

chaparral (CNDDDB 2006). Fire may also favor *C. plummerae* in these communities: several occurrences of *C. plummerae* have been reported after fire and increased numbers of *C. plummerae* have been observed in a few populations that have been revisited after fire (CNDDDB 2006). Beyond these observations, however, little is known about environmental and ecological factors that influence the distribution and density of *C. plummerae*.

This species is restricted to an area that includes only part of Southern California, and much of its historic range is highly urbanized. It has been found primarily between the Transverse Ranges and the coast in a region that encompasses parts of Riverside County, San Bernardino County, Los Angeles County, Ventura County, and Orange County. The California Native Plant Society includes it in CNPS List 1B.2, indicating that the species is rare throughout its range and is fairly endangered (i.e., 20-80% of the species' occurrences are threatened; CNPS 2006).

In the spring following the massive wildfires of October 2003, a number of populations of *C. plummerae* were found in the San Bernardino National Forest and on adjacent lands. These included a population on the campus of California State University, San Bernardino that had previously escaped detection (Fig. 1). The studies of *C. plummerae* distribution described here were carried out to elucidate factors that might influence distribution and density of *C. plummerae*. Potential associations of *C. plummerae* with topographic position, steepness of slope, and density of non-native annual plants were investigated.

METHODS

The transect studies were carried out on Badger Hill between May 25 and June 7, 2005. Badger Hill, located in San Bernardino, CA (117° 18' E, 34° 11' N) is a ridge of Pelona schist surrounded by recent alluvium (Miller *et al.* 2001). It is approximately one km long and 0.2-0.4 km wide, ranging in elevation from approximately 475 m above sea level at the base to 565 m at the peak. Its soil is classified as a fine sandy loam of the Friant series with rock outcrops (Woodruff and Brock 1980). At the time of this study (seven months after the Old Fire burned the site in October 2003) the most common dominants on Badger Hill were resprouting chamise (*Adenostoma fasciculatum* Hook. & Arn.) and white sage (*Salvia apiana* Jepson).

To evaluate potential associations between *C. plummerae* density and topographic position, steepness of slope, and density of annual plants, we established 16 transects over four topographic positions. Four belt transects were established on ridges, four were established on north-facing slopes, four were established on south-facing slopes, and four were established in gullies. The four nominally north-facing slopes had aspects that ranged in azimuth from 6° west of north to 20° east of north. The four nominally south-facing slopes covered a wider range of aspects, ranging from 65° east of south to 15° west of south. Gullies all faced more north than south (80° east to 15° west of north). The convoluted nature of Badger Hill allowed us to place transects on non-contiguous north-facing and non-contiguous south-facing slopes that descended from the main ridge, two side ridges, and a small hill at the west end of the ridge (Little Badger Hill).



Fig. 1. *Calochortus plummerae* on Little Badger Hill on the campus of California State University, San Bernardino, seven months after the October wildfires of 2003.

The transects varied in length (50 m - 250 m long), generally ending at tops and bottoms of slopes and at the ends of ridges. Transects were usually 6 m wide, but some segments were as narrow as 3 m if the narrow width of the ridge or the need to avoid dirt-bike trails prevented the establishment of a wider transect. Transects were divided into 10-m segments for the purpose of recording data, and the following parameters were recorded in each segment: density of *C. plummerae*, steepness of slope, and density of annual plants. Density of non-native annual plants (hereafter referred to as "weeds" for the sake of brevity) was estimated by individually scoring the density of (1) all annual grasses, (2) *Centaurea melitensis* L. (tocalote or maltese star-thistle), and (3) *Brassica nigra* (L.) Koch (black mustard) as either absent (scored as 0), 1-10 plants m^{-2} (scored as 1), 10-20 plants m^{-2} (scored as 2), or >20 plants m^{-2} (scored as 3). A "total weed score," obtained by summing the scores for all the three classes of annual plants, was used in most of the analyses.

Because most of the *C. plummerae* plants were past flower during the 2004 study, and because *Calochortus splendens* Benth. was present in the area, we conducted additional censuses in the spring of 2005 to ensure that potential errors in species identification had not confounded our results. We recensused the first 50 m of each of the transects on



McKinney, Lloyd B. et al. 2006. "Noteworthy Observation: Peirson's milk vetch ovules, seeds, and seed size." *Crossosoma* 32(2), 84–85.

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