

Tolerance to inundation differs greatly among species (Zedler 1987). Vernal pool plant zonation, in which characteristic rings of flowers form around vernal pools, is a result of this differential tolerance to inundation. Species that are the least tolerant to inundation grow along the margins of the pools, while those that can tolerate extended periods of inundation grow in the center of the pools.

Information for the vernal pool plants can be found in the final rules to list these species (62 FR 34029; 62 FR 14338; 57 FR 24192; 43 FR 44810) and in the criteria section of this rule. Additional information specific to each of the 11 individual vernal pool plant species described in this rule is provided below.

Limnanthes floccosa ssp. *californica*

Limnanthes floccosa ssp. *californica* (Butte County meadowfoam) was first collected in 1917 at a site 10 miles (mi) (16 kilometers (km)) north of Chico (Service 1991b), although it was recognized as a separate subspecies at that time. Kalin-Arroyo (1973) determined that it was a distinct taxon and gave it the scientific name *Limnanthes floccosa* ssp. *californica*. The type locality is in Butte County between Chico and Oroville, near the intersection of State Highway 99 and Shippee Road (Kalin-Arroyo 1973).

Limnanthes floccosa ssp. *californica* is a small annual of the meadowfoam or false mermaid family (Limnanthaceae). It has erect stems less than 10 in (25 cm) tall. The stem and leaves are densely pubescent (covered with short hairs). The alternate leaves are pinnately compound (divided into distinct segments which are arranged featherlike on either side of a rachis), up to 3 in (8 cm) long, and consist of 5 to 11 leaflets on a long petiole. A single flower arises in the axil (angle between the base of a leaf and the stem) of each upper leaf. The flowers are white with yellow veins, cup or bowl-shaped, and consist of 5 petals, 5 sepals, 5 pistils (female reproductive structures of a flower), and 10 stamens (male reproductive structures of a flower) on a long flower stalk (Kalin-Arroyo 1973; McNeill and Brown 1979; Ornduff 1993b).

Limnanthes floccosa ssp. *californica* has always been confined to small widely scattered occurrences in northwestern Butte County (Keeler-Wolf *et al.* 1998). In her original description, Kalin-Arroyo (1973) mentioned six collections, including the type locality. Five of those were in the areas ranging from the original collection site southeast to Oroville, and the sixth was from Table Mountain north of Oroville.

However, James Jokerst (1983) did not find *L. f.* ssp. *californica* on Table Mountain and later suggested that the specimen had been misidentified (Service 1992a).

All 13 of the occurrences described by the California Natural Diversity Database (CNDDB) (2002) had been reported by 1988 (Kalin-Arroyo 1973; McNeill and Brown 1979; Dole 1988; Jokerst 1989). Five were in northern and northeastern Chico near the municipal airport, four (including the type locality) were from the area around Shippee (northwest of Oroville), and three were from southeastern Chico. The other occurrence, northeast of the town of Nord, contained only one plant that was of questionable identity (CNDDB 2002). However, the area indicated would be in the same vicinity as the 1917 collection.

Two occurrences of *Limnanthes floccosa* ssp. *californica* have been extirpated, one each in northern and southeastern Chico (Jokerst 1989; Dole and Sun 1992; Service 1992a; CNDDB 2002). Some of the other 11 extant occurrences have been reduced in distribution (CNDDB 2002).

Limnanthes floccosa ssp. *californica* normally is found in three types of seasonal wetland habitats: ephemeral drainages (swales), vernal pool depressions in swales, and occasionally around edges of isolated vernal pools (Jokerst 1989). The swales and vernal pools where *L. f.* ssp. *californica* grows are on intermediate fan terraces (Kelley and Associates Environmental Sciences 1992) in annual grasslands with mima mound topography. Large cobbles are present throughout the pools and swales (Jokerst 1989). These pools are associated with Tuscan, Redbluff, Riverbank, and Modesto geologic formations, and most of them occur on soils of the Tuscan-Anita and the Redding-Igo complexes. Anita and Igo soils are confined to the pools and swales. Tuscan and Redding soils are restricted to the mounds. The two soils are underlain by iron-silica cemented and indurated (hardened) hardpan, respectively (Kelley and Associates Environmental Sciences 1993).

Limnanthes floccosa ssp. *californica* has been observed on Anita clay soils annually regardless of rainfall but appears on Igo soils only in years of above-average rainfall (Kelley and Associates Environmental Sciences 1992a; Crompton 1993; Schonholtz *in litt.* 1995), presumably because the former can hold approximately twice as much moisture (Kelley and Associates Environmental Sciences 1993). Confirmed occurrences have been found at 165 to 300 ft (50 to 90 m) in elevation (McNeill and Brown 1979; CNDDB

2002). The habitat associated with *L. f.* ssp. *californica* includes saturated soils and pools with a short lived inundation period.

Further discussion of the life history and habitat characteristics of *Limnanthes floccosa* ssp. *californica* can be found in the final rule to list the species (62 FR 54807).

Lasthenia conjugens

Edward Greene (1888) first described this species as *Lasthenia conjugens* (Contra Costa goldfields), from specimens collected near Antioch, California. Harvey Hall (1914) later lumped it in with *Baeria fremontii* (Fremont's goldfields). Roxana Ferris (1958) proposed the name *Baeria fremontii* var. *conjugens* to recognize the distinctiveness of *L. conjugens*. Finally, Robert Ornduff (1966) restored Greene's original name and rank, returning this species to the genus *Lasthenia*.

Lasthenia conjugens is a showy spring annual in the aster family (Asteraceae). Its stems are 4 to 12 in (10 to 30 cm) tall, somewhat fleshy, and usually are branched. The leaves are opposite and narrow; the lower leaves are entire, but stem leaves have one or two pairs of narrow lobes. The daisylike flower heads are solitary (Greene 1888; Ornduff 1993a).

Twenty extant occurrences of *Lasthenia conjugens* are found widely scattered in small vernal pool areas in Alameda, Contra Costa, Mendocino, Monterey, Napa, and Solano Counties. Of these 20 occurrences, Solano County has 11 small scattered occurrences in a general area east and south of the City of Fairfield. The Santa Barbara County and Santa Clara County occurrences of *L. conjugens* have probably been lost due to habitat alteration (CNDDB 2002). One Napa County site, Milliken Canyon, contained only a single plant in 1987 whether this individual is still in existence is unknown (CNDDB 2002).

Lasthenia conjugens typically grows in vernal pools, swales, moist flats, and depressions within a grassland matrix (CNDDB 2002). However, several historical collections were from populations growing in the saline-alkaline transition zone between vernal pools and tidal marshes on the eastern margin of the San Francisco Bay (Baye, Service, *in litt.* 2000a). The herbarium sheet for one of the San Francisco Bay specimens notes that the species also grew in evaporating ponds used to concentrate salt (Baye, *in litt.* 2000b). The vernal pool types from which this species has been reported are Northern Basalt Flow, Northern Claypan, and Northern Volcanic Ashflow (Sawyer and Keeler-Wolf 1995). The landforms and