are small and scalelike, whereas those on the upper stem are lance-shaped, not lobed, thick, fleshy, brittle, and easily broken. The bracts (leaf-like structures in the flowering structure) are green, similar to but shorter than the upper leaves, and longer than the flowers. Overall, the inflorescence (entire flowering structure of a plant) may occupy as much as half of the plant's height (Hoover 1936a, 1937, 1968; Chuang and Heckard 1991, 1993).

Castilleja campestris ssp. *succulenta* is known from 63 widely scattered extant occurrences in vernal pool habitats along the Southern Sierra Foothills Vernal Pool Region ranging from Madera County to a disjunct occurrence in northern San Joaquin County. *Castilleja campestris* ssp. *succulenta* is known from 11 occurrences in Fresno County, 9 in Madera, 36 in Merced, 5 in Stanislaus and 1 in Tuolumne (Keeler-Wolf *et al.* 1998; CNDDDB 2002).

Castilleja campestris ssp. *succulenta* is known mostly from vernal pools occurring on alluvial terrace landforms. These pool types have been described as both Northern Claypan and Northern Hardpan vernal pools (Sawyer and