# ALKALI MARIPOSA LILY

Calochortus striatus Parish

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Management Status: Federal - USFWS Species of Concern; BLM Sensitive California - S2.2; G2 (CDFG, 1998) CNPS - List 1B, R-E-D Code 2-2-2 (Skinner and Pavlik, 1994)

# **General Distribution:**

Alkali mariposa lily is a rare endemic of moist alkaline areas in the arid interior of southern California and southern Nevada. Specifically, it occurs in the southern Sierra Nevada; in the western, central and southern Mojave Desert; at the north base of the San Bernardino Mountains; in the southern San Joaquin Valley and disjunctly in southern Nevada. In Nevada, populations occur in Clark County near Las Vegas and in Nye County near Ash Meadows. It is considered "critically endangered" in Nevada and the two known populations are very small and apparently have not been seen recently (Mozingo and Williams, 1980; Kartesz, 1988; Morefield and Knight, 1992). In California, populations are scattered in Kern, northeastern Los Angeles, and southern and central San Bernardino counties. Outside the WMPA in California, there are twelve populations (900 total plants) around Lake Isabella (Mitchell, 1988), 14 populations (highest count 765 plants) at Beaver Pond on The Nature Conservancy's Kern River Preserve (Weldon Quad), and three populations (highest count 4074 plants) at the KVLI radio tower meadow adjacent to the Kern River Preserve (Tollefson, 1992). There is also a single collection from west of Bakersfield.

# **Distribution in West Mojave Planning Area:**

There are five areas where this species occurs within the planning area (CDFG, 1997b): the San Bernardino Mountains at Cushenbury Springs and Box "S" Springs; Lucerne Valley (at Rabbit Spring); north of Barstow (which may be the same as the next); Paradise Springs near Ft. Irwin; Edwards Air Force Base (EAFB); north of Lancaster; and Red Rock Canyon State Park (CDFG, 1997b). In addition, the species was taken at 29 Palms in 1902 (SMASCH, 1998), but has apparently not been reported there since. The populations north of Lancaster are contiguous with, and undoubtedly part of, the huge populations reported at EAFB (Bagley, pers. com.). Specific sites, based on specimens at UCR, in this area include: "13 mi. N of Palmdale, Sierra Hwy at Ave. F, uncommon" (=scattered, occasional but rather regularly encountered); "12 mi. N of Palmdale, Sierra Hwy at Ave. G, fairly common (several hundred scattered through the area)"; "SW edge of Rosamond Dry Lake, near E end of Ave. C, just W of Piute Ponds and E of Sierra Hwy, fairly common" (several hundred at this site). In addition, Sanders (pers. obs.) remembers that in the 1980s there were numerous plants in the saltbush scrub immediately N of the Lancaster Sewer Ponds at Sierra Hwy and Ave B. We conclude that there is an extensive population of alkali mariposa lily along Sierra

Hwy for at least 5 mi. (8.3 km) from Ave. G (and probably S of that), all the way to the Kern Co. line, and certainly at least to Ave. B. It appears that only the cleared sites in this area don't have the species and there are thus several thousand acres (perhaps as much as 6400 acres/2590 ha) of probably occupied habitat. It appears that there are tens of thousands of plants in this area. A larger scale study of natural resources within the city of Lancaster (Tierra Madre, 1991) found populations of alkali mariposa lily in 24 of 67 sections surveyed in the saltbush scrub community and in 8 of 23 sections in the Joshua tree woodland community. Unfortunately, this study was primarily directed at rare animals so plant species were not censused in a more detailed way. UCR has a collection (*LaPré and Campbell s.n.*) from "Rosamond, east side of 20th St. W, 0.3 mi. S of Marie Ave." taken in 1988, with no population estimate given. This would appear to be a northern fringe of the "Sierra Ave." population just described.

# Natural History:

Parish (1902) originally described alkali mariposa lily (Liliaceae) from his collection at Rabbit Springs in San Bernardino County, California. It is a perennial arising from a small membranous-coated corm and has two or three slender, grass-like, basal leaves 4-8 in. (10-20 centimeters) long that are withered by the time the plant flowers. The inflorescence is umbel-like with one to five erect bracts 0.5-1.25 in. (1-3 cm) long. The species flowers from April through June. The perianth is bell-shaped with a narrowed base and the sepals are 0.4-0.8 in. (10-20 mm) long. The petals are 0.8-1.2 in. (20-30 mm) long, irregularly toothed at the tip, and are white to lavender with conspicuous purple veins. The oblong nectary on the upper petal surface is not depressed and is densely simple-hairy. The fruit is erect, 1-1.5 in. (4-5 cm) long, linear in shape, but angled in cross section (Fiedler and Ness, 1993). The flower is perfect and is pollinated by flies and bees (Tollefson, 1992). It is unknown whether reproduction is most commonly from seedling establishment or corm division (deBecker, 1985).

This species is very distinctive and should not be confused with any other *Calochortus*. Most notably, it can be distinguished from other mariposa lilies by subumbellate inflorescence, oblong gland and obvious dark purple veins on the petals. Over much of its range the only other mariposa lily in the same general habitats is the desert mariposa lily (*Calochortus kennedyi*) with bright orange ("day glow") flowers.

A number of early authors (Jepson, 1921; Abrams, 1923; Jaeger, 1940) placed *Calochortus striatus* in synonymy with the related *Calochortus palmeri*, but this was based partly on a confusion of type specimens and this treatment has not been followed by more recent authors (e.g., Munz, 1959; Fiedler and Ness, 1993). It appears that the species has been uniformly accepted as distinct since the monograph of Ownbey (1940).

#### Habitat Requirements:

Alkali mariposa lily grows in calcareous sandy soil (Fiedler, 1985) in seasonally moist alkaline habitats such as alkali meadows (Mozingo and Williams, 1980), ephemeral washes, vernally moist depressions and at seeps within saltbush scrub at 300-4500 ft. (800-1400 m) elevation (Fiedler and Ness, 1993). These plants are not found in soils with surface salts, or wetter areas with permanent standing surface water (Mitchell, 1988). The bulb remains dormant and does not sprout in dry years.

At the Lake Isabella and Paradise Spring sites this species is found in low growing saltgrass (*Distichlis spicata*), but it is not found in stands of tall grasses. Associated species at Paradise Spring included Mexican rush (*Juncus mexicanus*), beak spike sedge (*Eleocharis rostellata*), arrow grass (*Triglochin concinna var. debile*), California blue eyed grass (*Sisyrinchium bellum*), alkali sacaton (*Sporobolus airoides*), and Emory's baccharis (*Baccharis emoryi*) (Bagley, 1989). Associated species on EAFB include wild rye (*Elymus cinereus*), honey mesquite (*Prosopis glandulosa var. torreyana*), alkali goldenbush (*Isocoma acradenia*), rabbitbrush (*Chrysothamnus nauseosus ssp. hololeucus*), baltic rush (*Juncus balticus*) and winter fat (*Krascheninnikovia lanata*) (Heckard and Moe, 1977). The Alkali mariposa lily is associated with saltbush (*Atriplex spp.*) at The Nature Conservancy's Kern River Preserve (CDFG, 1997b).

# Population Status:

In considering the figures presented below, it must be stressed that abundance figures are complicated by large fluctuations from year to year (Tollefson, 1992). There were about 6,000 plants reported for Kern county (on Cantill, Lake Isabella South, Millux, Pinyon Mtn., Weldon and Woolstaff Creek 7.5' USGS Quads) from 1988-1992 (CDFG, 1997b). There is an unknown number at the Rosamond location mentioned above. There are as many 165,000 plants in 67 areas documented on EAFB (Los Angeles and Kern Counties: Bagley, pers. comm., 1998). There were 133 plants reported in 1990 at Red Rock Canyon (CDFG, 1997b). About 400 plants were reported at three sites around Lancaster in Los Angeles County in 1988 (CDFG, 1997b), but that clearly understates the situation in this area, as noted in the W Mojave distribution section, above. In San Bernardino County, about 100 plants were reported at Cushenbury Springs, about 100 plants were reported at Rabbit Springs in 1993, and about 1,500 plants were reported in 1989 at Paradise Springs near Fort Irwin (CDFG, 1997b).

# **Threats analysis:**

Seasonally moist alkaline habitat is a critical limiting factor in the occurrence of this species. The greatest threat to this habitat is the lowering of water tables. The next greatest threat to this species is probably urbanization in the Lancaster area where the largest populations are concentrated. An additional threat is trampling and grazing by cattle, which may severely reduce its reproductive capacity. In a survey around Lake Isabella, plants in ungrazed areas were taller [12-15 in. (31-38.5 cm) compared to 3-4 in. (8-10 cm)], more robust and more numerous than those in grazed areas (Mitchell, 1988). Low intensity horse grazing was tested from 1984-1991 to determine if soil disturbance and/or the reduction of competing grasses and weeds would affect alkali mariposa lily productivity at The Nature Conservancy's Kern River Preserve. There was neither a dramatic increase or decrease in the grazed *Calochortus* population during this period compared to non-grazed control populations (Tollefson, 1992). This study did not measure the height of the plants.

Urbanization and road construction are also threats (Skinner and Pavlik 1994). A population of unknown size at Whiskey Springs was extirpated in 1920s by construction of Highway 18 (CDFG, 1997b). The Cushenbury Springs population declined due to expansion of Kaiser Cement in 1988 when they diked the flow of the spring for their use and added a parking lot (CDFG, 1997b). A population of 300 plants southeast of Highway 178 near the Radio Tower Meadow was destroyed in 1989 by development (Tollefson, 1992). The large populations along Sierra Highway are in the path of expanding urbanization from Lancaster. These populations are largely on private land and receive minimal protection.

The ongoing monitoring at The Nature Conservancy's Kern River Preserve indicate competition from taller grasses such as wild ryegrass (*Elymus triticoides*) and non-native barley species (*Hordeum* sp.) may contribute to population declines (Tollefson, 1992), but this may not be a general problem.

# **Biological Standards:**

Due to wide fluctuations in population numbers, one documented example being at The Nature Conservancy's Kern River Preserve (low of 43 to a high of 765), long term monitoring is required to protect this species (Tollefson, 1992). Even though this species occurs on a large number of quads, most of the populations are small (Bowen, 1984), with the notable exception of the metapopulation extending from Lancaster to Edwards Air Force Base. The conservation of this species is a particular challenge because it faces four major threats: lowering water table, grazing, competition from weedy species, and land development. Interaction is needed with local water authorities regarding possible measures necessary to maintain (or restore?) the water table at its historic level and to remove or modify existing obstructions to natural spring or seep flows. Known population sites should be fenced to prevent trampling and grazing by cows. Partial or complete removal of introduced weeds would reduce competition for resources, and thus improve reproductive capability, but this has yet to be tested for this species and may not be possible or practical. Listing may discourage development on public lands. The Nature Conservancy's Kern River Preserve populations are currently protected from development.

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